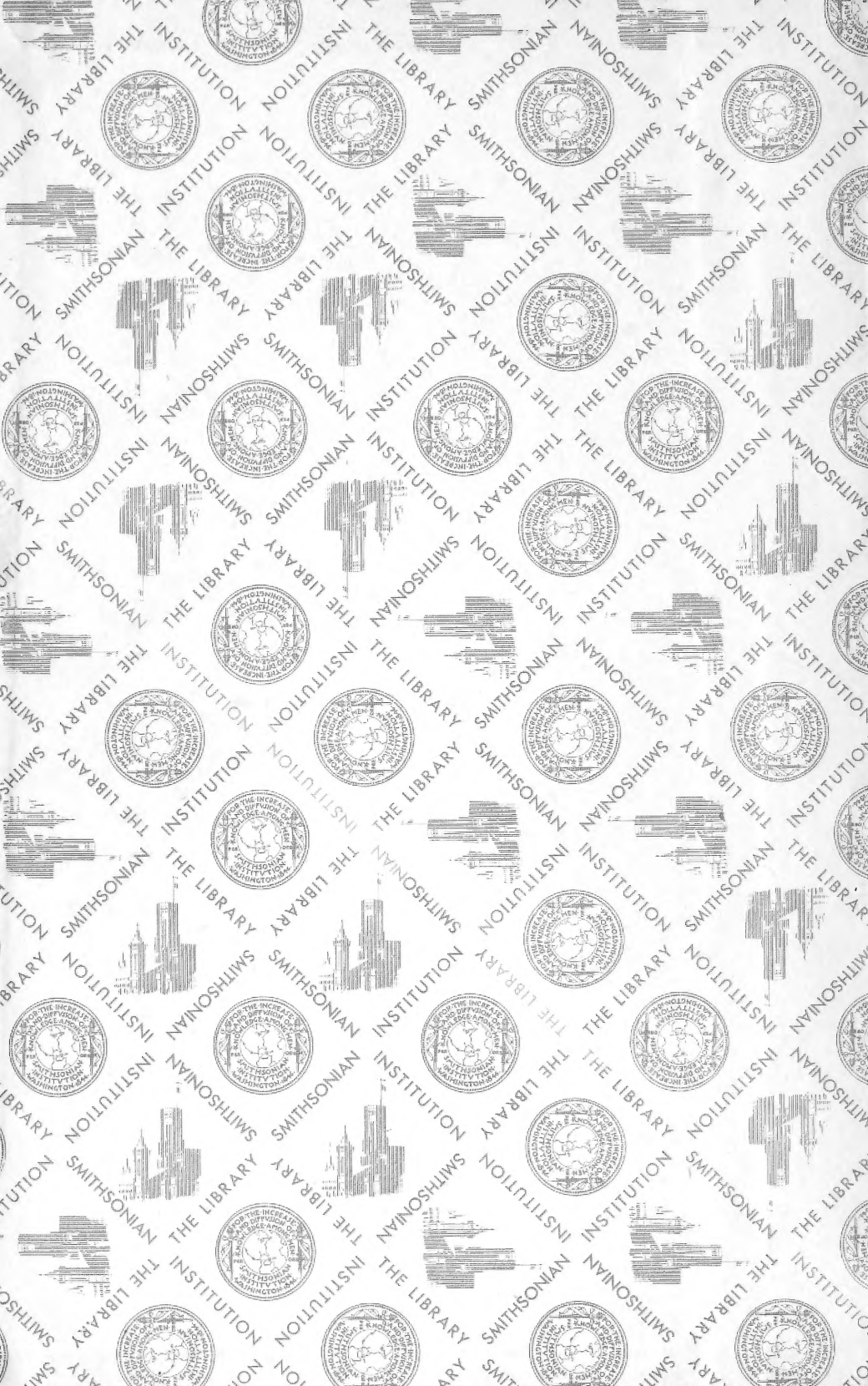
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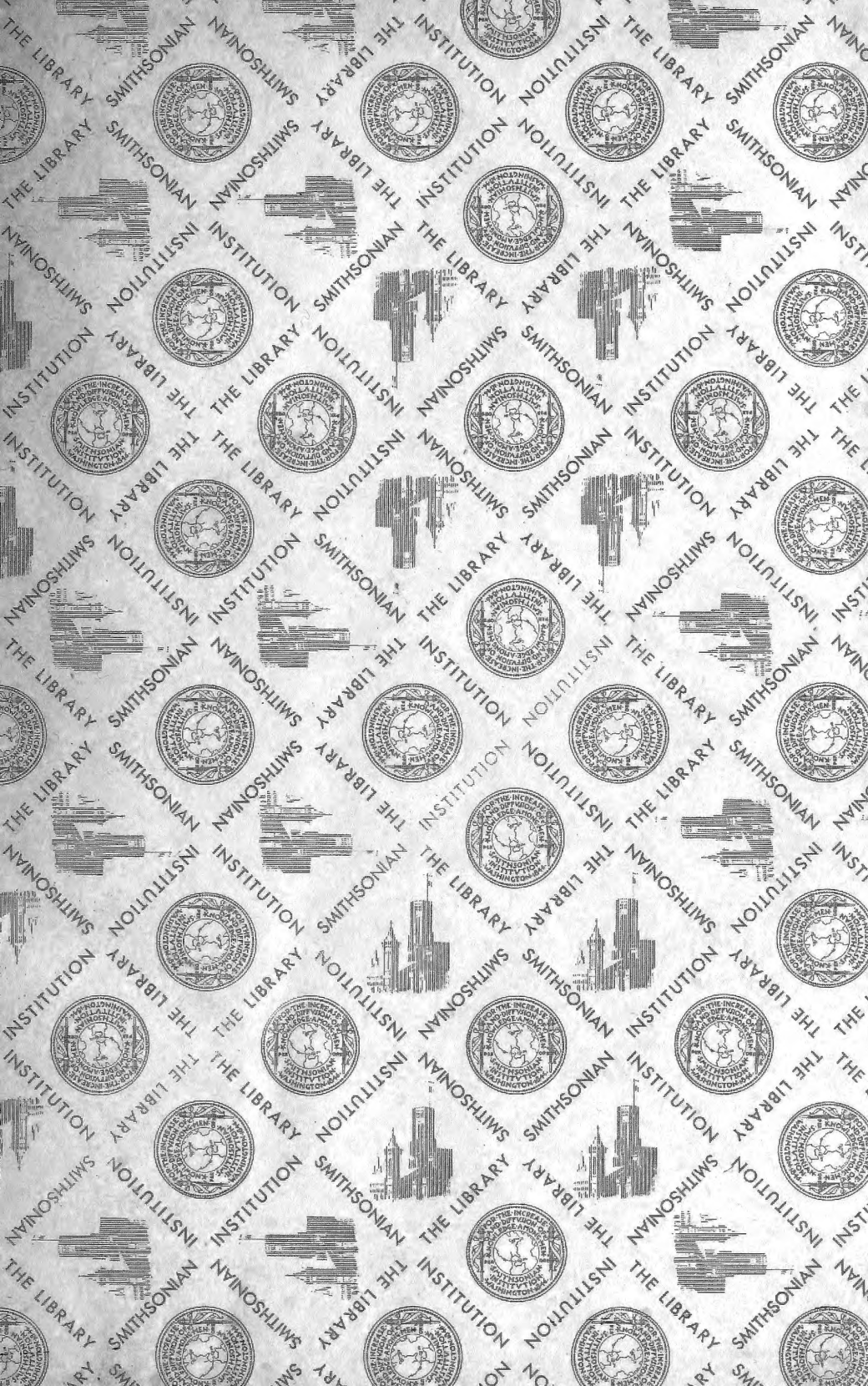
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Forel, Professeur Auguste (Hon. Correspg. Member). *Europe.*
Forrest, L. R. W. ... ... *Europe.*
Forsyth, Dr. W. ... ... *Europe.*
Forteath, H. H. (I.F.S.) ... . Pokokku, U. Burma.
Foster, Capt. L. M. ... ... Kirkee.
Foulkes, George F. F. ... ... Madanapally.
Fowler, F. D. (C.E.) ... ... Madras.
Fox, C. P. (C.E.) ... ... Gadag, S. M. Ry.
Fox, F. G. Brook (C.E.) ... ... *Europe.*
Francke, A. ... ... Bombay.
Fraser, Major A. ... ... Mean Meer.
Fraser, Capt. H. A. D. (R.E.)... ... ... Bangalore.
Fraser, S. M. (I.C.S.) ... ... Bangalore.
Freeman, Col. T. ... ... Bombay.
French, Surg.-Capt. G. B. ... ... Calcutta.
Frenchman, Surg.-Major E. P. ... ... Bassein, Burma.
Friedlander and Sohn, Messrs. R. ... ... *Europe.*
Fry, T. B. ... ... Bandora.
Fuller, Hon'ble Mr. J. B. (I.C.S., C.I.E.) ... Jabalpur.
Fulton, Hon'ble Mr. Justice E. M. (I.C.S.) ... Bombay.
Fulton, Lt.-Col. R.... ... ... Dharamsala.
Furdoonji Jamsetji... ... ... Bombay.

Gabbett, E. (C.E.) ... ... Rangoon.
Gaddum, F. ... ... *Europe.*
Gadsden, F. O. (R.I.M.) ... . Bombay.
Gahagan, E. G. (C.E.) ... ... *Europe.*
Gama, Dr. J. A. Da ... ... Bombay.
Gamble, J. S. (F.L.S.) ... ... Dehra Dun.
Gaye, W. C. ... ... Secunderabad.
Gell, H. G. ... ... Bombay.
George, C. P. ... ... Secunderabad.
Gerhardt, Paul ... ... Bombay.
Gibbs, H. M. ... ... *Europe.*
Gibbs, R. T. ... ... Waltair, Madras.
Gilbert, C. F. (M.I.C.E.) ... ... Bhamo, Burma.
Gilbert, Reg. ... ... *Europe.*
Giles, E. ... ... Poona.
Giles, R. ... ... Karachi.
Gimlette, Surg.-Major G. H. S. ... ... Indore, C. I.
Giro, C. G. ... ... Bombay.
Girvin, Surg.-Capt. J. ... ... *Europe.*
Glazebrooke, N. S. ... ... Bombay.
Gleadow, F. ... ... Dehra Dun.
Godwin-Austin, H. ... ... Ellichpur, Berar.

Goethals, Rev. Dr. Paul, Archbishop of Calcutta ... Calcutta.
Goldsmid, F. L. ... ... Poona.
Goldthorpe, Lieut. F. H. ... ... Jacobabad.
Gompertz, Rev. F. W. ... ... *Europe.*
Gonsalves, Dr. J. F. ... ... Bijapur.
Gordon, D. M. ... ... Mone, Burma.
Gore, Col. St. G. C. (R.E.) ... ... Dehra Dun.
Græne, Col. R. C. ... ... *Europe.*
Graham, J. A. ... ... Coorg.
Graham, W. D. ... ... Hongkong.
Grant, Surg.-Capt. D. St. J. ... ... Lahore.
Gray, Chas. ... ... Coonoor.
Gray, Brig.-Surg.-Lt.-Col. Wellington... ... *Europe.*
Greany, Surg.-Major H. ... ... Bolarum.
Greany, Surg.-Lieut.-Col. J. P. ... ... Dharwar.
Greatheed, C. ... ... Ahmednagar.
Greaves, John ... ... Bombay.
Green, E. Ernest (F.E.S.) ... ... Ceylon.
Green, Surg.-Major J. S. ... ... Benares.
Green, W. M. (I.F.S.) ... ... Kurseong, Bengal.
Greig, Joseph ... ... Sylhet.
Griffiths, John ... ... *Europe.*
Guinness, Major E. (R.A.) ... ... *Europe.*
Gunn, Vet.-Capt. W. D. ... ... Meerut.
Guy, G. Filmer ... ... Bombay.
Gwyn, Capt. A. ... ... Calcutta.

Habibuddin, S. (C.S.) ... ... Khamamett.
Haig, Brig.-Surg.-Lt.-Col. P. de H. ... ... *Europe.*
Haines, H. H. ... ... *Europe.*
Hall, Mitchell ... ... Jalpaiguri.
Hamilton, R. E. A.... ... ... *Europe.*
Hampson, Sir George F. (Bart.), F.L.S., F.E.S. ... *Europe.*
Hankin, E. H. ... ... *Europe.*
Hannyngton, W. O. ... ... Pyinmana, Burma.
Hanson, C. O. ... ... Seoni, Chapara.
Hare, A. J. B. ... ... Jalpaiguri.
Hargrave, H. J. B. (C.E.) ... ... *Europe.*
Harington, Lieut. E. C. ... ... Bolarum.
Harington, Surg.-Major V. ... ... Ulwar.
Harold, Lt. C. F. ... ... Zaila, Somali Coast.
Harris, L. T. ... ... Vizagapatam.
Harrison, Lt. H. ... ... Aden.
Hart, G. H. R. ... ... Calcutta.
Harter, R. H. ... ... Bombay.
Harvey, W. L. (I.C.S.) ... ... Bombay.
Haslope, Rev. L. M. ... ... Deesa.
Hasted, W. A. ... ... Waltair, Madras.
Hatch, Capt. A. E. ... ... Poona.

Hatch, H. F.	... Rajkote.
Hatch, Surg.-Lt.-Col. W. K.... ...	... Bombay.
Hate, Vinayek N.	... Bombay.
Hatherell, Capt. W. G.	... Quetta.
Haughton, Samuel (C.C.S.)	... Colombo, Ceylon.
Hauxwell, T. A.	... Tonghoo, Burma.
Hearsey, T. N.	... Kurnool, Madras.
Heath, R. H.	... Kot-Kapura, Punjab.
Heeckerenz, Le Baron Von (Hon. Corrpg. Member).	Java.
Henderson, Surg.-Capt. R. S. F. ...	... Campbellpur.
Henderson, Surg.-Major W. G. H. ...	... Bombay.
Herbert, Surg.-Capt. H.	... *Europe.*
Hibbert, Capt. E.	... *Europe.*
Hibbert, Col. J.	... *Europe.*
Hickman, R. St. J....	... Cachar.
Hight, Mrs. A. E.	... Poona.
Hildebrand, Lt. A. B. R. (R.E.) ...	... Bombay.
Hill, F. J. A.	... *Europe.*
Hill, H Charles	... Mandalay.
Hla, Maung Po	... Mingin, Burma.
Hodges, Capt. H.	... *Europe.*
Hodgson, C. M.	... *Europe.*
Hojel, Surg.-Capt. A. G.	... Bombay.
Hole, H. A.	... Silchar, Cachar.
Holland, W. J.	... Bijapur.
Hollis, T.	... Bombay.
Hooton, Surg.-Lt. A.	... Poona.
Hope, G. A. (R.A.)	... Ellichpur.
Hore, Lt.-Col. W. S.	... *Europe.*
Hornidge, S. (C.E.)	... Ahmednagar.
Howes, Mowbray	... Selangore.
Howlett, Col. A. (I.S.C.)	... Bhamo, Burma.
Howse, G. E.	... Bombay.
Hudson, C. W. M. (I.C.S.)	... Ahmednagar.
Hudson, L. S.	... *Europe.*
Hunt, E. R.	... Sylhet.
Hunter, H. C. V.	... *Europe.*
Hunter, Lt.-Col. J. M.	... Rajkote.
Hunter, Capt. W. H.	... Sawantwady.
Hussey, Col. C. E.	... *Europe.*
Hutchinson, F. T.	... *Europe.*
Hyam, Judah (Life Member)	... Poona.
Ichalkaranji, The Hon'ble Narayenrao Govind *alias* Babasaheb Ghorpade, Chief of (Life Member)	... Kolhapur.
Imray, Robt. S.	... Peermaad, Travancore.
Indore, H. H. the Maharaja Holkar of ...	... Indore.

Inglis, Chas. M. ... ... Darbhanga.
Inverarity, J. D. (Life Member) ... ... *Europe.*
Israel, Shalom Bapujee ... ... Murud, Janjira.

Jackson, A. B. (I.F.S.) ... ... Nilamber, Malabar.
Jackson, Col. F. H. ... ... Palanpur.
Jacob, Mrs. Arthur... ... ... Mhow, C. I.
Jacob, G. (I.C.S.) ... ... Karachi.
Jacob, H. S. ... ... Munmar.
Jameson, Surg.-Capt. J. B. ... ... Poona.
Jamrach, W. ... ... *Europe.*
Jamsetji, M. Doctor ... ... Bombay.
Jardine, A. J. A. ... ... Bangkok, Siam.
Jardine, E. R. ... ... *Europe.*
Jardine, James ... ... *Europe.*
Jardine, Lady John... ... ... *Europe.*
Jardine, W. F. ... ... *Europe.*
Jayakar, Surg.-Lt.-Col. A. S. G. ... ... Muscat.
Jeffrey, J. A. ... ... Bombay.
Jennings, Capt. A.... ... ... *Europe.*
Jermyn, Capt. T. ... ... Kohat.
John, H. C. ... ... Mirpur Khas, Sind.
John, H. E. ... ... Bombay.
Johnson, J. R. Kirby ... ... *Europe.*
Johnson, S. M. ... ... Cawnpore.
Johnson, W. P. ... ... Bombay.
Jones, Surg.-Capt. F. W. C.... ... ... *Europe.*
Jones, Lieut. M. D. Goring ... ... Poona.
Jowitt, John F. ... ... Bandarwella, Ceylon.
Jugmohundas V. Bhaisett ... ... Bombay.

Kaliandas Keshavdas ... ... Bombay.
Kay, Dr. W. ... ... *Europe.*
Kazi Sahabudin, Khan Bahadur (C.I.E.) ... Poona.
Kearns, A. S. ... ... Bangalore.
Keary, Lt.-Col. H. D. ... ... Meiktila, Burma.
Keatinge, G. (I.C.S.) ... ... Dharwar.
Keene, Lt. C. W. ... ... Peshawar.
Kemball, H. V. (C.E.) ... ... Jacobabad.
Kendall, Lieut. C. J. (R.I.M.) ... ... Bombay.
Kennedy, Lt.-Col. W. P. ... ... Navanagar.
Kennedy, H. E. Rear-Admiral W. R. ... ... *Europe.*
Kennedy, R. ... ... Bombay.
Kenyon, James ... ... Karachi.
Ker, L. B. ... ... Bombay.
Kerkhoven, E. J. (Hon. Correspg. Member) ... Java.
Keys, H. W. ... ... *Europe.*
Khan, Muncherji Framji ... ... Bombay.
Khareghat, M. P. (I.C.S.) ... ... Ratnagiri.

King, Alfred ... ... Bombay.
Kinsman, F. ... ... Calcutta.
Kirtikar, Surg.-Lt.Col. K. R. ... ... Ratnagiri.
Knight, D. ... ... *Europe.*
Kolhapur, H. H. the Maharaja of (Life Member) ... Kolhapur.
Kotah, H. H. the Maharaja ... ... Kotah.
Kunwar Kushal Pal Singh ... ... Narki.

Lamb, R. A. (I.C.S.) (Life Member) ... ... Poona.
Lambert, R. M. ... ... Hyderabad.
Land Records and Agriculture, The Director of ... Poona.
Lang, F. ... ... *Europe.*
Lang, Walter ... ... Bombay.
Langley, Brig.-Surg. E. H. ... ... *Europe.*
Lathi, H. H. the Thakore Sahib of ... ... Lathi.
La Touche, Lieut.-General C. D. ... ... *Europe.*
Lawder, Dr. E. J. ... ... Hyderabad(Deccan).
Lawrence, Mrs. E. ... ... *Europe.*
Leask, J. ... ... Bombay.
Lee, Lieut. A. W. H. ... ... Sima, Upper Burma.
Lee, P. Henry K. ... ... Bangalore.
Lees, John ... ... Cachar.
Lee-Warner, W. (I.C.S., C.S.I.) ... ... *Europe.*
Leggett, S. P. ... ... Karachi.
Lely, F. S. P. (I.C.S.) ... ... *Europe.*
Leslie, A. K. ... ... Bombay.
Lester, Lt. C. D. ... ... Quetta.
Leville, Rev. H. ... ... *Europe.*
Lewis, Fred (F.L.S.) ... ... Colombo, Ceylon.
Light, Major R. H. ... ... Quetta.
Light, Lieut. W. A. ... ... Poona.
Lightfoot, S. St. C. ... ... Mimbu, U. Burma.
Lindesay, Major E. ... ... Saugor, C. P.
Lindgren, O. ... ... Debrogarh, Assam.
Lingard, Dr. Alfred ... ... Naini Tal.
Linnell, Fred. ... ... Rangoon.
Little, F. A. ... ... *Europe.*
Littledale, Professor H. ... ... *Europe.*
Loam, Mathew ... ... Coimbatore, Madras.
Loch, Col. W. W. ... ... Bagdad.
Logan, R. (I.C.S.) ... ... *Europe.*
Long, A. M. ... ... *Europe.*
Long, G. R. (Life Member) ... ... Moulmein.
Lovegrove, W. H. (I.F.S.) ... ... Kotedwara.
Lowdell, Surg.-Major C. G. W. ... ... *Europe.*
Lowndes, G. R. ... ... Bombay.
Lowrie, A. E. ... ... Coorg.
Luard, E. S. ... ... Bombay.
Lucknow, The Curator & Sec., Provincial Museum.. Lucknow.

Lye, Rev. S. L. ... ... Bombay.
Lynch, C. B. ... . *Europe.*
Lynn, G. R. (C.E.) ... ... Baroda.
Lyons, Surg.-Major R. W. S. ... ... *Europe.*

Macaulay, Capt. K. ... ... Bombay.
Macaulay, Hon'ble Mr. R. H. ... ... Bombay.
Macaulay, W. M. ... ... Bombay.
MacCartie, Surg.-Major F. ... ... *Europe.*
MacDonald, Dr. D. (Life Member) ... ... Bombay.
MacDonald, J. ... ... Bombay.
MacDonald, P. J. ... ... Calcutta.
Mackenzie, J. Muir (I.C.S.) ... ... Poona.
Mackenzie, Col. K.... ... ... *Europe.*
Mackenzie, Kenneth ... ... Kurnool, Madras.
Mackenzie, Lt. K. L. W. ... ... Poona.
Mackenzie, M. D. ... ... Karachi.
Mackenzie, M. M. ... ... Chapra.
Mackenzie, T. D. (I.C.S.) ... ... *Europe.*
Mackinnon, P. W. (F.E.S.) ... ... Mussoorie.
Maclean, Jas. ... ... China.
Macleod, N. C. ... ... Bombay.
Maconachie, Brig.-Surg.-Lt.-Col. G. A. ... *Europe.*
Macpherson, John... ... ... Bombay.
Macpherson, Col. T. R. M. ... ... Poona.
Mactaggart, H. B.... ... ... Negapatam.
Madden, Lieut. T. E. ... ... Silchar.
Madras, The Supt., Govt. Central Museum ... Madras.
Mahaluxmiwalla, K. D. ... ... Bombay.
Mainwaring, H. ... ... *Europe.*
Mair, A. ... ... Calcutta.
Maitland, Surg.-Major C. B. ... ... Poona.
Mallins, Surg.-Major C. ... ... Mominabad.
Mandlik, Narayan V. (Life Member) ... ... Bombay.
Manson, F. B. ... ... Tenasserim.
Mant, R. N. ... ... *Europe.*
Maries, Chas. (Hon. Correspg. Member) ... Gwalior.
Marjoribanks, Surg.-Lt. J. L. ... ... Poona.
Marston, G. D. (C.E.) ... ... *Europe.*
Marten, James ... ... Dehra Dun., N.-W.P.
Martin, Lieut.-Col. Gerald (Life Member) ... Bombay.
Mason, Geo. E. ... ... *Europe.*
Masson, D. P. ... ... Lahore.
Mathew, Surg.-Lt. C. M. ... ... Nowgong.
Maxwell, F. D. ... ... Maubin, Burma.
McArthur, Vet.-Surgn. G. W. ... ... *Europe.*
McCabe, R. B. (I.C.S.) ... ... Kamrup, Assam.
McClelland, W. S. (M.I.C.E.) ... ... *Europe.*
McIntosh, Alex. (C. E.) ... ... Cachar.

McIntosh, H. J. (I.C.S.) ... ... Bhagalpur.
McIntosh, R. (I.F.S.) ... ... Madanapally.
McKay, Surg.-Lt.-Col. H. K. ... ... Jabalpur, C. P.
McKee, J. A. ... ... Nagpur, C. P.
McKenzie, Alex. ... ... Bombay.
McMullen, Dr. G. C. ... ... Kotri, N.-W. P.
McNair, Major J. F. A. ... ... *Europe.*
McNeil, J. (I.C.S.) ... ... Surat.
Mead, Capt. H. R. ... ... *Europe.*
Mead, P. J. (I.C.S.) ... ... Ahmedabad.
Meade, Lt.-Col. M. J. ... ... Bushire.
Meredith, Richard ... ... Lahore.
Merrony, Chas. ... ... Bulsar.
Messent, P. G. ... ... Bombay.
Meyer, Surg.-Capt. C. H. L. ... ... Bombay.
Meyer, O. ... ... *Europe.*
Middleton, T. H. ... ... *Europe.*
Millard, W. S. ... ... Bombay.
Miller, E. ... ... *Europe.*
Millett, G. P. ... ... Nasik.
Mills, Vet.-Major Jas. ... ... Bombay.
Milne, Surg.-Capt. C. J. ... ... Bombay.
Minniken, G. G. ... ... Lahore.
Miraj, Shriman Gungadharrao Ganesh *alias* Babasaheb Patwardhan, Chief of (Life Member) ... Miraj.
Modi, Bomanji Edulji ... ... Kaira.
Moir, E. McArthur ... ... *Europe.*
Monks, Surg.-Major C. ... ... Bombay.
Monté, Dr. A. de ... ... Bandora.
Monté, Rev. Dr. B. de ... ... Mahim.
Moon, A. J. ... ... KadraBeat, Bombay.
Morgan, A. ... ... Kotagiri.
Morgan, Surg.-Lt. E. J. ... ... Bombay.
Morison, W. T. (I.C.S.) ... ... Bombay.
Morris, Lieut. D. O. ... ... *Europe.*
Morton, Surg.-Lieut. J. P. ... ... *Europe.*
Moscardi, E. H. (I.C.S.) ... ... Surat.
Moss, Capt. C. ... ... Bombay.
Moulvi Syed Ali Belgram ... ... Hyderabad.
Möwis, Paul ... ... Darjeeling.
Moylan, W. ... ... Haflong, Cachar.
Muir, Frank ... ... Jhansi.
Muir, Surg.-Col. H. S. ... ... *Europe.*
Muller, Professor O. V. ... ... Bombay.
Mure, J. S. ... ... Lahore.
Murray, W. ... ... Bombay.

Nagpur, The Curator, Central Museum... ... Nagpur.
Nangle, Lieut. K. E. ... ... Kherwara.

Naranji Dwarkádas (Life Member) ... ... Bombay.
Narrotumdas Morarji Goculdass (Life Member) ... Bombay.
Navanagar, H. H. Maharaja Jam Saheb of ... Rajkote.
Newland, Surg.-Major A. G. E. ... ... Meiktila, Burma.
Newnham, Capt. A. (F.Z.S.) ... ... Mhow, C. I.
Nicéville, L. de (Hon. Correspg. Member) ... Calcutta.
Nicholson, E. F. ... ... Bombay.
Nicholson, Capt. J. S. ... ... Natal.
Nicholson, Surg.-Major R. H. ... ... Choubattia.
Nisbett, Lieut. W. G. ... ... Mandalay.
Nurse, Capt. C. G. (F.R.G.S., F.E.S.) ... ... Deesa.
Nurse, Lieut. H. H. ... ... *Europe.*

Oakes, George ... ... Ootacamund.
Oates, E. W. (Hon. Correspg. Member) ... *Europe.*
O'Brien, Edward ... ... Amreli, Kathiawar.
O'Brien, Hon'ble W. T. ... ... Karachi.
O'Callaghan, I. ... ... *Europe.*
O'Connell, J. ... ... *Europe.*
O'Conor, J. E. (C.I.E.) ... ... Calcutta.
Oldham, F. T. ... ... Kamptee, C. P.
Olivier, Lt.-Col. H. D. (R.E.) (Life Member) ... Bombay.
Ollivant, Hon'ble Sir E. C. K. (I.C.S., K.C.S.I.) ... Poona.
Ommanney, D. G. ... ... Thana.
Ommanney, H. T. (I.C.S.) ... ... *Europe.*
Opiumwalla, Dorab E. ... ... Bombay.
Ormiston, Geo. E. (C.E.) ... ... *Europe.*
Orr, J. P. ... ... *Europe.*
Orr, Col. W. J. ... ... Karachi.
Osmaston, B. B. ... ... Chakrata, N.-W. P.
Osmaston, L. S. ... ... Poona.
Owen, R. R. ... ... *Europe.*
Ozanne, E. C. (I.C.S.) ... ... *Europe.*

Palliser, H. G. (C.E.) ... ... Belgaum.
Pandurang Gopal, Dr. ... ... Kharaghora.
Parker, Surg.-Major J. ... ... *Europe.*
Parmenides, John ... ... *Europe.*
Parratt, F. E. H. ... ... Chiegmai, Siam.
Parsons, Hon. Mr. Justice ... ... Bombay.
Partridge, Henry (Life Member) ... ... Pyinmana, Burma.
Pawalla, Jamsetji C. ... ... Bombay.
Pearse, Surg.-Capt. A. ... ... Calcutta.
Pearson, E. H. M. ... ... *Europe.*
Pearson, Mrs. H. C. ... ... Bhaynder.
Pease, Vet.-Capt. H. T. ... ... Lahore.
Pechey-Phipson, Mrs. (M.D.) ... ... *Europe.*
Peet, A. W. ... ... *Europe.*
Peile, Capt. A. J. (R.A.) ... ... *Europe.*

Pelly, C. B. N. ... . Madras.
Pemberton, E. S. ... . Marmagoa.
Pennington, R. W. R. .. .. Bombay.
Pentland, Major R. C. ... ... Natal.
Penton, John E. ... ... Ratnagiri.
Pestonji Jivanji ... ... Hyderabad, Deccan.
Peters, Surg.-Lt.-Col. C. T. ... ... Belgaum.
Petit, Bomanji Dinshaw (Life Member)... ... Bombay.
Petit, Jehangir Bomanji (Life Member)... ... Bombay.
Phillips, Mrs. ... ... *Europe.*
Philpott, C. C. ... ... *Europe.*
Phipson, H. M. (C.M.Z.S.) (Life Member) ... Bombay.
Pilcher, Capt. A. J. (R.E.) ... ... *Europe.*
Pilcher, Surg.-Col. J. G. ... ... Simla.
Pinhey, Capt. A. F. ... ... Sutna.
Place, G. ... ... Akyab, Burma.
Plinston, G. C. ... ... Bombay.
Pollen, Dr. John (I.C.S.) ... ... *Europe.*
Pollock, Surg-Capt. C. E. ... ... Ranikhet.
Poncins, Baron Edmond de (Life Member) ... *Europe.*
Poore, Capt. R. M.... ... ... Natal.
Pope, P. J. (I.C.S.) ... ... Kurnool, Madras.
Powell, R. M. ... ... Ongole, Nellore District.
Prain, Surg.-Capt. D. ... ... Calcutta.
Prall, Surg.-Capt. S. E. ... ... Bandra.
Pratt, E. M. (I.C.S.) ... ... Sholapur.
Pratt, F. G. (I.C.S.)... ... ... Sholapur.
Prentis, Lt. W. S. ... ... Fort Stedman.
Preston, F. J. ... ... *Europe.*
Primrose, Alex. M. ... ... Cachar.
Prior, Major H. M. ... ... *Europe.*
Prior, Capt. W. ... ... Dilkusha, Lucknow.
Proctor, H. E. ... ... *Europe.*
Pyrke, Capt. R. D. ... ... *Europe.*

Quicke, Surg.-Major W. H. ... ... Bombay.

Radcliffe, R. C. J. ... ... Shahadadpur, Sind.
Rahimtoola Khairaz ... ... Bombay.
Raikes, E. B. ... ... Bombay.
Rambant, B. R. R. (R.A.) ... ... *Europe.*
Rattray, Lieut. H. B. ... ... Malakand, Punjab.
Rattray, Major R. H. ... ... Thul, Kuram Valley.
Ravenshaw, Lt.-Col. C. W. (Life Member) ... Oodeypore.
Rayment, Vet.-Major G. J. ... ... Rawal Pindi.
Readymoney, N. J. ... ... Bombay.
Rees, J. C. (C.E.) ... ... Pegu, Burma.
Reeve, R. ... ... Bombay.

Reid, G. B. (I.C.S.) ... ... *Europe.*
Reid, M. F. ... ... Bombay.
Renton, Capt. C. C.... ... ... Hingoli, Deccan.
Reynolds, P. (C.E.) ... ... Bombay.
Rhodes, T. M. ... ... Haflong, Cachar.
Richardson, Vet.-Capt. A. E. ... ... Allahabad.
Richardson, Cecil ... ... Bombay.
Richardson, Major W. St. John ... ... Poona.
Ritchie, A. M. (C.E.) ... ... Ahmednagar.
Rivett-Carnac, J. T. ... ... Silchar, Cachar.
Rivett-Carnac, L. ... ... Bombay.
Robb, Surg.-Major John (M.D.) ... ... *Europe.*
Roberts, R. ... ... Secunderabad.
Roberts, T. L. ... ... Bombay.
Robertson, B. (I.C.S.) ... ... Seoni, Chapara.
Robertson, Col. D. ... ... Bangalore.
Robinson, Mrs. ... ... *Europe.*
Robinson, Lieut. G. T. ... ... Falam, Burma.
Rodon, Major G. S. ... ... Dharwar.
Rodonachie, Ambrose ... ... *Europe.*
Roffey, T. H. ... ... Mysore.
Rogers, C. G. ... ... *Europe.*
Rogers, Henry (M.R.C.V.S.) ... ... Bombay.
Rogers, Thos. ... ... Bombay.
Rome, F. J. ... ... Bombay.
Rome, R. E. ... ... Jacobabad.
Roorkee, The Principal, Thomason College ... Roorkee.
Roosmale Cocq, Lt. Chas. H. ... ... Mardan.
Rundle, Surg.-Major C. S. ... ... Thayetmyo, Burma.
Rushton, Kenneth C. ... ... Ahmednagar.
Russell, L. P. ... ... *Europe.*
Rustomjee, H. J. ... ... Karachi.
Rutherford, D. ... ... Larkhana, Sind.
Ryan, G. M. (I.F.S.)... ... ... Thana.
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BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNT from 1st January, 1897, to 31st December, 1897.

RECEIPTS.	Rs.	a.	p.	EXPENDITURE.	Rs.	a.	p.
Balance in Bank on 1st January, 1897 ...	1,189	9	8	Rent from 1st December, 1896, to 30th Nov., 1897, at Rs. 125 per month	1,500	0	0
Petty Cash balance on 1st January, 1897 ...	21	14	7	Establishment from 1st December, 1896, to 30th November, 1897	1,452	0	0
Subscriptions for 1895 (arrears recovered) ...	45	0	0	Library Account	177	0	0
Do. for 1896 (do.) ...	450	0	0	Furniture Account	161	14	4
Do. for 1897	9,661	6	0	Printing and Stationery	367	8	0
Do. for 189- (in advance)	419	12	0	Journal Account, cost of printing Journal and cost of Plates from England, &c.	8,913	6	9
Do. for Journal from Members residing out of India	316	0	0	General Expenses	1,586	3	5
Do. for Life Membership	435	0	0	Balance in Bank on 31st December, 1897 ...	864	2	2
Entrance Fees	1,090	0	0	Petty Cash balance on 31st December, 1897....	28	3	6
Sale of Back Journals and Miscellaneous Receipts.	1,262	8	8				
Interest on Investments ($3\frac{1}{2}$% Govt. Paper) ...	159	3	3				
Total ...Rs.	15,050	6	2	Total ...Rs.	15,050	6	2

Examined and found correct.

E. M. SLATER,
Hon. Auditor.

A. ABERCROMBIE,
Hon. Treasurer.

BOMBAY, 1*st January*, 1898.

BOMBAY NATURAL HISTORY SOCIETY.

Investment Account.

1897.		Rs.	a.	p.	1897.		Rs.	a.	p.
Jan. 1 ...	Balance of 3½% Government Paper deposited with the Bank of Bombay	4,800	0	0	Dec. 31 .	Balance of 3½% Government Paper deposited with the Bank of Bombay	4,800	0	0
	Rupees...	4,800	0	0		Rupees...	4,800	0	0

Examined and found correct.

E. M. SLATER,
Hon. Auditor.

A. ABERCROMBIE,
Hon. Treasurer.

BOMBAY, 1*st January*, 1898.

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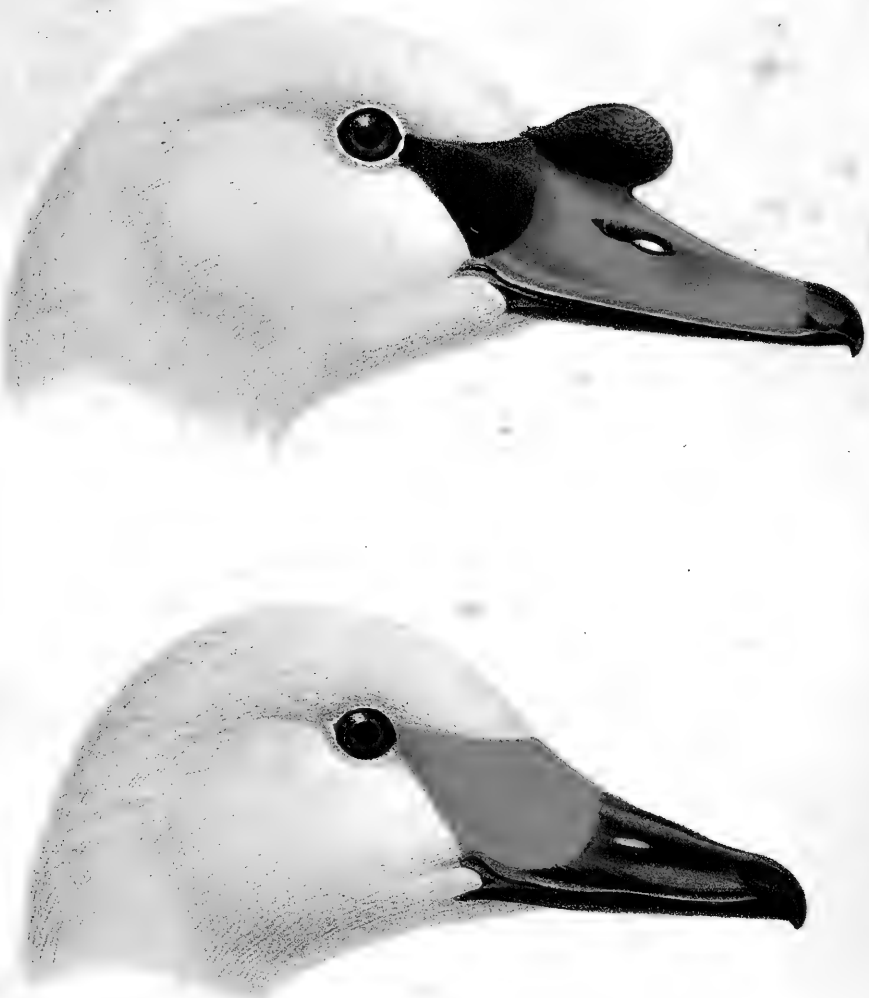


J. G. Keulemans del. Mintern Bros. Chromo lith. London.

THE MUTE SWAN — Cygnus olor.
BEWICK'S SWAN — Cygnus minor.
½ Nat. size.

CORRECTION.

Vol. X, page 628, line 7—for (*Pica bottanensis*) read (*Pica rustica*).

JOURNAL

OF THE

BOMBAY

Natural History Society.

Vol. XI. BOMBAY. No. I.

INDIAN DUCKS AND THEIR ALLIES.

By E. C. Stuart Baker, F.Z.S.

(*Read before the Bombay Natural History Society on 18th November*, 1896.)

My excuses for undertaking to attempt to compile a series of articles on the order *Chenomorphæ* are two: first, that no one else could be found willing to deal with the work; second, that it consists mainly of extracts from what other men have written and involves but little that is original. In order, however, that in addition to what is already on record something new or interesting may find a place in these papers, I sincerely trust that ornithologists and sportsmen will send me any notes they possess connected with ducks either from a sportsman's or an ornithologist's point of view. Few ducks remain throughout the year in India and breed, but even these few are not as widely or as thoroughly known as they ought to be.

The classification I have adopted is that of Salvadori, as given in Vol. XXVII of the "Catalogue of the Birds of the British Museum;" and the keys to sub-orders, families, sub-families, and genera, etc., are taken from that book, merely changed, so far as is necessary for Indian ducks, by eliminating such matter as does not refer to them, and other minor alterations. The references made are only to books which refer to the birds as Indian birds, as a complete reference to synonyms and publications would both have taken too much time and have proved of but little interest to the general reader.

The books mainly referred to are the "British Museum Catalogue of Birds," Vol. XXVII; Jerdon's "Birds of India;" "Stray Feathers;" Hume and Marshall's "Game Birds;" "Nests and Eggs of Indian Birds;" Legge's "Birds of Ceylon;" and this journal.

Order CHENOMORPHÆ.

The characteristics of this order, as defined by Huxley, are Palate desmognathous; young covered with down and able to run or swim in a few hours after hatching.

The order is divided into three sub-orders, but with the first of these, the *Palamedeæ* or Screamers, we have nothing to do, as they are confined to the neotropical region, and do not visit our part of the world.

The two remaining orders are the *Phœnicopteri* or Flamingoes, and the *Anseres* or true Swans, Geese, and Ducks. There can be no chance of these two being confounded by any one, as the two forms are so widely different.

Key to Sub-orders.—Tarsus, three times the length of femur; bill strongly bent downwards in the centre ... ... PHŒNICOPTERI.

Tarsus, about the same length as the femur; bill not bent but straight ... ... ANSERES.

The sub-order *Phœnicopteri* contains but one family—the *Phœnicopteridæ*—and that family, as far as we are concerned, but two genera, both of which contain but a single species.

Key to the Genera.—Upper mandible overlapping lower; throat naked... ... ... PHŒNICOPTERUS.

Upper mandible not overlapping; throat feathered ... ... PHŒNICONAIAS.

Order PHŒNICOPTERUS.

Family PHŒNICOPTERIDÆ.

(1). Phœnicopterus roseus. The Flamingo.

Phœnicopterus roseus.—"Cat. B. of B. M.," Vol. XXVII, p. 12; Jerdon's "B. of I.," Vol. III, p. 775; Hume's Cat., No. 944; *ibid.*, "Str. Feath.," Vol. I, p. 257; Butler, *ibid*, Vol. IV, p. 25; Fairbank, *ibid*, p. 264; Butler, *ibid*, V, p. 234; Davids and Wend., *ibid*, VII,

p. 92; Murray, *ibid*, p. 112 ; Vidal, *ibid*, IX, p. 91 ; Butler, *ibid*, p. 436 ; Legge's " B. of Ceylon," p. 1092 ; Reid, " Str. Feath.," X p. 78 ; Davidson, *ibid*, p. 325 ; Hume, *ibid*, p. 513.

Phœnicopterus antiquorum.—Hume, " Str. Feath.," VII, p. 491 ; Barnes' " B. of Bombay," p. 392.

Phœnicopterus andersoni.—Hume, " Str. Feath.," III, p. 414.

Description : *Adult male*.—Whole plumage, with the exceptions noted, a beautiful rosy-white; the rose colour much more developed on the tail and rather more on the head and neck. Primary coverts nearly or quite white, other wing coverts and innermost secondaries light rose-red. Primaries and outer secondaries black ; underwing coverts and axillaries scarlet ; under median and primary coverts black.

Orbital skin, fleshy-pink to bright rose-red ; irides lemon-yellow, pale yellow, or pale golden-yellow, (Jerdon) ; bill bright flesh-colour ; edge of mandible and terminal portion of bill black ; legs and feet pinkish-red ; claws black.

Length varies from 44″ to 53″, wing 15·5″ to 17·5″, tail 6″ to 7·5″; tarsus about 13″, bare part of the tibia 9″; culmen 5·5″ to 6·4″, depth (of bill) at centre 1·5″ (Legge's B. of Ceylon).

Female.—Similar to the male ; the rose colour on head, neck, and back often less pronounced, but not always so. Length from 38″ to 48″ ; wing 14·3″ to 15·8″; tail 5·5″ to 6·8″ ; tarsus about 10·5″ to 11·5″ ; bare tibia about 7″; culmen 4·75″ to 5·6″.

Young.—Head, neck, and lower plumage white, more or less tinged with rosy-buff ; back and wing coverts ashy-buff with dark shaft stripes ; the greater coverts more brown, but with pale tips soon wearing off ; underwing coverts and axillaries pale pink. Bill more dull than in the adult ; legs dark plumbeous.

Nestling.—White down, more or less tinged with grey, especially on the upper parts ; down in texture like that on a young swan (Dresser). In the nestling the bill is perfectly straight, but soon assumes the normal shape.

Habitat.—Southern Europe, practically confined to the Coast line, Asia on the East and South-East, and the whole of Africa.

In India it is found more or less throughout the Continent, but I can find no record of its having ever extended to Burma, and in

Hume's collection there are none from the East of Bengal or Assam, though from the latter place there is one skin marked "*x*' juv. sk. Assam" obtained by McClelland in the British Museum collection. It is very common on the major part of the West Coast and extends quite down to Ceylon, where Legge states that it is seen in large numbers both on the West and East Coast. Thence it extends northwards and is common in certain parts of Madras, but in Eastern Bengal is a decidedly rare bird. I have once seen it during the cold weather in the Sunderbands, and there are a few other recorded instances. In the widely-known and shot-over Chilka Lake in Orissa it is fairly frequently met with, though, I hear, less frequently and in smaller numbers than formerly, probably owing to the lake being more accessible to sportsmen now-a-days than it used to be. Elsewhere in Bengal it is only a casual flock that is seen in the cold weather.

Legge seems to have thought that the Flamingo bred in Ceylon; but his ideas on this subject have never been confirmed, and it is unlikely that it breeds anywhere within our limits, or anywhere nearer than the northern shores of the Persian Gulf.

Its principal breeding-places lie in Africa and in Asia, in Arabia and Persia, where they collect during the breeding season in countless numbers. It also breeds in Spain, and is said to do so on the Rhone delta. Hume, and after him Barnes, in Vol. VI, No. 3, p. 285, have commented on the curious and untidy habit these birds possess of dropping eggs about in a casual sort of manner, and in this way a good many have been found in India.

Other ornithologists have noted this habit, and it seems to be one common to the whole genus, as Barnes notes, having obtained eggs thus which he considered belonged to the Lesser Flamingo.

Again, my friend E. Hartert, when visiting Bonaire, came across a colony of Flamingoes breeding; and, though he could not approach near enough to obtain specimens and satisfy himself as to the species, he managed to visit the nesting-places, and he mentions that he obtained two fresh eggs which were lying in the water. Here the birds do not seem to have commenced breeding in earnest, and these eggs appear to have been casually dropped by the bird into the water either before the nest had been made to receive them or, more likely, before the bird felt inclined to commence incubation.

All kinds of Flamingoes, of which the nidification is known, breed in large communities and seem to select much the same kind of country, sheets of water wide in extent but very shallow, as the sites in which to make their nests. These are inverted cones of mud, some foot or eighteen inches high, with the ends broken off and a shallow cavity made in the summits instead. The nests are made close together, in many cases several in a group almost touching one another, but of course their proximity depends greatly on the depth of the water in which they are placed. Where this is variable, the nests will be found in close clusters in the shallower parts, sometimes even on mud or sand-banks above water-level ; where the water is all shallow—such as is found in the Rhone delta, Spain and elsewhere—the nests are scattered casually over a considerable extent of land. In Bonaire, the land on which the birds had made their nests was not of mud or sand covered by water but of coral. Hartert's own words describe the place vividly for us, he says : "The water was deep in places and the bottom very rough, consisting of very sharp corals and often of a deceitful crust of salt or saltpetre under which the water was black and very deep. It required much care to avoid these places, and it took us over an hour to reach the nests. The nests themselves were flat plateaus standing out of the water from 3″ to 6″, the water round them being apparently very shallow; but it was often the fatal crust that caused this appearance, not the proper bottom. Many of the nests were close together and some of them connected by dry ground. They were quite hard, so that one could stand on them, and almost the only way of getting along was to jump from one nest to another. The nests consisted of clay, hardened by the sun and penetrated and encrusted with salt and pieces of coral, with a distinct concavity in the centre."

The eggs, nearly invariably two in number, are long ovals, generally a good deal pointed at both ends. The colour of the true shell itself is a pale skim-milk blue, but they are so encrusted with a dense chalky covering that they appear, except where stained, to be pure white. They vary in size considerably, but average about 3·6′×′2·3″.

Although so common in many parts of India, they are nowhere, I believe, easy to get shots at, as they are extremely wary and cute birds. All over their habitat shyness seems to be their most

prominent characteristic, and a close approach means the result of a stalk as carefully made as if the stalker was after the very wildest kind of deer or antelope. A mistake made in attempting to conceal one's self and the whole flock rise gracefully into the air and remove themselves into safety. Typically their flight is distinctly anserine, not perhaps exactly **V** shape, but more in the form of a curved ribbon, the ends fluttering backwards and forwards as the birds, more especially those at the two extremes, alter their position. As a matter of fact different writers have declared the birds' flight to vary very much; some have said that in no respect does the flight of these birds resemble that of ducks or geese, but that, rising in one indiscriminate mass, they continue their flight as they rise; others, on the other hand, say that the formation they assume is nearly as regularly **V** shaped as that adopted by geese. Both are doubtless right, and it seems probable that, when flying for a short distance only, they adopt no special mode of flight, whereas on migration, or when moving to any distance, their formation is much as already described. Flying or wading, they are a lovely sight and, often as they have been described, no one has yet been able to do justice to their beauty. In December, 1881, when passing through the Suez Canal, I observed more of these birds congregated together than I had ever considered possible, the banks in some places looking as if covered with a rosy snow, so densely were the birds packed. As the steamer gradually approached nearer and nearer, the snow melted on its outskirts into a crimson flame as the birds lifted their wings prior to taking flight, and in so doing exposed their scarlet underwing coverts and axillaries. They made but little noise, the few calls that were heard being very similar to those of a wild goose, but not, I think, quite so discordant.

Writing of these birds, Mr. Eagle Clarke (Ibis, Vol. I, No. 2, p. 200, 1895), writes: "To witness the simultaneous unfolding of a thousand lovely crimson and black pinions under sunlight is a sight the recollection of which will not readily be effaced from our memories. The flock did not run forward to rise on the wing, but we noticed that they deliberately turned and faced a gentle breeze that was blowing and rose with perfect ease . . . . . We several times noticed the whole herd . . . . on the wing . . . but in no instance was any particular formation maintained."

They do not, however—at least in this country—always rise in the same graceful manner, but both before rising and after alighting run forward some steps in a most ungainly manner.

They generally leave Northern India in May or June, though they have been seen in July, and the first few birds return in the end of September. From Southern as well as from Eastern India, they migrate earlier a good deal, as a rule, but they have been recorded in Ceylon in May.

As might be expected from the very curious formation of the flamingo's bill, their mode of feeding is also rather remarkable. Bending down their long necks between their legs, and looking very much like bird acrobats preparing to stand on their heads, they invert their bills entirely and use them as shovels in which to catch or collect their food. This they obtain by moving their heads backwards and forwards, or from one side to another, and gently stirring up the mud. What they actually feed on is not at all well known, and is one of the easy points still left for sportsmen to clear up, as it only means the examination of the internal economy of a few birds shot whilst feeding. We know that a considerable part of their diet is vegetarian, but they are also, in all probability, far more given to animal food than has generally been believed to be the case. Mr. Eagle Clarke, in his interesting article already referred to, came to the conclusion that the flamingoes inhabiting the Rhone delta existed almost entirely, if not quite, on a tiny Phyllopod, the brine shrimp (*Artemia saleria*) which he states is found there in "marvellous abundance."

The value of the flamingo when divested of its feathers and placed on a table has been variously estimated. Some have said that *skinned* and well cooked it is equal to almost any duck in flavour, whilst, though few abuse it as fishy or nasty in any way, many have said and written that the flesh is black, flavourless, and stringy. Probably, as with so many ducks, it depends greatly on the bird's diet and the length of time it has had to recover from its migratory flight. Doubtless birds just arrived, wanting food and not very particular as to what they eat, are tough and may acquire almost any taste; on the other hand, those that have had a good time to rest and gain flesh at the expense of muscle are tender, and those that have lived on a good diet are also well flavoured.

(2). Phœniconaias minor. The Lesser Flamingo.

Phœniconaias minor, Cat. B.B. Museum, XXVII, p. 18; Hume, Str. Feath., I, p. 31; Adam, *ibid*, p. 400, II, p. 339; Hume, *ibid*, IV, p. 25; Butler, *ibid*, V, p. 234; Hume, *ibid*, VIII, p. 114; *id.* Cat. No. 944, *bis*; Butler, Str. Feath., IX, p. 436; Legge, B. of Ceylon, p. 1093; Hume, Str. Feath., X, p. 513; Barnes, B. of Bombay, p. 393.

Phœnicopterus roseus, part, Jerdon, B. of India, III, p. 775.

Description: *Adult male.*—General colour a bright pale pink; feathers at the base of the bill crimson; the longest scapularies and median wing coverts crimson, the latter edged paler; other wing coverts and the edges of the underwing coverts rosy; the greater underwing coverts and quills black; axillaries crimson; rectrices darker, and with the outer webs tinged with crimson; under tail coverts subtipped with a tinge of crimson. Some old males, perhaps during the breeding season only, have the feathers of the back with crimson shaft stripes.

Iris red minium, bill dark lake red (with the tip black), feet red (Antinori); length 34″ to 38″; wing 13″ to 14″; tail about 5″; culmen 4″ to 4·25″; tarsus 7·5″ to 8·25″ (or 95″ ?).

Female.—Similar to the male, but smaller and paler, without the crimson scapularies and with no crimson on the back or breast.

Length about 32″ to 34″; wing 12·2″ to 13″; tail about 5″ or less; culmen about 4″; tarsus about 7·25″.

The young appears to be very like that of *Phœnicopterus roseus*, but with a more rosy and less brown or buff tinge about it. Altogether a brighter, paler bird.

Habitat.—This bird is not spread over nearly so large an area as is the common flamingo. It appears to extend through South Africa on both Coasts, but the extent of its range northwards or the West Coast is still doubtful. In the British Museum Catalogue Salvadori marks its habitat Bengal with a "?" In the east it is found on many parts of the Coast as far north as Abyssinia and also in Madagascar. From N.-E. Africa it extends to N.-W. India, where, however, it is not found far south, or far into the interior, nor is it found anywhere towards the east.

It has been recorded from various parts of India from the end of September up to the beginning of July, and cannot breed very far from

our shores ; in all probability most of the birds which visit us breed on the west coast of the Red Sea, and, if such is the case, there would be nothing very remarkable in the shortness of the time elapsing between the departure of the last birds and the arrival of the earliest ones in the following September and October. It seems likely that none of the various species of flamingoes migrate to any great distance, and some, as we know, are practically permanent residents of the countries they inhabit. In Vol. IV of Stray Feathers Hume has the following note on this beautiful bird : " We know but little as yet of this species. I ascertained that it occurred in Scind in the early part of the hot weather. Captain Fielden shot it in July in Secunderabad. It has been seen on the great Majuffgarh Jheel, 20 miles north of Delhi, during the cold season, and Mr. Adams has given us full accounts of its occurrence in great numbers, but irregularly, at the Sambhar Lake. We have no record of its occurrence in any other part of Jodhpore, or in Kutch, or in Kathiawar.

In habits the Lesser Flamingo seems to differ in no way from its larger cousin, and is just as wary a bird as the latter. It is on the Sambhar Lake alone, perhaps, that it has, as a species by itself, been observed in any numbers in India. There it was found to be an extremely wide-awake bird ; even in the middle of the day it rested well away from all cover and was most difficult of approach. It feeds in the manner usual to the genus—that is to say, in groups, the formation of which is generally a long line. This line slowly advances through the shallow water, the long necks of the birds covering a radius of some two feet or so as, head downwards, they shovel and rake about in all directions in search of food.

The only note I can find regarding the nidification of this flamingo is that made in this journal by the late E. Barnes, who says that he obtained an egg from a fisherman who had found it on a sand-bank in the Indus. This egg, from its very small size, he believed to have belonged to the present species, and he adds that he examined the huge series of flamingo eggs in the Frere Hall Museum, Karachi, but failed to detect any so small. There is no reason to be found why the egg should not belong to *P. minor*, and Barnes was so careful in the statements he made that I think this egg is more likely to belong to that bird than to *P. roseus*.

Sub-Order ANSERES.

Family ANATIDÆ.

Key to the Sub-Families—

a Hind toe not lobed.
  a' Neck as long or longer than the body ... 1 SYGNINÆ.
  b' Neck not as long as body.
    a'' Hind toe rather long, tail-feathers rather long. Upper part glossy ... 2 PLECTROPTERINÆ.
    b'' Hind toe moderate, tail-feathers rather short. Upper parts not glossy. Mocere. 3 ANSERINÆ.
b Hind toe very narrowly lobed.
  c' Bill short and goose-like ... ... 4 CHENONETTINÆ.
  d'' Bill rather flat and broad ... ... 5 ANATINÆ.
c Hind toe broadly lobed.
  e'' Bill more or less *depressed.*
    c'' Tail-feathers normal... ... ... 6 PULIGULINÆ.
    d'' Tail-feathers narrow and very stiff... 7 ERISMATURINÆ.
  f' Bill more or less *compressed*, never decidedly *depressed* ... ... 8 MERGINÆ.

Sub-Family CYGNINÆ.

This sub-family contains but one genus which is represented in India, the other two families *Chenopsis* and *Pescoroba* being confined to Australia and South America only.

The swans are so easily identified by the veriest beginner that it is not necessary to add anything to the above key, though there are a good many other distinctions they possess, besides the one named, interesting only from a scientific point of view.

Key to the Species—

a No knob at the base of the culmen; lores yellow.
  a' Black apical portion of the bill generally does not extend above the nostrils, and on the side only reaches half-way to the gape. Culmen exceeds 4" ... 1 C. MUSICUS.
  b' Black apical portion of the bill extends much above the nostrils and backwards to the gape. Culmen under 4"... 2 C. BEWICKI.
b Culmen with a prominent knob at the base; lores black ... ... 3 C. OLOR.

(3) Cygnus musicus. The Hooper.

Cygnus musicus, B. of B. Museum, XXVII, p. 20 ; Hume and Marshall, Game Birds, III, p. 4.

Cygnus ferus. Hume, Str. Feath., VII, pp. 106, 107, 464 ; VIII, p. 114 ; *id.* Cat., No. 944 *quat.*

Description : *Adult*, *male* and *female*. Pure white, rarely showing a slight rufous-grey wash on the feathers of the head ; this probably due to immaturity.

Young.—Wholly a light brownish-grey.

Nestling.—White down.

Length of adult male 60″, expanse 95″ ; wing 25·75″ ; tail 7·5″ ; bill along culmen including bare space on forehead 4·5″ ; from tip to eye 5·16″ ; tarsus 4·16″ ; weight 19 lbs. (Hume).

Total length about 5′ ; wing 25·5″ ; tail 8·5″; culmen 4·2″ ; tarsus 4·2″ (Salvadori).

Female length 52″ ; expanse 85″ ; wing 23·5″ ; tail 7·5″ ; bill as above 4·5″ ; to eye 4·84″ ; tarsus 4″; weight 16·5 lbs. (Hume.)

A young bird killed in March (in India ?) measured 44″ in length and weighed 8·25 lbs. (Hume).

The young have the bill a dull flesh-colour with the tip and margins black, which extends with advancing age until it leaves only an orange band across the nostrils, and the bases of both mandibles very pale yellowish-green, or greenish-white. In the adult bird the bill has the terminal half black, the base and margins of the maxilla yellow. Legs, toes and webs black ; irides deep hazel.

It is more than probable that this swan, the Hooper or Whooper as it is often called, has not really been recorded within the limits of the Indian Empire at all. So far the only foundation for calling the bird an Indian one is a drawing, and from this drawing different ornithologists have arrived at different opinions. The specimen from which the drawing was made is not now in existence, and the drawing, which is by Hodgson or one of his men, does not contain the usual voluminous notes which most of Hodgson's illustrations contain on their backs, and which would, no doubt, have helped to elucidate the matter. Hume—and it is, I suppose, impossible to get any one better qualified to settle the question—considers the drawing to represent *Cygnus bewicki*. Brooks however, as well as other men, have given

their decision the other way, and so the matter stands. Salvadori does not mention India as one of the places visited by the Hooper, nor are there any specimens in the British Museum which have come thence; on the other hand there is a skull and feet which come from Nepal, presented by Hodgson, which are labelled *Cygnus bewicki*.

Although there is no better evidence than this of the occurrence of this swan in India, it is rather strange that such should be the case, for its range is a very extensive one and one would have thought it more than likely that stragglers should have penetrated within our limits.

It extends practically over the whole of Northern Europe and Asia, extending in its limits to Japan and to Greenland. In winter it works south and visits much of Southern Europe, and in Asia has been recorded from Japan, South Vezo, Shanghai, Corea, Teheran, &c. On the Caspian it is very common in the winter, and a few even remain to breed about its northern shores. About Corea it cannot be said to be rare in winter, for Mr. C. W. Campbell remarks: "In mild seasons I have noticed that a number of these swans pass the winter in a bend of the Han River about three miles south of Soul." In Iceland this was the only species of swan observed by Messrs. H. J. and C. E. Pearson, and in the "Ibis" (Vol. I, No. 2, p. 243, 1895) they have the following note:—

"Eggs were taken on June the 20th and 28th, but the weather among the hills had been so bad this season that several pairs were only commencing to prepare their nests about the latter date. We afterwards saw a clutch of seven eggs which had been recently taken. Although these birds sometimes breed on islands in the inhabited districts, it is little use to look for their eggs until you pass the last farm as they are generally taken either to eat or sell."

They also breed, but not, I believe, in great numbers, in South Greenland and in the north of Europe, and in Asia as far south as it is allowed by civilisation, which is, of course, equivalent to slaughter.

All swans seem to have the same breeding habits. They make huge nests of rushes, grass, and any other vegetable material which is soft enough and easily moved, the preference naturally being given to such kind as is the most handy. These are placed on the borders of marshes and swamps, often on islands, large or small, situated in

such places, sometimes actually in shallow water. More rarely they are placed by rivers, either up on the banks removed from the river itself or in amongst the rank herbage bordering its course. When placed in water they are said to raise their nests when the water happens to rise and threatens to swamp them, and as tame swans do this, it is in all probability likely that it is true that the wild ones do also. They lay from four to eight eggs, but in captivity often lay a larger number still, and I have known a tame duck-swan lay 14 eggs in a sitting. According to Morris, the smaller number of eggs laid are generally those of young birds, whilst the greater number of eggs are laid by those fully adult. I should think, however, judging by analogy, that though birds of the first season may lay fewer eggs than is normal, it is, on the other hand, almost certain that very old birds lay but small clutches. Their breeding season naturally varies very much according to the country they breed in. In the warmer—less cold would perhaps be the more correct expression—countries they commence breeding in May, but in Iceland, Greenland, &c., I imagine that they are normally at least a month later, and that August even may still find some of the latest birds laying.

Incubation lasts from 35 to 40 days, 37 being the most usual number of days for the swan to sit, though eggs of the same clutch may vary considerably in this respect.

Swans are very good parents and look after their young with the greatest care, the duck-bird often carrying her young ones about on her back whenever they want a rest.

In the *Asian* of the 5th March the following curious note was published, and from the habitat of the swans mentioned, concerning which the note was written, it probably relates to *P. musicus*:—

"A Scandinavian writer, cited by the 'Zoologist,' has recently described a curious method of capturing swans much employed for centuries past in the north-west of Iceland. The swans, after moulting in autumn, leave the interior in order to reach the coast. The inhabitants of the coast and their dogs are prepared, and, when the birds approach, begin to make as much noise as they can by shouting, striking boards with stones, and making as much of a racket as possible. This noise has a powerful effect on the young swans, which, terrified and distracted and not knowing which way to turn

their heads, allow themselves to fall to the ground, when they are captured without any difficulty. Fear is likewise exploited in South America for the capture of another species of swan by the Guachos, who, when they perceive a flock, run towards it keeping themselves leeward to the wind and concealing themselves. When they get close enough to the flock, they spur up their horses and rush upon the birds with loud shouts. The swans seized with fear are unable to take flight, and allow themselves to be seized and slaughtered upon the spot."

In spite of the beautiful novelty of this way of catching swans, Indian sportsmen had better keep to that dear, old-fashioned weapon, the D.-B. breechloader and leave the attempt to put salt on ducks' tails to Guachos who can "run towards" a flock on horseback by "keeping leeward to the wind" and then "spurring up their horses," or to Icelanders who are sufficiently distracting in their ways to confuse even the wily swan.

The hooper is said to have not nearly as stately or as graceful a carriage as the common swan, holding its neck in a much stiffer and more erect position than does that bird, which, of course, gives it a more jerky carriage when swimming. This trait may prove of use to the future sportsman or ornithologist who sees swans at too great a distance to examine their bills, and thus ascertain to what particular species they belong.

(4) Cygnus bewicki. Bewick's Swan.

Cygnus bewicki.—Cat. B. of B. Museum, XXVII, p. 29.

Cygnus bewickii.—Hume, Str. Feath., VII, pp. 107, 464, VIII, p. 114. Hume's Cat. No. 944, *quat*; Hume and Marsh., G. B., III, p. 51.

Cygnus ferus.—Blanf., Str. Feath., VII, p. 99; Hume, *ibid*, p. 464.

Description: *Adult Male.*—Similar to *C. musicus*, but considerably smaller. The whole bill is black, with the exception of the basal portion which is yellow; the lores, as in *C. musicus*, are also yellow. Legs and feet dull black, irides light brown or hazel.

Length 3'-10" to 4'-2"; wing about 21"; culmen 3·8"; tarsus 4·8" (Salvadori).

Length 45", expanse 74", wing 20·5", tarsus 5·5", bill along culmen from margin of frontal feathers 3·5", to eye 4·41", tarsus 3·75" (Hume). It must be noticed that Hume mentions the tarsus twice,

giving widely different measurements, both of which also differ from that given by Salvadori.

The female is some few inches smaller than the male, with a wing about 19″. Naumann gives the following dimensions for a female. Length 30·8″, expanse 73·0″, wing 18·6″.

Young birds of the second season are white, with the head and breast much marked or suffused with rusty ; the base of the bill is a dull lemon-yellow.

Birds of the first winter are greyish-brown, and have the base of the bill a dull fleshy yellow, whilst the feet are not black but are of a dull reddish colour. The irides are said not to be of so bright a brown as in the adult bird.

I can find no record of the nestling of this species, which, however, is almost sure to be white.

This swan is said to be an Indian visitor on the strength of the same evidence brought forward to prove the finding of *C. musicus* in India, but with, I think, far greater probability of being correct in the case of *C. bewicki*. That it is of the very rarest occurrence is, however, proved by the fact that no others have been recorded. The skull and feet of the bird obtained by Hodgson in Nepal are in the British Museum, but the skin, as I have already mentioned, is lost, having been destroyed by insects.

This is more of a British bird than the whooper, at the same time less, perhaps, of an European one. It is said to be a very rare visitor on migration to Heligoland is extremely seldom met with anywhere in the furtherest west of Europe, and is really nothing more than a casual wanderer in Central Europe, getting more and more common to the East. Its stronghold is Siberia, European and Russian—more particularly to the South, and Northern China. Seebohm remarks : " Bewick's swan is a winter visitor to the Japanese Islands. It was first included in the Japanese list on the authority of a specimen in the Tokio Educational Museum (Blakiston and Pryer, Ibis, 1878, p. 212)."

There is an example in the Pryer collection from Tokio Bay.

Four birds were obtained by Mr. C. C. Ricketts at Foochow. These were shot by one of his collectors in a bay on the coast south of Sharp Peak, and were killed in January.

Hume in "Game Birds" has these remarks on Bewick's swan. "This species is in a wild state very shy and difficult of approach, more so, if possible, than the hooper; but in captivity it is said to be very gentle, never molesting other water-fowl, as the mute swan often does. The call is said by some to be a low deep-toned whistle once repeated, but Naumann represents it by the syllable 'kuk,' uttered many times. In England they have not unfrequently been mistaken for geese, and when swimming their carriage is intermediate between that of the mute swan and the goose, wanting alike the 'grace and majesty' of the former. On the land, however, where by choice they spend much of their time, they show to greater advantage, and winged birds will run well and fast. It seems on the whole to be more of a marsh and narrow-water species and less of an open-water bird than the hooper. Their food, like that of the other swans, seems to consist of seeds, stems and corms of rushes, and various kinds of aquatic herbs, together with, *perhaps*, worms and larvæ of insects."

There is little on record of the breeding habits of Bewick's swan. Seebohm says that it "breeds in the high north both of the Eastern and Western Palæarctic region." Mr. Trevor Battye found its nest in Rolquen Island, and reports it as having been made entirely of moss, presumably the handiest material it could obtain. Messrs. Seebohm and Harvey obtained their nests in Petchora. They are said to breed there in May and June and to lay from five to seven eggs which differ from those of the hooper only in their smaller size. They are, of course, white, or almost so, and glossless.

(5) Cygnus olor. The Mute Swan.

Cygnus olor.—Cat. B. of B. Museum, XXVII, p. 35; Scully, Str. Feath., IV, p. 197; Blanford, *ibid*, VII, p. 99; Hume, *ibid*, pp. 101—106; Hume and Marsh., Game Birds, III, p. 41.

Cygnus unwini.—Blanford, Str. Feath., VII, p. 100; Hume, *ibid*, p. 104.

Cygnus sp.—Hume, Str. Feath., VII, p. 33; VII, p. 104.

Description: *Adult Male*.—The whole plumage white, with the exception of the lores which are black. Bill, the tubercle, base of maxilla, nostrils, margins and nail black, remainder of maxilla reddish-horny, mandible wholly black. Legs and feet dull black, irides rich brown.

Total length from 4·7″ to 5·2″ ; wing 23″ to 27″ ; tail about 10″ ; culmen 4·2″ ; tarsus about 4·5″, but varying much.

Weight about 15 to 20 lbs. in a wild state, rarely running up to 24 or 25 lbs. ; in a tame state birds of 30 lbs. may be met with, and heavier birds even than this have been recorded.

Female.—Smaller than the male, and with the tubercle at the base of the bill less developed. The neck is also more developed and the bird "swims deeper in the water" (Hume). In the majority of the birds of this order, the ducks swim deeper than the drakes, the reason of this being the anatomical structure of the different sexes.

Length 4·2″ to 4·8″ ; wing 18″ to 22″ ; tail under 10″ ; culmen about 4″ ; tarsus about 4·3″.

Young.—"Plumage almost a sooty grey ; neck and under surface of the body lighter in colour ; beak lead-colour ; nostrils and the basal marginal lines black" (Salvadori).

Cygnets.—"Covered with soft brownish or dull ashy-grey down, which in the lower throat and breast becomes much paler, almost white ; bill and legs lead-grey" (Salvadori).

In India the specimens of the mute swan obtained are nearly all young ones, and these have the tubercle on the bill very slightly or not at all developed, but the feathers of the forehead at the base of the bill are prolonged to a point "slightly truncated" (Hume).

The range of this swan does not seem to be nearly as extensive as that of the two birds already mentioned, that is to say in a truly feral state, as a domestic bird it is, of course, almost cosmopolitan. In the summer, in its wild state, it is said to be found throughout the central and south-eastern parts of Europe, but is more rare in the North, and is practically absent from the extreme North and the West. It has only twice been recorded from Heligoland, once in 1881, and once many years previous to that, both times in the winter. It extends throughout Prussia and Russia, and writing of Eastern Prussia, Hartert says : "*C. olor* breeds in small numbers in some of the greater lakes." Breeding-places are recorded in West Turkistan and Siberia and also in Denmark, Norway, and Swedan, and, I believe, in Greece, and parts of the valley of the Danube. In Asia it is found in West Siberia and adjoining countries. In winter it extends its range to Northern Africa, but does not seem to work far to the West, through

Egypt, Arabia, Asia Minor and frequently into Afghanistan. North-West India is, however, the extreme south-east point to which it has penetrated, not being on record as yet as having been obtained in China or further East.

In India it is only a very rare winter visitor, and as far as I can learn from what is recorded, seldom, if ever, appears except in very severe winters. As regards its occurrence within our limits, I can merely quote what has already been written several times. I pillage Hume and Marshall's Game Birds *en bloc* for this purpose, with many apologies to the authors. Hume gives it as a pretty regular but rather rare visitor to the Peshawar and Hazara districts, and as a straggler to Kohat, Rawalpindi, and the Trans-Indus portion of Scind.

The first bird recorded in India was shot by W. Mahomed Umar Khan and placed in the Peshawar Museum, from which place it eventually came into Hume's possession. This bird may be the one now in the British Museum marked "2′, Im sk. Peshawar, June," only that W. Mahomed Umar Khan got his bird in January not June. Regarding this bird Hume got the following letter which he reproduced *in extenso* in Game Birds, and which I take the liberty of again producing here together with other letters from the various sportsmen who have had the luck to obtain swans:—

"In the month of January, 1857, I shot this swan in the Peshawar district in the Shah Alum river, about a mile and a half on this side of the Kabul river. Neither before nor after have I seen other swans, but a few years after I killed it I heard from the shikaries of Hashtnagar (also in the Peshawar district) that they had recently seen five of these birds in Agra (?) village lake, in this same district, but had failed to shoot any."

The next birds Hume got were a pair of young birds received from Captain Unwin in 1871. These birds were for some time thought to be a new species and were called *Cygnus unwini*, after Captain Unwin who shot them, and who wrote to Hume about them in this letter:—

"To-day while duck shooting on the Jubbee stream on the border of the Hazara and Rawalpindi districts, during a short halt for breakfast on the banks of the nullah, I was attracted by seeing two large white birds flying over the stream some 250 yards lower down. The Jubbee has here a wide strong bed, with a small stream

in the centre forming occasional pools, in one of which the birds seemed inclined to alight. Changing their intention, however, they came flying up and passed me at a distance of about 60 yards ; to my surprise and delight I recognised in them most undoubted wild swans. Firing with loose shot at that distance was useless, so I watched in the hope that they would settle in some of the pools higher up in the stream and thereby afford a stalk, but they continued their slow, heavy flight until I lost sight of them in the distance.

" Concluding that they would not stop until they reached the Indus, some 20 miles off, I was returning to my breakfast, a sadder and a wiser man, when, in taking a last look in this direction, I saw them returning. I hastily got into the centre of the nullah in their line of flight, and as they rose slightly to avoid me fired both barrels, No. 3 shot, at the leader. She (for it proved to be the female) staggered but went on, slowly sinking, until she settled in a large pool about 400 yards off, accompanied by her male who alighted close beside her.

"" The pool, being commanded by a high bank, offered an easy stalk, and getting round into a favorable position I found the swans within 20 yards of me. A crowd of gadwal (*C. streperus*) which was close by took flight on seeing me, but the male swan stuck nobly by his mate and paid dearly for his fidelity, and shortly I had the satisfaction of landing them both.

" The villagers who collected to see the birds, gave the local name as ' penr ' (pronounced with a nasal n) and told me that the birds came there occasionally once in every three or four years."

In 1878 other three swans were obtained in the Sewan district, Scind, somewhere near the Manchur Lake, by Mr. H. E. Watson, after he had previously seen some birds of the same species in the lake itself, doubtless the same flock from which he afterwards obtained specimens.

Besides these a good number seem to have been seen, and in four cases a pair were shot, but in no instance were the skins preserved, though Hume seems to be satisfied that they were *C. olor*. Mr. Hill of the Rifles also shot a swan which was said to be *C. olor*, but again the skin was not preserved.

Mr. Watson writes of his birds, " I shot three swans this morning. As far as I can judge they are identical with the Indian species

(that is the tame swan). There were five on a small 'dhan' or tank, about half a mile or less in length by a quarter of a mile or less in breadth. I went to shoot ducks, but seeing these large white birds, I went after them and recognised them to be the same as those I had seen on the Manchar. They let a boat get pretty close, and I shot one. The other four flew round the tank a few times and then settled on it again. I went up in the boat and fired again, but without effect. They flew round and then settled again. The third time I shot another ; the remaining three again flew round and settled, and the fourth time I fired I did not kill. Exactly the same thing happened the fifth time, the birds flew round and settled close to me and I shot a third. The remaining two flew a little distance and settled, but I thought it would be a pity to kill them. I considered that there would be more than I could skin myself (for I have no one to do it for me) so I began to shoot ducks and then the two remaining swans flew by me, one on the right and one on the left, so that I could easily have knocked them over with small shots. However, I spared them and came home with three."

Everyone will notice how remarkably tame and confiding the above swans were ; were it not for the date on which they were shot, the 12th of February, one would have imagined that they were birds exhausted by their long flight on migration : as it is, there is no explanation beyond the fact that the birds were young in age and even younger in experience. In the same year as that in which Mr. Watson obtained his swans, but strange to say in the month of June, three more birds were seen, of which two were shot, one by Major Waterfield which was identified as *Cygnus olor*, and one by Mr. D. B. Sinclair. This last, most unfortunately, went bad before it could be examined by anyone competent to decide its species, and though, in all probability, the bird was *C. olor*, the point must remain in darkness. Even later than this swans were seen that year, for on the 7th July Mr. Sinclair wrote to Mr. Hume to tell him that there was still one more swan on the Gulabad jhil, a body of water some two miles north-east of Peshawar.

This swan is said to breed gregariously, so it is to be presumed that it is not so pugnacious a bird in its feral as in its domestic state. Certain birds which belonged to Shakespere's birth-place used to breed

every year on the river Avon, but these showed the keenest jealousy of one another, and no approach of any strange swan was allowed within about 200 yards of a nest by the owners thereof. It must be admitted that their ire was aroused equally as much by the advent of humanity as by that of their own kind. Boats were always greeted by the most warlike of demonstrations and canoes not unfrequently upset, their occupants being more or less damaged by the furious birds, which made for them in the water attempting to beat them under with their wings.

These swans, like most others of this species, generally choose small islands well covered with bushes and rushes as sites for their nests, most often selecting a mass of rushes close to the river's edge in which to place it ; now and then, but not often, one might be found well inland amongst the bushes. The site taken up by the birds was not always above flood-level, and whenever the river rose they were forced to add largely both to the height and bulk of the nest in order that the water should not wash away the eggs. They appeared to have no difficulty in working the materials under their eggs, nor have I ever heard of their upsetting their eggs into the water when so employed. Sometimes, however, when much frightened or when rushing to repel an enemy, they sweep an egg or two into the water. They sometimes make use of an immense amount of material in constructing their nests, and one such, in the Avon above-mentioned, must have contained a couple of cart-loads of weeds. What it was originally I do not know, but when I first saw it, after a small flood, the diameter of the base must have been ten or twelve feet, and it was close on six feet high.

THE BUTTERFLIES OF THE NORTH CANARA DISTRICT OF THE BOMBAY PRESIDENCY.

Part IV.

By J. Davidson, T. R. Bell, and E. H. Aitken.

(*With Plates VII and VIII.*)

(*Continued from Vol. X, page* 584.)

(*Read before the Bombay Natural History Society on* 18*th March*, 1897.)

Family HESPERIIDÆ.

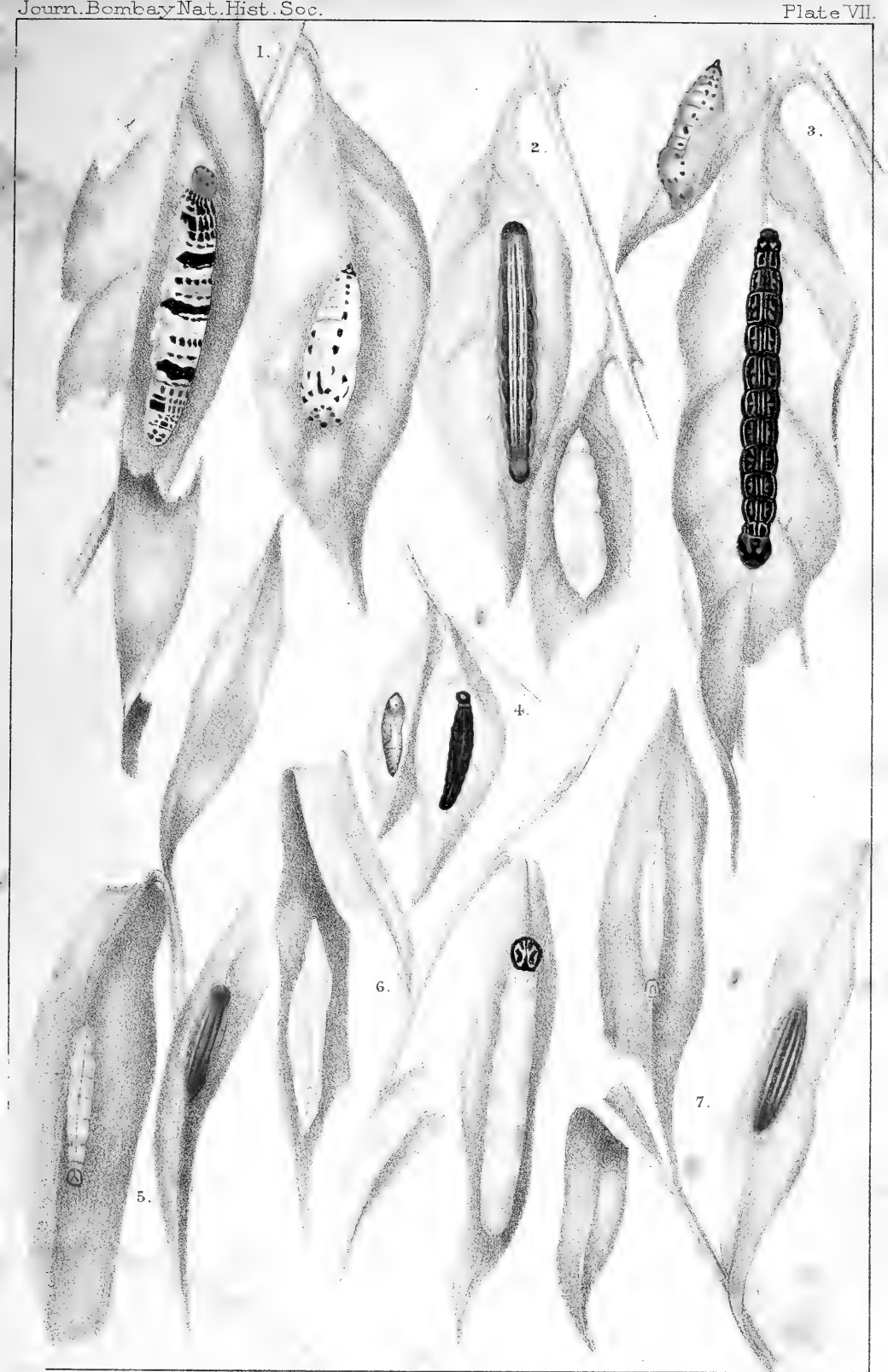
The number of species of this family that we have observed in this district is 56. Most of them are fairly plentiful either in the larval state or as imagines, for some have been rarely seen on the wing, but have been bred from larvæ in numbers, while others have been caught with the net in sufficient numbers to warrant the supposition that they are not uncommon in the localities where they occur, though their larvæ have not been obtained ; of other species again, we have only succeeded in catching single specimens, as for example *Isma submaculata*, Staudinger, and *Zographetus ogygia*, Hewitson ; the former species is, we are informed by Mr. de Nicéville, new to India, having been obtained hitherto only in the Philippine Islands and Sumatra. We have bred all but seven species out of the 56 ; all the larvæ, pupæ, sometimes also the egg, have been carefully described, and the food-plants and habits of the larvæ noted. The larvæ and pupæ of eighteen species have been depicted in the plates accompanying this paper ; five others will be found in the plates of our former paper.

The insects are numbered from 178 to 233, being a continuation of the consecutive numbers adopted in this paper up to the end of the *Papilionidæ*. The names given to the butterflies are according to Captain E. Y. Watson's paper in Vol. IX of the Society's Journal, p. 411 (1895).

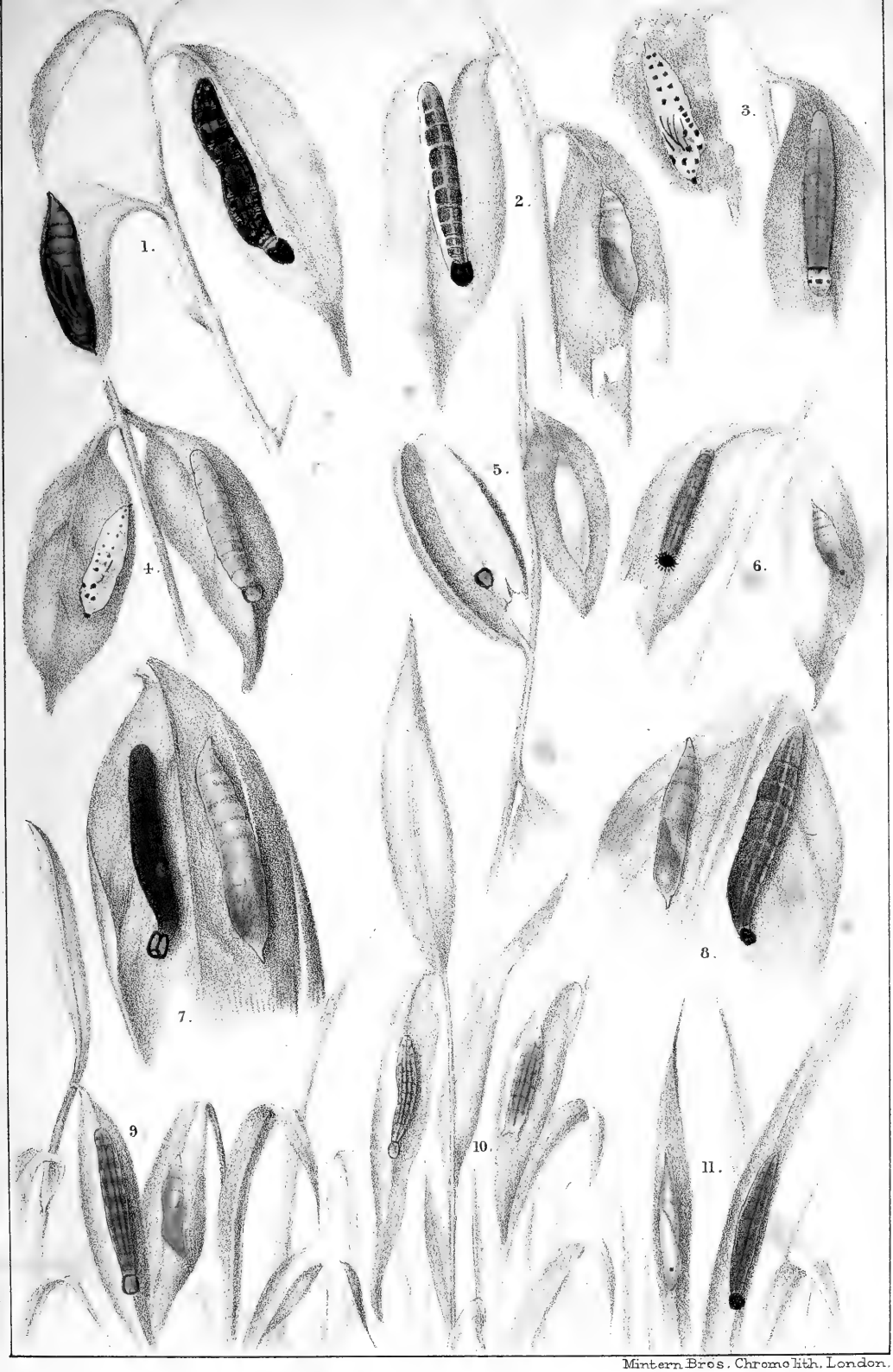
The order followed by us is based upon the habits of the larvæ and upon analogies in the larval and pupal stages. According to the habits of the larvæ, *i.e.*, to the nature of its food-plant, we have divided the family into two large divisions, namely :—

(I) Those whose larvæ feed on dicotyledonous plants.

(II) Those whose larvæ feed on monocotyledonous plants.



Mintern Bros. Chromo lith. London.



Mintern Bros. Chromolith. London.

There is an exception in the first division in the genus *Tagiades*, which feeds on plants that are scientifically placed amongst the monocotyledons, although to the uninitiated they are extremely like dicotyledons, having reticulated leaves, cordate or digitate in shape ; these plants belong to the Yam and Lily families in the botany books ; the butterflies evidently consider them to be dicotyledons; can it be that the butterfly is right and the scientist wrong ? Division I divides itself into the following groups, containing the butterflies given under each :—

DIVISION I.

Group A.

Imago heavy-bodied and of strong flight; closing the wings over the back when at rest. Larva stout, brightly coloured, cylindrical in shape, thickest in the middle, with a more or less squarish head, sometimes higher than broad, sometimes the reverse, with the lobes little apparent. The larva in its latter stages makes a cell by cutting a leaf from the edge to the midrib, at right angles to the midrib, on one side only, and turning over the piece on to the top of the leaf, fixing the edges down by silken threads all round except at the opening, which is towards the main surface of leaf ; the cell is always made at the point end of the leaf ; when the leaf is small, the whole leaf is double lengthways, its edges being joined to form the cell ; the inside of cell is generally covered with silk. The young larva is very quick in its movements and resembles a moth larva. The pupa is stout, circular in transverse section ; the head, shoulders and fore-part of abdomen about the same breadth ; a slight constriction ; thorax somewhat humped, very little higher at apex than abdomen at segment 7 ; the head swollen between the eyes into a more or less accentuated round boss ; pupa attached in the cell by the tail and a body-band.

178. *Ismene gomata*, Moore. (Plate VII, Fig. 1.)

This insect was never caught or seen in the district until a few years ago when a pupa was found by chance up on the ghâts, rolled up in a leaf of *Strobilanthes* ; the cells of a skipper were found just overhead on a large creeper with thick, 5-digitate leaves, called *Heptapleurum venulosum*, a kind of ivy. We have since bred the insect in quantities at all seasons of the year both above and below the ghâts ; it is probably to be had throughout the districts ; it has only once been seen

outside our cages, on a cow-dropping in a dark place in evergreen jungle; it is probably a dusk-flier, if not an absolute night-flier. The flight is heavy and fluttering in the day time.

Larva.—Head squarish, same breadth as height, light brown-yellow in colour; six black spots transversely across the middle of the face; a semicircle of four black spots round the top of the face. Anal segment depressed, rounded at the extremity, with two black, shiny, subdorsal patches at the hinder margin. Colour of body french-grey, suffused dorsally on segments 5 to 12 with light yellow; a black band covers the front half of segments 6, 8, and 10; segments 4 and 12 have a large black patch above the lateral margin; the rest is spotted and lined symmetrically with black.

Pupa.—Light yellowish-green in colour; a semicircle of orange on the front of the head, round which is a circle of black spots; from the centre of the spots arises a conical, sharp, short tubercle; along the front margin of the thorax is a dorsal streak flanked by a subdorsal one and a lateral black spot; shoulders tipped with black; a lateral row of large abdominal black spots, one spot to each segment; cremaster triangular, black.

Habits.—Eggs laid in batches of from five to twenty, in lines, on underside of leaf; larva gregarious while young; after second moult, makes a cell and eats the cuticle of leaf in a quarter of a circle from midrib upwards to the edge of the leaf, feeding inside the area thus marked off only while in that stage. When grown, wanders to feed, returning to its cell.

179. *Ismene fergusonii*, de Nicéville. (Plate VII, Fig. 3.)

This, the largest but one of our skippers, is found all over the district in similar localities to the last, preferring the damp evergreens and cool valleys of nallas, where the food-plant of its larva is plentiful about the rocks of waterfalls and by the sides of streams. It flies much like the *Sphingidæ* moths, making a distinctly audible fluttering with its wings. The butterfly is not commonly met with anywhere, but may be caught on the tops of the hills round Karwar on misty afternoons during the rains, and about evergreens towards the evening. Nearly all of our specimens—and they are many—have been bred from larvæ found on a large creeper, *Combretum extensum*, Roxb. The insect is a dusk flier.

Larva.—Head large, rounded, slightly higher than broad, vermilion-red with a broad black band, dilated on vertex into a circle, two black circles down middle of face, one on each cheek, connected by a narrow stem with the central band, and a black band just above the eyes on each side ; jaws black. Body high in the middle and rounded at extremity of last segment ; colour black, with a double thin, blue, dorsal line, a lateral broader yellow line, from which, and at right angles to it, proceed short yellow and blue lines which do not quite reach a broad white double line along the body above the base of the legs ; colour of abdomen bluish-white ; on segment 13 are two vermilion subdorsal spots, one on each side of dorsal line. Length 51 mm.

Pupa.—Very stout and compact ; colour light flesh-pink, powdered with a white powder excreted by the pupa ; five black spots on front margin of thorax, one spot in centre of segment 2, one on the eye, and an indistinct mark above each spiracle, all black ; spiracles surrounded by a black line ; cremaster tipped with black ; a dorsal black spot on the last two segments. Length 26 mm.

Habits.—The egg is laid on the underside of a leaf near the point ; the young larva makes a cell by turning over a small portion on one side of the midrib at the point on to the top of the part on the other side of midrib, eating through the greater part of the midrib, so that the cell part withers and dries ; it coats the inside densely with silk ; this form of cell is adhered to throughout its life. The larva pupates as a general rule in the cell.

180. *Bibasis sena*, Moore.

This butterfly, the larva of which feeds on the same food-plant as the last (*Combretum extensum*), occurs in much the same localities throughout the district, and is very nearly as rarely met with on the wing. Unlike the last, however, it flies generally in the morning, between 8 and 11 o'clock, and may be caught in small numbers on the tops of the hills above Karwar during the monsoon, where it is its habit to fly about, backwards and forwards, with a quick, darting flight, in certain prescribed open places in the forest ; it is nearly impossible to catch it on the wing, but it settles at intervals low down near the ground, when it may be captured.

Larva.—The larva is similar to *Ismene fergusonii*, de Nicéville, in every way ; it feeds on the young pink leaves of the same plant,

whereas *I. fergusonii* feeds exclusively on the tough leaves. It can be distinguished from the larva of the last by the yellow lines at right angles to the lateral yellow line being continued down to the marginal double white line, giving the body the appearance of having a lateral row of large black spots. Length 40 mm.

Pupa.—Similar in every way to, though smaller than, that of *Ismene fergusonii*; it can be distinguished at once, however, by having a large transparent-looking dirty patch in the middle of the thorax, which the former does not possess. Length 22 mm. *See* Journal, Bombay Natural History Society, Vol. V, p. 373, No. 88, pl. F, figs. 2 *larva*; 2*a*, *pupa* (1890).

181. *Hasora chromus*, Cramer. (Plate VII, Fig. 2).

This is one of the commonest butterflies with us, occurring everywhere. Its flight is very quick; it is fond of the vicinity of water, where it may be captured, laying its eggs on the young shoots and leaves of *Pongamia glabra*, Vent. It is difficult to distinguish on the wing from either of the two following.

Larva.—Head large for the size of the insect, nearly quite square, covered with longish white hairs, yellow or red-brown in colour; when yellow it has a black spot around the eyes (at the base of each lobe); a broad black collar on segment 2, reaching from spiracle to spiracle; anal segment slightly sloping, rounded at the extremity, with a shiny black dorsal patch on it; body sparsely covered with longish, erect, white hairs; colour more or less dark mauve, variable, suffused dorsally with light yellow; a dorsal dark mauve line, an obsolescent similar lateral line, and a broad marginal yellowish band bordered above and below with white; abdomen greenish-yellow; there may be a black spot on segments 5 to 9, that on segment 5 rarely being wanting. Surface oily-looking. Length 31 mm.

Pupa.—Stout, very similar to the foregoing, light green in colour, without markings, covered with a white powder.

Habits.—Larva makes a lax cell by folding a leaf longitudinally, which it does not line with silk; is very moth-like in its young stages, and pupates in the cell, attached by tail and a body-band.

182. *Hasora alexis*, Fabricius.

This insect has been but rarely met with. We have caught it near Karwar. We were lucky, however, in finding six larvæ once near

Karwar at an elevation of 1,000 feet, which we managed to rear successfully. It is probably similar to *H. chromus*, Cramer, in its habits, as, like it and in fact all the butterflies of this group, it is found resting on the undersides of leaves.

Larva and pupa.—The larvæ that were obtained by us were so similar to those of *H. chromus* that we mistook them for such; the pupæ were also exactly like those of the same species. The larva feeds on a species of *Rourea* or *Derris*, a climber, eating the young leaves only and making a cell exactly like *H. chromus*.

183. *Hasora chabrona*, Plötz.

This species was named for us by Mr. de Nicéville. It is extremely common throughout the northern above-ghat portions of the district from December to June; we found it absolutely swarming during the last two months of one year, the larva being so abundant that its food-plant, which was in young leaf and very plentiful, had hardly a leaf on it. The females may be seen any year, in the afternoons, laying their very small pink eggs on the young shoots of *Millettia racemosa*, Ben., a large woody creeper with leaves very like those of *Pongamia glabra*. It is a butterfly of rapid darting flight.

Larva.—The larva is very similar to that of *H. chromus*, Cramer, except that the head is broader than high and of a dark brown colour, light towards the vertex. Segment 2 is smaller than the head; somewhat swollen, glabrous and shiny. Last segment broadly rounded, flattish, thick, dorsally dark and shiny. The surface of the body is covered fairly densely with longish, white, erect hairs; it is much hairier than *H. chromus*. Colour mauve-green (never as dark as *H. chromus*), densely spotted with small yellow spots; a double dorsal yellow line; a subdorsal, lateral and marginal yellow line; a lateral black spot on segments 3 and 6. Length 34 mm.

Pupa.—Very similar in shape to that of *B. sena*, Moore, but without the dorsal patch on the thorax. Colour pink on abdomen, dirty green-white on the wings, thorax and head; a long black dorsal streak on front slope of thorax reaching to front margin; a short dorsal black streak on hinder margin of same; a dorsal black mark on segment 13; two black marks on the inner margin of the eye; head-point and cremaster black. Length 25 mm.

Habits.—The habits are identical with those of the last two in the larval and pupal stages. The imago, however, is generally found in dry situations on the slopes of hills in rather open jungle, where the food-plant is found.

184. *Badamia exclamationis*, Fabricius.

Probably the commonest skipper in the district. It may be seen at any season of the year, resting on the underside of leaves, or flitting about flowers; in some years it is, however, less abundant than in others. It is excessively rapid in its flight, and is consequently difficult to capture on the wing; but it rests often, when it falls an easy prey to the net. About the month of April, one year, we have seen the insect so plentiful as to be put up in veritable clouds in the course of one's walks through the jungles; the food-plant was then in young leaf. The food-plant, *Terminalia belerica*, Roxb., was in this particular year denuded of its leaves, and it is one of the largest as well as one of the commonest trees in our jungles; the larva was in such quantities that, after eating all the available food on one tree, it would wander down the stem in such numbers as to hide the bark from view; each leaf of every surrounding tree later on contained a pupa.

Larva.—Similar in shape to that of *H. chabrona*, Plötz, but slimmer and more moth-like. The colour is bright yellow, more or less thickly banded with black; the head is yellow with two parallel lines of black spots, often coalescing into lines across the face; it is broader than long and somewhat depressed in the centre of the vertex. It is sometimes found feeding on *Combretum extensum*. Length 34 mm.

Pupa.—Similar in shape to the foregoing, but slimmer, with a long triangular cremaster, knob-shaped spiracular expansions on segment 2, a knob-shaped boss in front of the head between the eyes, and a slight transverse ridge parallel to the front margin of each segment; thorax more humped than in any of the foregoing species. Colour brown, with dorsal abdominal black spots; wing cases nearly white; surface shiny and covered with a white powder. Length 24 mm.

Habits.—Egg laid on young shoots. Young larva makes a cylindrical tight cell at the edge of the leaf; the later cells are like those of *H. chromus*, Cramer.

185. *Hasora badra*, Moore.

We have only caught a few specimens of this butterfly near Karwar and at Gairsappa and at Kadra, all places below the ghâts. Nothing is known of the larval and pupal stages.

186. *Hesperia galba*, Fabricius. (Plate VIII, Fig. 6.)

This little butterfly is placed here as forming the connecting link between this group and the next. The imago rests with its wings closed when at rest, although, when basking in the sun, it keeps them three-quarters open ; the fact of its keeping its wings closed when at rest prevents us from including it in the next group, although the larva and pupa by their analogies belong to the following group, the imagines of which all rest with their wings wide extended. The butterfly is to be found only on the immediate coast in the district, and particularly in sandy open places where it gets the full benefit of the sun, and where the food-plant of the larva, a little straggling ground weed, *Waltheria indica*, is common. The insect is very hard to see, being spotted with grey and black, but is easily captured once espied, as it often rests to bask on some leaf or stick ; its flight is not very rapid ; it is not uncommon in the localities where it is found.

Larva.—Front view of head round, shallowly bilged, thick, shiny black, clothed with close yellow fur interspersed with long white hairs ; very long white and black hairs on the sides of the head, the black hairs flattened ; jaws red. Segment 2 bright orange with a narrow black collar and a central row of long black hairs. Body cylindrical, rounded at extremity, covered with small white tubercles, each bearing a long white or brown erect hair, the brown ones being confined to the front part of the body. Colour green with a darkish dorsal and a white marginal line. Length 17·5 mm.

Pupa.—Head square with a swelling between the eyes ; thorax slightly humped ; constriction slight; pupa broadest at centre ; circular in transverse section. Spiracular expansions of segment 2 are oval, large, well raised from the thoracic surface, dark chocolate-brown, rounded in outline. Surface finely rugose, covered with long, white, erect hairs, densest on head and around eyes. Colour of body green-yellow, green on thorax, wing cases covered all over with a white powder. Length 13 mm.

Habits.—Larva doubles a part of a leaf on to the top or bottom of the rest of leaf, fastening the cell thus formed with silk all round and lining the inside strongly with silk. The larva rests like those of *Sarangesa* and *Coladenia* of the next group with its head turned round on its side. The pupa is formed in a cell, and is fixed by the tail and a body band. In the localities where this butterfly is commonly found at the end of the rains, in the months of September and onwards, there is not a specimen to be seen in the dry-weather and the beginning of the rains. The eggs probably lie over on the stems of the plant during the long period during which it is leafless—from December to June.

Group B.

The imagos of this group rest with their wings fully open ; the flight is strong, but of short duration ; they rest generally on the upperside of leaves. The larva is spindle-shaped, thickest about the fifth segment, attenuated towards both ends ; last segment narrow, rounded at extremity ; head round, somewhat bullet-shaped, hardly bi-lobed, large ; the colour of the larva is some shade of brown or green, with a collar of a different colour on segment 2 ; the larva makes a cell by turning over part of the leaf from the edge on to the upperside or underside, lining the inside with silk ; the method of making the cell, however, differs in the different genera. The pupa is stout, square in front, with a boss between the eyes, and large spiracular expansions to the spiracles of segment 2 ; it is attached by the tail and a body band. The larva and pupa of *Hesperia galba*, Fabricius, are very similar to the larvæ and pupæ of this group. The egg is nearly hemispherical, and is rayed from top to bottom.

187. *Caprona ransonnetii*, Felder. (Plate VIII, Fig. 4.)

This insect is very common throughout the district at all seasons ; it is very variable in colour, running from bright golden-brown above with few markings to dark brown with many markings ; the golden-brown form, named *C. taylorii*, de Nicéville, for us by Mr. de Nicéville, has been bred in the cold season from larvæ and pupæ similar in all points to those which produce *C. ransonnetii* in the monsoon. The butterfly is rapid of flight, and difficult to capture on the wing.

Larva.—Head slightly bi-lobed, dark chesnut in colour, with the lower third of the face clothed with white adpressed hairs densely, above which

are erect white hairs traversed by a band of brown erect hairs ; near the vertex of each lobe is a bare patch ; the sides of the head are clothed with long, curved, white hairs ; the head is large. The surface of the body is covered with small, hair-bearing tubercles, rendering it somewhat rugose. Colour green with a yellowish tinge at the margins of the segments. Length 28 mm.

Pupa.—Head thick and quadrate, with a small pointed tubercle on the front of each eye, and a larger blunt one between the eyes on the front of the head, which latter tubercle is hairy. The spiracular expansion of segment 2 is kidney-shaped, large, and red-brown in colour. The colour of the pupa is light green spotted with black as follows :—A 5-sided spot at the dorsal front margin of the thorax, another behind the spiracular expansion, eight others in different positions on the thorax, a series of subdorsal spots on the abdomen, one to each segment, each spiracle surrounded by black, some black markings about the cremaster, four longitudinal black lines on the wings. Surface of pupa finely hairy with short, adpressed and erect hairs. Length 19 mm.

Habits.—The egg is laid on the top surface of the leaf; the young larva makes a cell by cutting a circular piece out of the leaf, leaving this piece attached by a hinge and turning it over on to the top of the leaf, where it is fixed down by silk and strongly lined inside with the same material ; this piece is small and withers soon to a brown colour. The final cell, and some before it, is made by turning a large piece from the edge over on to the underside of the leaf, and fixing loosely with silk ; the larva eats holes in the top-covering of the cell thus formed, leaving, however, space enough to rest on, for it rests on the roof of the cell with its back towards the ground ; the change to pupa is performed in the cell. The larva feeds on *Helicteres isora*, L.—*See* Journal, Bombay Natural History Society, Vol. V, p. 374, No. 94, pl. F, Figs. 1, *larva*; 1*a*, *pupa* (1890), where the transformations of this species are figured under the name of *Abaratha ransonetti*, Felder.

188. *Odontoptilum angulata*, Felder (=*sura*, Moore).

(Plate VIII, Fig. 3.)

Is met with all over the district, above and below the ghâts, with the exception of the parts immediately bordering on the plains. It is nowhere common. The flight is rapid and jerky, but it often

rests on the uppersides of leaves, on flowers, &c. We have bred many.

Larva.—The larva is very similar to that of the last in shape and habits; the head, however, has not such long hairs at the margins; it is of the same colour, and is covered with longish, erect white hairs, there being three patches in a line across the face near the vertex of the head, where the hairs are brown; there is also a line of brown hairs above each jaw; the lower third of the face is clothed with adpressed white hairs. Segment 2 has a broad, glabrous, shiny collar. The surface of the body is covered with short, thick-topped hairs, which are longer on the last segment than anywhere else. Colour is green-yellowish to dark red-brown. Feeds on *Allophylus cobbe*, Bl. Rumph. Length 22 mm.

Pupa.—Very similiar to that of the foregoing species; the spiracular expansion of segment 2 is here smaller, hemispherical in shape and yellow-brown in colour. The colour of the pupa is green, with a yellow tinge on the abdomen. The markings are similar to those of the last, but there are many more black spots. Length 17 mm.

Habits.—The egg is laid on the top surface of the leaf as in the last species; the habits of the larva are identical with those of that of *C. ransonnetii*, Felder.

189. *Coladenia tissa*, Moore.

The insect is common throughout the district at all seasons; the golden-yellow or brown form in the dry-season; the dark form in the monsoon months; these two forms differ from each other just in the same degree that *C. taylorii*, de Nicéville, differs from *C. ransonnetii*, Felder. The insect is easily captured as it is resting on a leaf, stone, &c., near the ground; it is fond of shade. Both forms have been bred plentifully by us.

Larva.—Head nearly round from front view, thick through, and with a slight linear depression down the centre of the face; surface finely rugose, clothed with very short, white, star-shaped hairs mixed with a few longer red hairs about the mouth. Posterior half of segment 2 is pure white; anal end thickened, squarish at extremity; surface of body clothed with short, white hairs, similar to those on the head; colour of body dark greenish-chocolate, becoming lighter when the larva is about to pupate; abdomen bluish. Feeds on *Xylia*

dolabriformis, Benth., *Grewia microcos*, L., and many other plants of different orders. Length 19 mm.

Pupa.—Head with a knob-like process between the eyes pointing forwards and constricted at the base, covered with short, red bristles; surface finely rugose, covered with minute red hairs, spiracular expansion of segment 2 prominent, ear-like, facing forwards, spongy-looking, golden in colour. Pupa stout, constricted somewhat in centre, of a dark red-brown colour, strongly glazed. Length 15·5 mm.

Habits.—The habits of the larva in its first stages are similar to the habits of the young larvæ of the last two species; in the form of making the last cell, however, it differs; the cell is formed by cutting right across the leaf from edge to edge about the middle and at right angles to the midrib, which is also partially gnawed through, so that the piece thus separated dies and withers; one side of the part so separated is turned over on to the top of the other and diagonally across it; the cell is thickly lined with silk, so that it is difficult to tear it; an aperture is left in front where the midrib has been gnawed through. The larva is of slow growth, and is very much attacked by spiders, birds, wasps, &c., notwithstanding its strong retreat; it is caught when out feeding.

190. *Coladenia dan*, Fabricius.

This butterfly, very local in this district, occurs only along the banks of rivers above the ghâts, and in the deep river valleys away from the coast below the ghâts; we have seen it in places both in Supa and Karwar; it is fond of shade, and rests on the surface of leaves near the ground like the last, which it indeed resembles in every way: it is found in thicker jungle than the last. We have bred about a dozen specimens; it varies much in size.

Larva.—The larva of this species, the foregoing species, and the next following two species, are only distinguishable with difficulty; that of *C. tissa*, Moore, being the largest, the other three much of a size and a good deal smaller than that of *C. tissa*. The larva of *C. dan* is spindle-shaped; has a white collar to segment 2; head round from front view, shallowly bi-lobed, covered with minute semi-adpressed, white, transparent hairs in bunches; the head is a good deal larger than segment 2, about equal in diameter to segment 3. The last segment is rounded. The surface of the body is covered

with minute, colourless, star-topped hairs and is minutely punctured ; anal margin with eight longish simple hairs and a few branched hairs. Colour is black brown as to head ; the body is greenish-chocolate.

Pupa.—The pupa is identical with that of *S. dasahara*, except that the spiracular expansions are longly semi-circular, thickened at apex, and rugose ; the proboscis is free from the end of the wings to the centre of segment 9 only. Colour of pupa is a dirty greenish-white. Size as in *S. dahasara.*

Habits.—The habits of the larva are exactly similar to those of the larvæ of the genus *Sarangesa* ; the cells formed are similar, and the manner of pupation also.

191. *Sarangesa purendra*, Moore. (Plate VII, Fig. 4.)

The imago is similar in habits to *C. dan*, Fabricius. We have found many in Karwar during the monsoon months, settling on the ground and on leaves in shady places. We have bred many, but only below the ghâts and in the monsoon.

Larva.—The larva is exactly similar to that of *C. dan*, except that in this species the collar is rosy-white, and the colour of the body a dark, blackish olive-green. Length 17 mm.

Pupa.—Head large, quadrate, with a rounded boss between the eyes, which is clothed with fine, erect, red hairs curved at the points; surface of body clothed with reddish, short, curved-topped hairs, shorter than those on the head ; segments 1 and 2 finely rugose ; rest of pupa shiny and smooth. Proboscis free from end of wings and reaching end of body (to the cremaster). Length 14 mm.

Habits.—Egg laid anywhere on leaf or stalk ; the larva on emerging immediately makes a cell by turning over a triangular piece from the edge of the leaf on to the upperside, choosing a small young leaf. In the last two stages the larva makes a cell out of two or three leaves, which it binds together strongly with silk, often incorporating a dead leaf, and covers the inside of the cell laxly with silk ; it pupates in the cell. Larva feeds on *Blepharis asperrima.*

192. *Sarangesa dasahara*, Moore.

This insect is like the last in habits ; the imago differs from typical *S. dasahara* in having a white, instead of a dark, fringe (we have been informed by Captain Watson, who has seen our specimens).

Our specimens were bred above the ghâts in the dry-season only; they are much lighter in colour than the last insect.

Larva.—The larva is not distinguishable from that of *S. purendra*, Moore, except by its colour, which is greenish-chocolate, and by the shape of the head, which is more broadly lobed; it is more narrowly lobed, however, than the head of the larva of *C. dan*, Fabricius. Same size as last.

Pupa.—Same as that of *S. purendra*; the spiracular expansions of segment 2 are semi-circular in shape, slightly raised from thorax and face forwards. Body covered with fine, white, simple hairs. Colour a transparent emerald-green. Size the same as that of *S. purendra*.

Habits.—Are the same as those of the last two. The larva feeds on an acanthaceous plant allied to *Lepidagathis*, growing in moist places generally. The larva of this and the last two species rest in their cells with the head turned round on the side.

GROUP C.

The imagos of this group rest with their wings wide open as those of Group B, and generally on the underside of the leaves. They are all shade-loving insects, and have a very rapid jerky flight, never sustained for any length of time. The typical larva is stout, thickest at the fourth and fifth segments and somewhat narrow at the anal end, the extremity being flattened and rounded; the head is large, very strongly bi-lobed, the lobes being separated by a deep triangular sinus on the vertex; surface of the head rugose; jaws strong. The colour of the larva is variable, being brown, green or white, according to the species. The larva lies closely applied to the surface of the leaf, with its head turned round on its side when at rest, like that of the foregoing group; it raises its head and opens its mandibles when disturbed, as if to bite; it makes a cell by turning over a triangular piece of leaf from the edge on to the upperside, fixing laxly with silk round the edges, and lying with its back towards the leaf-surface on the underside of the piece turned over; it sometimes scollops the edge of the piece turned over. The pupa is stoutish, with a slightly humped thorax and slight constriction, a short snout to the front of the head between the eyes; in some cases, there is a spiracular expansion to segment 2. The pupa is attached by the tail and by a body-

band. *Tapena thwaitesi*, Moore, has been placed in this group, as it evidently is most intimately related to the imagos of the group; its larva is somewhat abnormal in the shape of the head, and the pupa in not having spiracular expansions to segment 2.

193. *Tapena thwaitesi*, Moore. (Plate VIII, Fig. 5.)

The imago is common throughout the damper parts of the district in the cold weather and rains; it is of fast flight, but rests often on the upperside of leaves generally, though we have seen it also pitch on the under surface of leaves in the same way that all the other members of the group do. We have bred many. Specimens bred in the wet months are darker than those bred in the dry ones.

Larva.—Head with lobes rounded on the vertex; less prominent than in any other of the group, being shallowly, though broadly indented; very thin through; of a yellow colour more or less suffused with dark brown on the upper part, with a marginal red line. Body pure opaque white tinged with blue. Length 22 mm.

Pupa.—The pupa is square in front, with a short beak between the eyes, and no spiracular expansions to segment 2. The colour is greenish-white, waxy-looking. Length 17 mm.

Habits.—The imago lays many eggs on the young shoots of the plant, but always singly. The young larva on emerging proceeds at once to make a cell by turning over a piece of the edge of a leaf on to the top and scollops the edge of the cell. It pupates in the cell; the pupa is attached by the tail and by a body-band. The larva feeds on *Dalbergia latifolia*, *D. tamarindifolia* and *D. volubilis*.

194. *Celœnorrhinus leucocera*, Kollar.

The insect is fairly common both below and above the ghâts where there is heavy jungle; it rests on the undersides of leaves; it is very easily captured. We have bred quantities of it.

Larva.—Head very large, dark brown, nearly black, square from front view, with a deep triangular broad indentation on the vertex, rugose as to surface; thick in the direction of the longitudinal axis of the larva. Body more or less cylindrical, very fat and flanged somewhat on the margin, thickest towards the centre; anal end narrowish, rounded at extremity. Colour dark indigo-green; segmental margins yellowish, and a dark pulsating dorsal line; a thin white marginal line. Length 28 mm.

Pupa.—Head large, quadrate; eyes prominent, with a short, conical obtuse beak; constriction slight; section of abdomen circular; at segment 7 the pupa is broadest; shape longish; surface corrugated finely, slightly and shortly red-haired; spiracular expansions of segment 2 large, raised, oblong, facing forwards, spongy-looking and golden in colour; proboscis reaches beyond the cremaster, being free from the end of the wing cases. The colour is a rich golden-brown and shiny. Length 23 mm.

Habits.—The habits of the larva are those given for the group, except that it does not scollop the edge of its cell. The pupa is attached by the tail and by a body-band. The larva feeds on a plant of the acanthaceous genus *Eranthemum.*

195. *Celænorrhinus ambareesa*, Moore. (Plate VIII, Fig. 1.)

Is found much in the same localities as the last, but often visits the verandahs of bungalows; it haunts places where the shade is deep amongst rocks in the jungles, and may be caught at flowers in the early morning round the open spaces in the forest. We have bred many from larvæ obtained with larvæ of the next species.

Larva.—Head similar to the last in colour and shape. Segment 2 somewhat swollen and shiny. Shape of body the same as the foregoing. Colour of larva when young is black (*C. leucocera*, Kollar, and *C. fusca*, Hampson, are green) but is dark brown olive-green when full grown, with a pair of lateral short white lines to each segment, a dark dorsal pulsating line, and a white marginal line. Length 32 mm.

Pupa.—The chrysalis of this species is nearly exactly the same as that of the last in every particular, the proboscis being produced to the same length, &c. Length 25 mm.

Habits.—The habits are the same as for the last; the larva does not scollop the edge of its cell. Feeds on *Strobilanthes callosus*, Nees.

196. *Celænorrhinus fusca*, Hampson. (Plate VIII, Fig. 2.)

Much commoner than either of the last two species in the imago state; it swarms in the monsoon on the tops of the hills round Karwar, where the "karwi," the food-plant of its larva, is common; it is to be met with everywhere above the ghâts in the dry-season. We have bred great numbers of it. It rests on the underside of leaves in thick jungle.

Larva.—Is the same as the last in shape. Colour green, with a light dorsal line, and a whitish marginal line ; otherwise the body is unmarked ; the head is always yellow or brown-yellow, never being as in the two foregoing species *C. leucocera*, Kollar, and *C. ambareesa*, Moore. Length 32 mm.

Pupa.—The same as the pupa of *C. ambareesa* in shape, but stouter, shorter, and more like that of *T. atticus*, Fabricius, and green in colour instead of brown. Pupates in its cell with tail suspension and body-band. Length 23 mm.

Habits.—The habits are those of the foregoing species ; the food-plant of the larva is also the same, *i.e.*, *Strobilanthes callosus*, Nees.

197. *Tagiades atticus*, Fabricius.

The insect is very common throughout the district, more particularly, however, in the dense jungle tracts ; it can be seen any time flying about in shady places at a great pace, low down. We have bred many at all seasons.

Larva.—Head same shape as that of the last, yellow-red in colour : shape of body also the same as the last ; colour indigo-green, speckled with yellow dorsally. Length 28 mm.

Pupa.—Head quadrate, with a strong conical beak ; abdomen stout, circular in transverse section ; cremaster triangular, curved, strong ; constriction slight ; surface smooth, pitted finely. No prominent spiracular expansions on segment 2. Colour transparent, light olive-green ; margin of dorsal segment edged with brown ; two white, enamel-like, triangular marks laterally on the wing-case line. Length 24 mm.

Habits.—Are the same as for the foregoing species of the group ; the larva scollops the edge of its cell. The larva of this as well as that of the preceding and succeeding species live sometimes in a state akin to hibernation ; we have noticed them lying in the same place for nearly two months, without eating, prior to pupating ; this happens generally in the cold weather. The larva of *T. atticus* feeds on *Smilax macrophylla*. *See* Journal Bombay Natural History Society, Vol. V, p. 373, No. 91, pl. F, Figs. 5, *larva* ; 5*a*, *pupa* (1890).

198. *Tagiades obscurus*, Mabille.

This butterfly is scarcer than the last throughout the district, though by no means uncommon in Karwa in the months of September

and October. We have generally found it at flowers; it is fonder of thick jungle than the last species; like the last, it rests on the underside of leaves. We have bred a fair number.

Larva.—Is not to be distinguished from that of *T. atticus*, Fabricius, except by the colour of the head, which is here black, and by the front segments of the body being suffused with rose colour. The larva is somewhat larger than that of *T. atticus*.

Pupa.—The pupa, though larger, is proportionately slighter than that of the foregoing; the surface is covered with minute brown pittings and very minute hairs. Spiracular expansion of segment 2 is small, slightly swollen, with a spongy-looking surface, facing slightly backwards. Colour a light greenish-yellow. A little larger than that of *T. atticus* all round, and a good deal longer comparatively.

Habits.—The larva scollops the edge of its cell; occasionally hibernates; resembles in habits the last species; feeds on *Dioscorea pentaphylla*.

GROUP D.

This group consists of a single species. The larva makes a cell by gnawing through the midrib half-way up the leaf, separating the top half from the basal half by eating a line across; the latter half is joined by the edges and withers, hardening into a perfectly cylindrical curved cell; this cell is lined inside thickly with silk, drawn under the green half and fastened there, being thus protected from wet; the mouth of the cell is at the point where the midrib has been gnawed through. The young larva makes a tight and cylindrical cell at the edge of the leaf by turning over an oblong piece on to the top; the larva is peculiar in being broadest at the twelfth segment; the head is heart-shaped, the vertex being the narrow side, and is slightly bi-lobed, very finely velute, and chocolate-brown in colour, larger than segment 2. Body cylindrical, depressed at the last 4 segments, squarish at the extremity; segment 2 has a broad, shiny, red-brown collar. Surface covered with small, light, erect hairs. Colour light green, yellowish on segments 3 and 4; posterior segments yellowish; a dorsal brown line on segments 11 to end; a green dorsal line on segments 2 to 10; the margins of segments 11, 12, 13 are marked with brown. Length 25 mm.

Pupa.—The pupa has the head rounded in front, with a semi-circularly rounded boss, which is flattened above and below between the

eyes, and covered with long, stiff, erect, white hairs ; on the vertex of the head is a subdorsal sharp point covered with long adpressed hairs ; eyes prominent, with long erect hairs on hinder margin. Anal segment with a subdorsal tuft of long erect hairs. Spiracular expansion of segment 2 raised, oval, moderately large, and brown in colour ; thorax stout, abdomen gradually decreasing in diameter to the end ; cremaster stout, square, square at the extremity, set with strong, red, hooked hairs all round the margin ; surface of body covered with small, stiff, erect hairs ; colour light olive-green ; shape that of *Telicota*. Length 14 mm. Fixed by the tail only. The imago at rest folds the wings over the back.

199. *Cupitha purreea*, Moore.

We bred this insect on *Terminalia paniculata* from the larva long before we ever saw one on the wing ; it has been caught twice latterly in Karwar at the end of the monsoon, but these were the only two occasions it has ever been seen below the ghâts near the sea coast. In the cold season we have bred many above the ghâts as well as in the valley of the Kalinaddi river, thirty miles from the coast. We have only once seen the butterfly in the cold weather in what might be called its wild state, and then it had only just emerged from the pupa. It is probably a dusk, if not a night, flier. It inhabits the densest jungles, generally near water. The larva feeds also on *Terminalia belerica* and *Combretum ovalifolium*.

DIVISION II.

Group A.

This group contains two insects, the imagos of which at rest fold their wings over their back ; the butterflies are both dusk-fliers, only appearing in the morning and evening ; they have a rapid flight, and are fond of flowers. The larvæ are somewhat dissimilar, one having a rounder head than the other ; the one being broadest at the twelfth segment, the other more or less cylindrical and narrowest at the neck (segment 2) ; the one rough of surface, the other smooth. The pupæ are similar in that they are both longish, not particularly stout, and have the thorax humped ; they have a moderate constriction dorsally, the shoulders being the broadest part of the body, the apex of the thorax the highest ; the transverse section of thorax is circular,

oval at the sixth segment to end ; there is no spiracular expansion ; the proboscis is free after the end of the wings ; the head is broad, with a boss between the eyes ; the eyes are very prominent, the pupa is fixed only by the tail and rattles about in the cell when disturbed. The egg of *Matapa aria*, Moore, is dome-shaped and bears long hairs. The larva makes a cell in its first stages in the same way as does *C. purreea*, Moore. In the last three stages the cell is made of a leaf spirally rolled into a cylindrical tube, the leaf being cut across near the base so as to allow the tube to hang by a small strip ; the inside of the cell is lined with silk disposed in short, thick, horizontal lines. With this group we commence on the insects feeding on monocotyledonous plants.

200. *Matapa aria*, Moore.

This insect, remarkable for its bright red eyes, is plentiful at all seasons in the more densely forest-clad parts of the district. It appears in the early morning and about twilight in the evening, flying about flowers, and settling low down on leaves, &c., in shady places. It is easily captured, though it generally spoils itself by fluttering in the net. We have bred many specimens at all seasons, and have noticed that those bred in the dry-season are much lighter in colour than those bred in the monsoon months.

Larva.—Head only a little higher than broad; somewhat heart-shaped, but rather depressed on the vertex, which is the narrowest part ; it is thick in the direction of the longitudinal axis of the larva, larger a good deal than segment 2, slightly bi-lobed, reddish-yellow in colour. Body more or less cylindrical, though somewhat depressed, being highest at the twelfth segment and also broadest. Anal segment rounded at the end, slightly sloping; spiracles black ; colour of the body pure, opaque white, with a bluish tinge, strongest on segments 2, 3, and 4 ; under parts bluish-white. A narrow black collar near the hind margin of segment 2. Length 32 mm.

Pupa.—As in the description of the group ; shoulders slightly angulated; a low, transverse, flattened ridge, yellow in colour, across the top of the thorax ; abdomen a good deal depressed, oval in transverse section ; constricted between the segments ; cremaster square, curved, thin ; thorax humped strongly. Length 28 mm.

Habits.—The method of making the cell, &c., is described in the group. The egg is laid on the underside of a leaf near the point; the young larva is red in colour; the larva feeds on bamboos, principally on *Teinostachyum*. *See* Journal, Bombay Natural History Society, Vol. V, No. 85, pl. F., figs. 3, *larva*; 3*a*, *pupa* (1890).

201. *Gangara thyrsis*, Fabricius.

This is our largest skipper. It is only seen flying at dusk, resting on tree-trunks, rocks, and on the underside of leaves in the darkest places in the jungle during the hours of sunlight. It comes to flowers in the dusk, but is very rapid on the wing and is very difficult to capture; the larva is, however, abundant all over the district, and we have bred the butterfly in numbers.

Larva.—Head large, much higher than broad, heart-shaped, dark brown in colour, the colour being however hidden by a white cerous secretion which covers all but the clypeus; slightly hairy on the sides and about the jaws; body cylindrical, broadest about segment 5; anal end high, sloping slightly, and broadly rounded at extremity; surface of body slightly hairy, with light, erect, shortish hairs, especially laterally; colour of body rosy-brown dorsally, excepting on segments 2 and 3, which are pale sea-green like the sides; the larva exudes a white excretion from the surface which hides the green colour and only allows the brown to appear in patches; this excretion takes the form of long feathery threads arranged in bunches dorsally, being most dense on the sides of the first three segments. Length 62 mm.

Pupa.—Eyes very prominent; thorax moderately humped; wings very slightly expanded behind the shoulders; section of abdomen nearly circular; proboscis nearly half as long again as the total length of the pupa; segment 12 quite square at the end, with a tooth at each corner, segment 13 appearing as a thin oval piece tacked on behind; cremaster oblong, stout, curved, not one-third the breadth of segment 12; the pupa is broadest at the shoulders and highest at the apex of the thorax; is fixed only by the tail and rattles against the sides of the cell when disturbed, making a creaking noise by rubbing the abdominal segments together at the margins. The inside of the cell is covered thickly with white powder. Length 40 mm.

Habits.—The habits are those given for the group ; the larva lies with its head turned round on its side, in which it differs from that of *M. aria*, Moore. The larva feeds on *Cocos nucifera*, L., *Calamus rotang*, L., and *Caryota urens*, L.

GROUP B.

The group is composed of two species, the one a *Padraona*, the other *Iambrix salsala*, Moore. The imago is similar to the imago of the succeeding group; it keeps its wings closed over its back when at rest, but, unlike that of the next group, does not like the strong sunlight, but prefers to keep to the underwood in the jungles ; the butterflies are never found in the open country ; they fly quickly in curves, and are difficult to see on the wing, but rest often, when they are easily caught ; they are generally seen chasing each other. The larva is cylindrical, the last segment rounded at the extremity and somewhat depressed, the head being triangular in shape seen from in front; the colour is green. The pupa is stout, circular in transverse section, except at the head, where it is oval ; the head is broad as the eyes are prominent ; constriction dorsal, slight ; thorax slightly humped ; spiracular expansions of segment 2 prominent; is affixed by the tail only, and covered with a white powder. The cell is made of a leaf folded into a cylindrical tube by joining the two edges longitudinally; it is very strongly made.

202. *Padraona dara*, Kollar.

The butterfly is fairly common throughout the district ; it has been noticed everywhere and at all seasons. We have bred many in the rains and in the cold weather.

Larva.—As given for the group ; head dark brown or black with a white marginal band not meeting on the vertex and ending at the jaws ; segment 2 with a black dorsal collar; colour transparent-looking green, with a darkish, not very conspicuous, dorsal line ; abdomen light green ; anal segment with short, light, fine hairs round the margin. Length 25 mm.

Pupa.—Head slightly bowed, otherwise as for the group ; last segment is square at the extremity ; cremaster short, strong, ending square, with two strong converging ridges on the dorsum which end each in a sharp, turned-up, short point behind ; spiracular expansions of segment 2, large, ear-like, oval, facing forwards, red-brown

in colour, with a spongy-looking surface ; proboscis produced free to hinder margin of segment 9 ; surface finely rugose, with short hairs from segment 8 to end of dorsum; some longish, stiff hairs on front of the head and round the eyes ; colour light green, strongly suffused with red-brown, especially on the top of segments 1 to 3.

Habits.—The larva makes a cell as above described for the group, and eats the leaf above at the base, leaving the cell attached by the midrib to the stalk ; often, finally, the cell falls to the ground, where the larva pupates inside it. The larva feeds on bamboos, chiefly on *Teinostachyum*, the egg being laid always on a leaf near the ground.

203. *Iambrix salsala*, Moore. (Plate VIII, Fig. 9.)

The butterfly is very common in this district, more especially during the latter part of the rains, in the months of September, October and November ; it is never, however, scarce ; it frequents shady places in the thick, damp jungles, and keeps generally near the ground. We have bred the insect often.

Larva.—Head as in the group ; colour of head dirty whitish-yellow with a red-brown marginal band meeting the opposite one on the vertex ; an impressed brown line from the vertex to the apex of the clypeus, and a short brown line parallel to this on each side of it running from the centre of the clypeus to half-way up the face ; clypeus light brown, with a dark brown line from the apex to the base ; jaws dark brown ; shape of body as in the group ; colour of body is a watery-looking green, on the sides yellow, dorsally spotted minutely with green ; a dorsal and subdorsal dark green line ; surface oily-looking. The hinder edge of the last segment somewhat shortly hairy. Length 275 mm.

Pupa.—Similar to the last ; cremaster shortly triangular, pointed, with a single bunch of hooked hairs at extremity ; spiracular expansions of segment 2 raised slightly, semi-circular, facing forwards ; dark brown in colour ; proboscis produced to the end of segment 9 ; surface slightly and shortly hairy. Length 15 mm.

Habits.—The egg is laid on the upperside of a blade of grass or on a bamboo leaf near the ground ; it is nearly smooth to the eye, dome-shaped, rather higher than broad, and of a dark red colour. The larva makes a more or less lax cell at first, but finally a very tight one by joining the leaf by its edges longitudinally ; the larva will often lie on

the open surface of a leaf; the pupa is generally formed inside the cell; it is covered with a white powder. The larva feeds on *Bambusa arundinaceæ*, or on grasses—generally broad-leafed coarsish grasses.

GROUP C.

The imagos of this group are very similar to those of the last in shape; they keep their wings folded over the back when at rest; often, when basking in the sun, they open the lower wings; they are all fond of bright sunlight and are found basking; they are of very rapid flight, which flight is sustained frequently for a long time; they are all easily captured at flowers or when basking. The larva is, as in the last group, cylindrical, with a flattened anal segment somewhat rounded at the extremity; the head is, however, here more or less round when looked at from in front and slightly bi-lobed. The colour of the larva is some shade of green without transverse markings of any sort, with one exception, namely, *H. honorei*, de Nicéville, which has the larva coloured red, yellow, and white. The pupa is similar in form to that of the last group, being circular in transverse section, having large expansions to the spiracles of segment 2, being unmarked by spots, and fixed only by the tail in the cell (*H. moorei*, Watson, is an exception in the latter respect, in that it is fixed neither by the tail nor by a body-band, but lies quite free in the cell). The larva changes in the cell to the pupa; and feeds on bamboos and grasses; it makes its cell in a cylindrical shape by folding a leaf, generally lengthways, but *H. moorei* folds the leaf transversely.

204. *Baoris bada*, Moore.

The insect is the commonest butterfly in the district, swarming together with the *H. subochracea*, Moore, around and in every rice-field at all seasons of the year when the rice is green, and around flowers in the rains; it is quick of flight, but is easily caught when feeding on flowers. The larva is to be had in the rains in hundreds in the rice-fields. We have bred great numbers of it.

Larva.—As in the description of the group; segment 12 slightly swollen laterally round the spiracles; anal segment somewhat narrow-looking in consequence, sloping and applied close to the leaf, head rough, on the surface finely and sparsely hairy, shiny, light yellow-green in colour suffused with brown, a black brown marginal band of varying width, a central band of the same colour splitting along the

sides of the clypeus, and a line on each side of the central band parallel to it reaching half-way up the face; segment 2 thickened in the centre, with a thin dorsal black collar from spiracle to spiracle; colour of body is greyish-green, with conspicuous brown spiracles; body shortly hairy round the margin, and covered with minute setiferous tubercles, the setæ being also minute. Length 32·5 mm.

Pupa.—As in the description of the group; constriction nearly *nil*; proboscis free beyond the wings to the centre of segment 10; spiracular expansions of segment 2 large, facing forwards, slightly raised, brown; colour of pupa very light, watery yellow-green, the abdomen being a dirty whitish-yellow, covered with white powder in the cell. It is stout. Length 20 mm.

Habits.—The larva makes an extremely tight cell of several blades, clothing it inside so densely with silk that it is difficult to tear open; the cell is thickly powdered inside; it is cylindrical; the final cell in which the change to pupa takes place is made generally low down near the stem of the plant. The larva feeds upon *Oriza sativa* (rice) and on certain grasses.

205. *Suastus gremius*, Fabricius.

This skipper cannot be said to be rare at any season or in any part of the district, but is not met with as often as certain other butterflies. It has a rapid flight and is difficult to capture on the wing. We have bred nearly all our specimens.

Larva.—As in the description of group; head round, flattish, slightly bi-lobed; jaws strong and large; colour whitish, with a marginal brown band and a central one of the same colour separating along the sides of the clypeus, a brown mark above the jaws, and a large brown oval patch in the centre of each lobe; body-colour grey-green with many minute green spots; spiracles pure black; head is large for the body; anal segment flattened, rounded at the extremity. Length 30 mm.

Pupa.—Not very stout; eyes prominent; thorax slightly humped; constriction slight; spiracular expansions of segment 2 large, ear-shaped, brown in colour; colour green, with head and abdomen slightly yellowish; pupa covered with a white powder in the cell. Length 16 mm.

Habits.—The larva makes a strong cylindrical cell of a leaf longitudinally folded, which it clothes densely with silk, rendering it difficult to tear open; the cell is thickly covered with white powder inside. It feeds on palms (*Caryota*, *Cocos*, *Calamus*, *&c.*)

206. *Isma submaculata*, Staudinger.

This insect, very like the last to look at in the imago, is only known to exist in the district from the fact that we caught a single specimen a few years ago in the south. The exact locality we do not know, as we took the butterfly to be a *S. gremius*, Fabricius, until it was examined during the monsoon. The specimen was sent to Mr. de Nicéville for identification and pronounced by him to be *I. submaculata*, a species, he informs us, that has never yet been taken in India, though known to occur in the Phillipine Islands and Sumatra. It is placed here in this group as it is so like the foregoing in general *facies*. The larva is unknown to us.

207. *Baoris philotas*, de Nicéville.

We know little about this small skipper. We have bred two specimens of it from larvæ feeding on grass or rice, both of which larvæ we took to be *Baoris bada*, Moore; it is possible that there may have been a larva slightly differing from those of the last-named species among the crowd we had, but we did not notice it if this was the case. One specimen was bred in the monsoon below the ghâts, the other in the dry weather above the ghâts. One specimen was sent to Mr. de Nicéville, who identified it for us. May it not be possible that *Baoris philotas* is only a starved individual of *B. bada*? The question would be worth investigating. *B. bada* is easily reared from the egg in a cage in which it is only necessary to plant some rice and, after it has sprouted, to introduce a female *P. bada*; a few larvæ can be put apart and brought up on short allowance after the first three moults. This insect has been placed in this group, as we think it very similar to *Baoris bada*.

208. *Halpe moorei*, Watson.

This insect is very common all over the district at all times of the year. It is fond of water and basks in the sun on leaves; it may be easily caught when drinking and basking, but is of extremely rapid flight and difficult to capture on the wing. We have reared many, both in the monsoon and in the dry weather.

Larva.—As in the description of the group; head yellow-brown with black mandibles; eyes black; a red-brown central band down the face, and a red-brown crescent-shaped mark in centre of each lobe; the colour may vary from yellow-brown to brown-black, but is always somewhat lighter on the vertex of each lobe. The dark head is characteristic of the wet months, the light of the dry season; body covered with short, darkish, erect hairs; longish hairs round the margin; colour of the body is a watery dirty dark green. Length 31·25 mm.

Pupa.—As described for the group; slight boss between the eyes, surmounted by four fan-shaped tufts of dense bristles; eyes prominent, with short erect hairs; head bowed slightly; segments 11 to 13 with tufts of hairs directed backwards on their lateral margins; cremaster short and square, with a short tooth at each hinder corner, clothed along the margin and extensor ridges with longish, dense, red-brown hairs which are not hooked; body covered with more or less erect, short, yellow hairs; a lateral row of oval, flat, raised, dark brown, smooth tubercles; another subspiracular row of similar tubercles; also a ventral row; on segment 11 there are three tubercles arranged in a triangle; colour of thorax and wings green; of abdomen green-yellow; a green dorsal line; hinder edge of cremaster and teeth dark brown. Length 16 mm.

Habits.—This larva builds a cylindrical cell tightly closed, like the cell described for the group, until the last moult, when it forms a cell by doubling the leaf transversely across the middle bringing the point up to the stalk and joining the edges loosely with silk; when about to pupate, it eats the leaf free at the stalk end, and the cell falls to the ground where the pupation takes place. The pupa is in no way fixed inside the cell. The larva feeds on bamboo.

209. *Halpe astigmata*, Swinhoe.

We have caught a single specimen of the butterfly in Supa, above the ghâts, in the month of May, basking on a leaf in a very thick place in a nalla. It is the only specimen we have seen.

210. *Halpe ceylonica*, Moore.

We have obtained a few specimens of this butterfly also at some time with the net, but took them to be slightly weathered individuals of *H. moorei*, Watson.

211. *Halpe honorei*, de Nicéville.

The imago is found throughout the district at all times of the year. It is not common anywhere. It has the same habits as *T. bambusæ*, Moore. We have bred it at all seasons.

Larva.—As in the description of the group; head light yellow-brown with a round black spot at the top of each lobe. The colour of the body is as follows :—a dorsal green line, a subdorsal broad yellow band, a lateral rose-coloured band, broader than the subdorsal one and with just a shade of green in it, and a marginal white band; the last segment is quite black and rough. The skin is somewhat transparent. Length 28 mm.

Pupa.—Shape as in the group; on the front of the head is a broad, heart-shaped overgrowth of the same thickness throughout, occupying the space between the eyes, rough and honey-combed on the surface; immediately behind this overgrowth are two small similar overgrowths, oblong in shape, situated along the front margin of segment 2 and separated by a triangular overgrowth; the front of the eyes is also rough and honey-combed, as well as a small spot at the anterior inferior corner of the eye and a smaller one on each side and contiguous to the maxillæ. These overgrowths are all black-brown in colour; the spiracular expansions of segments 2 are large, nearly circular, face forwards, and have a transverse depression in the centre; they are black-brown in colour. On segment 2 is a black, narrow, lateral triangular mark reaching on to the thorax; cremaster curved, provided with many irregular hooklets on its dorsal surface and around its edges; the dorsal ridges of the cremaster are strong and are provided with three teeth pointing backwards along their length; colour of pupa a waxy-looking white with a slight yellow tinge; cremaster brown. Length 14 mm.

Habits.—Larva generally incorporates a few dead leaves in its cylindrical cell; the cell is coated inside with steps of silk which are disposed irregularly; pupa fixed by the tail only; the larva feeds on bamboo, and is generally found on bamboo-clumps in which there are a lot of dead yellow leaves.

212. *Halpe hyrtacus*, de Nicéville.

This insect was caught in the valley of the Kalinaddi river in the ghâts, for the first time, a short time ago, in the early morning, at the

flowers of *Kydia calycina* ; the larva was obtained shortly afterwards in the same locality. It is a new species, named from a single specimen obtained quite lately in another district by Mr. de Nicéville, to whom we forwarded some specimens bred by us, which he kindly identified. The insect is very similar in its flight to *H. moorei*, Watson, but seems to frequent the neighbourhood of water to a greater degree than the latter. It is not a common insect in this district, and seems to be extremely local, frequenting the bamboo jungles in the evergreen portions of the district on the edge of the ghâts.

Larva.—Head round, slightly indented on vertex; face convex; surface rugose; finely hairy all over; the hairs being quite apparent to the naked eye ; clypeus and about the jaws very dark brown; margin and hinder part also dark brown ; the rest dirty yellow, with a broad, central, dark brown, longitudinal band ; shape of body as in the group; the anal segment covered all over with reddish-brown star-shaped spots, from each of which springs a short seta ; surface of body covered with fine, short, erect, colourless hairs, which are longest on the anal margin ; colour of larva is a watery greenish dirty yellow, with a brown tinge on the hinder segments ; a dark green dorsal line. Length 37·5 mm.

Pupa.—Head bowed, square in front, parallel-sided, broader transversely to length of pupa than long ; nearly as broad as is the thorax at the shoulders ; slightly bossed between the eyes; hairy in front and around the eyes, with erect, light, longish hairs ; segment 2 narrow, parallel-sided ; thorax only slightly humped; twice as high at the apex as segment 2 ; evenly convex, rounded at shoulders ; section (transverse) of body is circular from shoulders to anal end ; cremaster shortish, triangular, rounded at extremity; perfectly flat underneath, with feebly developed dorsal extensor ridges, and a tuft of hooked hairs at upperside of rounded extremity ; proboscis does not extend free beyond the wings ; spiracular expansion of segment 2 large and kidney-shaped, with its edge slightly raised from the surface of the thorax, with a strainer-shaped central hollow and a rugose surface, facing forwards ; dark brown in colour, very conspicuous ; body-surface covered very densely with semi-erect, short, light hairs ; irregularly and finely rugose, colour of pupa light dirty yellow tinged with brownish-red ; a lateral dark smudge along the side of the

thorax as well as some dark spots ; each of the abdominal segments from 6 to 12 has two rows of black spots transversely to body length across it. The pupa is stout and similar to that of *Telicota bambusæ*, Moore. Length 22 mm.

Habits.—The larva builds a strong cylindrical cell, in which it lives like *T. bambusæ*. The pupa is fixed only by the tail and is not covered with white powder ; is formed in the cell.

213. *Telicota bambusæ*, Moore.

The butterfly is very common at all seasons throughout the district ; it basks on bamboo leaves, &c., in the sun with its wings half open, when it is easily caught ; it is an insect of very rapid flight. We have bred it at all seasons both above and below the ghâts.

Larva.—As in the group ; head round and thick ; colour yellow, with a central dark red line down the face broadening out at the clypeus, and a black spot at the eyes ; the colour may vary from this to a rich dark black-brown all over ; last segment rounded and flattened at extremity; colour of body is a watery grass-green, yellowish at anterior margins of anterior segments. Length 34 mm.

Pupa.—As in the group ; spiracular expansions of segment 2 are large and ear-like, red-brown in colour ; cremaster is a truncated triangle in shape, with a sharp tooth at each hinder corner, and set with spare bristles on the hinder margin ; the thorax is slightly compressed; the surface is covered with fine, red, short hairs ; the head is somewhat inclined. Colour is red-brown with greenish wing-cases. Length 19 mm.

Habits.—The larva makes a cylindrical cell as described for the group, lining it inside densely with silk ; it pupates in the cell. The egg is laid on a young leaf, whereas that of *H. honorei*, de Nicéville, is laid on an old tough leaf.

214. *Baracus septentrionum*, Wood-Mason and de Nicéville.

(Plate VIII, Fig. 11.)

This butterfly and the next are very similar in habits, except that this one frequents places where the grass is high, and is often found in dense jungle ; it keeps to the tops of the hills around Karwar, and is never found at a lower level than 800 feet. It is plentiful where found, but is local. We have bred many. The insect has a slow, somewhat jerky flight and is always found near the ground.

Larva.—Shape as in the group; head black, very perfectly round, with a finely reticulated surface; finely and sparsely hairy, with very minute, more or less adpressed hairs; about the jaws the hairs are longest; the head is large for the size of the body; last segment covered with dense, low, conical, brown tubercles; body covered with minute erect hairs. Colour is a watery dirty green. Length 25 mm.

Habits.—The larva makes a cell as for the group at the point of a leaf, eating the substance of the leaf below the cell, towards the stalk, and leaving the midrib only. The pupa is suspended by the tail, and has a loose body-string; this body-string is black in colour. The larva feeds on a very long-leafed soft grass.

215. *Taractrocera ceramas*, Hewitson.

This insect we for a long time mistook for what we called *Ampittia coras*, Cramer (=*Taractrocera nicévillei*, Watson). It is common below the ghâts in the monsoon months; it skips about amongst the small grasses in open places, on paths, and in the compounds of bungalows on the hills. We were a long time in finding the larva, which we obtained for the first time last monsoon. The butterfly is easily caught sunning itself on blades of grass with its wings half-open.

Larva.—Head rounded; not very thick in the line of the longitudinal axis of the larva; face convex; surface rugose; hairy about the jaws; green-white in colour, with the hinder margin black; a black band on the cheek reaching from the vertex to the base; a broad central black line continued along the sides of the clypeus; another from the apex to the base of the clypeus, and a brown longitudinal streak in the centre of each lobe not reaching the vertex; segment 2 has a thin, black collar joining the two black spiracles; last segment flat, broadly rounded at the extremity; surface of body covered with minute, brown, setiferous tubercles; margin shortly hairy. Colour of body grass-green. Length 16 mm.

Pupa.—Shape as in the group; head bowed, nearly as broad as the shoulders; a slight constriction between segments 2 and 3; the pupa nearly the same breadth from the shoulders to segment 10; thorax slightly humped and somewhat compressed; transverse section of abdomen absolutely cylindrical from segment 4 to segment 10; cremaster very short; a mere ledge, with a short triangular

tooth at each hinder corner ; the cremaster is slightly turned-up as in *P. dara*, Moore, and has in the centre of its hinder margin a dense single row of simple red hairs pointing straight backwards ; head rounded between the eyes, with an eliptical shield-like surface raised from the surface of the head between the eyes ; spiracular expansion of segment 2 large, raised, semi-circular, spongy-looking as to surface ; body covered with erect and semi-erect small red hairs ; some erect longish hairs on the head and eyes ; colour of pupa is a watery-looking dirty cream ; cremaster, spiracular expansions, and front of head red-brown. Length 11·5 mm.

Habits.—The egg is laid on the underside of the leaf ; the larva makes a cylindrical cell, when small, at the side of a leaf ; when full-grown it makes a cell by folding a leaf longitudinally ; when about to pupate, it makes a cell at the root of the plant in which some dead leaves are incorporated. All the larvæ obtained were taken when nearly full-grown in October ; they ceased feeding by the 25th of the month, remained in the larva state in the cell until the 12th of February, when they commenced to pupate, all about the same time, the butterfly coming out in fifteen days' time. The pupa lies free within the cell. The larva, when feeding, wanders somewhat ; when disturbed in its cell it will run out and fall to the ground, where it will curl up.

216. *Taractrocera mævius*, Fabricius.

We have captured some specimens of this little butterfly near Bhatkal, in the southern part of the district, near the sea-coast ; they were flying about on the road in the sun. We have never bred it.

217. *Zographetus ogygia*, Hewitson.

A single specimen was caught on the hills near Karwar, in the monsoon, some years ago, by Mr. C. Hudson of the Indian Civil Service. This is the only specimen we have ever seen.

218. *Hyarotis adrastus*, Cramer.

This butterfly is not uncommon in the southern parts of the district, but has not been caught in the north. Although a fair number of specimens have been caught, we do not know the food-plant of its larva, nor, consequently, the larva itself. It is an insect of rapid flight. It has been placed in this group as it was thought to be more closely related to the butterflies of this group than to those of any other.

Group D.

All the imagos of this group and the next two groups rest with their wings closed over the back. They are, moreover, connected together by the similarity of the pupa, and the fact that the pupa is formed free on the surface of the leaf, attached by the tail and a body-band, instead of inside a cell. The larvæ all feed on monocotyledonous plants. The butterflies of the group D are all fast-flying insects, generally fond of basking in the sun on leaves, and are all greedy flower-feeders. The larva has a head of a semi-eliptical shape, somewhat narrowed at the top, truncated at the base and slightly bi-lobed; the body is cylindrical, somewhat depressed, thickest at segment 5, sloping at the last segment, with the extremity of the anal segment rounded broadly. The pupa is cylindrical, very slightly constricted dorsally only, behind thorax, produced generally into a long, sharp, conical snout in front (in *Ampittia maro*, Fabricius, there is an up-turned small conical point in front of each eye), the eyes being prominent; the abdomen is tapering, and ends in a thin, long more or less broadly triangular, curved cremaster; the proboscis (except in *A. maro*, Fabricius) is produced beyond the wings, and generally as far as the cremaster; the colour is a bright watery-looking grass-green all over; the surface is quite glabrous and shiny; there are no spiracular expansions to segment 2; it is fastened by both the tail and a band. The pupa is formed on the open surface of the leaf, either on the upperside or the underside (*A. maro* is again abnormal in that its pupa is formed on the stem of the grass or rice on which its larva feeds); the edges of the leaf may be slightly drawn together, but they are never made to meet, the pupa is quite exposed. The larva makes a cell by joining the edges of the leaf longitudinally, loosely (never tightly), but it as often as not lives on the open surface of the leaf; it feeds on grasses and bamboos.

219. *Ampittia maro*, Fabricius. (Plate VIII, Fig. 10.)

The butterfly is common throughout the district at all seasons; it is very abundant round rice-fields. Its flight is not very rapid, and it rests often; wherefore it is easily captured in the net; it is fond of basking with its wings half-open. We have bred many specimens in cages from the egg.

Larva.—As in the group; colour of head transparent-looking, dirty, yellow-white, with a green clypeus, a light brown stripe running down the centre of each lobe from the vertex to base, and another inside it and parallel to it; eyes black; jaws black; surface finely celled, covered with erect, short, light hairs; surface of body covered with minute, erect, white hairs; segments 3 and 14 covered with brown setiferous tubercles; anal margin with longer hairs than the rest; colour dark green, with a subdorsal yellowish band flanked by a whitish line; two lateral and a marginal white line. Length 20 mm.

Pupa.—Head square, convex on top; eyes prominent; between the eyes in front of the head are two conical excrescences which overhang the eyes somewhat, the two together having the appearance of a small crescent, the horns of which point forwards; proboscis not produced; surface glabrous, shiny; colour grass-green, with the markings of the larva apparent on abdomen. Length 16 mm.

Habits.—Larva lives absolutely in the open when full-grown. Pupa forms on the stems of grass, or rice, with its head downwards. The larva feeds on rice and grasses.

220. *Aëromachus indistinctus*, Moore.

This little skipper is extremely local in this district, but occurs in quantities where found; such is our experience; in the months of November and December we found it in the valley of the Kalinaddi, far away from the coast, in numbers; in January there was hardly a specimen to be seen. The spot where we found it was a piece of marshy ground surrounded by dense jungle. It is a greedy flower-feeder; flies low down near the ground among the grass and settles often; it is extremely difficult to see, being so small. We have noticed odd individuals now and again at different times of the year; always in nalla beds and in thick jungle country; we have bred two specimens; we possessed a very few specimens until we came across the lot mentioned above, when we obtained as many as we wished.

Larva.—Very like that of the preceding species, *A. maro*, Fabricius; head half-elliptic, higher than broad, finely hairy about the mouth; colour green; jaws yellow; colour whitish-green, with dark green showing through in small spots; a dark dorsal line; a white lateral distinct line; and a submarginal, white, indistinct line. Length 19 mm.

Pupa.—Head square ; eyes prominent, with a conical, parrot beak of moderate length ; thorax ending square behind ; shoulders rounded ; segment 5 has a small dorsal point under which the suspension-band passes, this point being directed forwards ; proboscis free to the end of segment 10 ; cremaster nearly parallel-sided, minutely hairy round the margin ; surface of pupa extremely minutely hairy under a lens ; colour a dark watery-looking green, with a fine subdorsal and lateral white line and an obsolescent white spiracular line. Length 14 mm.

Habits.—Egg laid anywhere on dead or green leaves, but nearly always on the underside ; larva makes a lax cell ; when full-grown, the larva makes an open cell, lying on the underside of the leaf, where it changes to the pupa, fastening itself by the tail and a body-band ; the egg is very large for the size of the insect ; hemispherical in shape, somewhat depressed ; 18 thin low ridges from top to base ; white in colour ; the larva feeds on grasses, and generally on short grasses.

221. *Padraona gola*, Moore. (Plate VII, Fig. 5.)

This butterfly is found in similar places to *A. maro*, Fabricius ; unlike *A. maro*, however, it is found also in the jungles among bushes ; it is very similar in habits to *A. maro* ; it is common throughout the district and at all seasons of the year ; the larva is one of the commonest found on grass in the monsoon months in Karwar. We have reared many.

Larva.—As in the group ; head light-yellow, bordered narrowly with black, and having a thin black central line splitting along the edges of the clypeus down the face ; segment 2 swollen, narrow, shiny green ; surface of body very minutely hairy, the hairs being longer on the margin ; colour grass-green spotted all over with dark green, a dorsal dark green line, and a lateral and submarginal indistinct white line. Length 25 mm.

Pupa.—As in the group ; the snout is shortish, slightly turned-up ; proboscis not produced beyond the wings ; colour watery-green, with the markings of the larva. Length 17 mm.

Habits.—Has the habits as described for the group ; larva sometimes makes a lax cell ; pupa always forms on the underside of a leaf, with the edges of the leaf just drawn towards each other by a few threads of silk ; the larva feeds on soft grasses.

222. *Baoris conjuncta*, Herrich-Schäffer.

Uncommon in the early rains below the ghâts ; at the end of the rains, and throughout the cold season, though plentiful enough at times, it cannot be said to be common. The butterfly is fond of settling on the ground and on stones ; it is a very fast flier, but generally returns to the same spot, like all the following species of this group, when disturbed ; it makes a very audible fluttering noise with its wings when flying ; it is most plentiful in the vicinity of water. This butterfly is perhaps better known in India as *Parnara narrooa*, Moore.

Larva.—As in the group ; head white with a black line from the apex to the base of the clypeus ; a large round black spot near the top of each lobe and another near the base ; these spots may be coalescent and the face suffused with black in the lower portion in the monsoon specimens ; the colour of the body is white tinged with blue and yellow, punctuated finely with dark green, and clothed with fine, erect, white, minute hairs. Length 50 mm.

Pupa.—As in the description of the group ; snout long, pointed ; proboscis produced to the end of the cremaster ; colour green, with a subdorsal and lateral white band. Length 36 mm. over all.

Habits.—As described for the group ; larva generally lives in a laxly closed cell ; egg dome-shaped, broadest just above the base, more or less smooth ; larva feeds on long grasses, also on *Zea mais*.

223. *Baoris oceia*, Hewitson. (Plate VII, Fig. 6.)

This butterfly being so like the next, we did not distinguish it for a long time, and consequently did not know it existed in the district until we bred it. Since breeding it, however, and thereby becoming aware of its existence, we have caught many males basking on bamboo leaves, in the beds of nallas, in shady places where little spots of sunshine came through, with *Baoris canaraica*, Moore, up till 9 o'clock in the morning and for a short time before sundown ; it retires when the sun is hot. We bred specimens below the ghâts and above the ghâts in the monsoon and in the dry weather ; the larva is always much ichneumoned. The butterfly always returns to the same leaf when disturbed ; can be caught between one's finger and thumb when sitting ; and has a strong flight. The females, probably on account of their not being found basking, are difficult to obtain.

Larva.—Similar to the last ; head white, with a shiny black, broad border ; a broad shiny black line down the centre of the face splitting down the sides of the clypeus, and a curved black mark in the centre of each lobe ; all these marks are broader in the rains specimens than in the dry weather ones. Length 47 mm.

Pupa.—The pupa is not distinguishable from the pupa of the preceding in any particular.

Habits.—The same as for *B. conjuncta*, Herrich-Schäffer ; larva feeds on bamboo.

224. *Baoris kumara*, Moore.

A very common insect at all times and places in this district ; it basks like the last, but always on leaves, and is fond of flowers in the early morning ; it is easily captured when basking as, if disturbed, it returns to the same leaf ; it has an extremely rapid flight. We have bred many specimens at all seasons and above and below the ghâts.

Larva.—Very similar to the last, except that the head is somewhat smaller, light yellow in colour, with a dark line down the centre of the face ; the head is suffused with black in the monsoon months. Length 27 mm.

Pupa.—Not distinguishable from that of the last. Length 27·5 mm.

Habits.—Larva makes a cell out of two or more leaves laxly drawn together with a few threads, when full-grown ; feeds on bamboos. The transformations of this species have been figured in Journal, Bombay Natural History Society, Vol. V, p. 370, No. 80, pl. F, Figs. 4, *larva* ; 4*a*, *pupa* (1890), as *Parnara kumara*.

225. *Baoris plebeia*, de Nicéville.

Is found throughout the district at all seasons in similar localities to *B. kumara*, Moore ; it is very similar to the last in appearance ; indeed so similar as to be difficult of separation as concerns the males ; the female of this species is, however, greyish on the underside of the hind wing, whereas the female of the last is rusty-red ; the male of this is perhaps also more constantly rusty-red underneath than the male of *B. kumara*.

Larva.—Very similar to the last, but has a broad black band round the head; a black line down the centre of the face splitting along the sides of the clypeus, the furcations reaching half-way down the clypeus, where they are met by a brown line parallel to the central line,

which brown line runs up the face, but does not reach the vertex of the head; all these markings are obsolescent in some specimens; a black line down the centre of the clypeus; segment 12 is slightly broader than segment 11, being somewhat swollen at the spiracles. colour bluish opaque white all over, with a yellow tinge at the front margins of the anterior segments. Length 40 mm.

Pupa.—As in the description of the group; the beak is slightly curved downwards; has a blunt tip, and a small bit stuck on to the tip; colour is a very watery darkish green, with a double, broadish, white dorsal line; proboscis reaches only to the hinder margin of segment 9. Length 34 mm. over all.

Habits.—The same as for the last. The larva feeds on bamboo.

226. *Baoris canaraica*, Moore.

This insect, of which we have never reared or discovered the larva, was unknown to us until last year, when we found it plentiful in the same localities as *B. oceia*, Hewetson; it has the habits of this latter species in that it is only found basking in the early morning sun and just before sundown, but it frequents the borders of the open glades in the jungle, whereas *B. oceia* prefers the small spaces under high trees where the ground is covered with weeds. Single specimens have been caught near Karwar on the coast. The females are extremely rare, as only the males bask; it is a rapid flier.

GROUP E.

This group is characterised by the insects having a larva with a triangular-shaped head when looked at from in front; otherwise, the larva and pupa are the same as in the last group. The imagos rest with the wings closed over the back; are of rapid, short flight; are fond of flowers, and are found always settled near the ground. The larvæ feed on rice and grasses.

227. *Baoris colaca*, Moore. (Plate VII, Fig. 7.)

We have bred great numbers of this insect in Karwar in the monsoon; it is the commonest of the grass-skippers in the larva state; it is so like others of the genus that we did not distinguish it after capture for a long time, much less did we recognise it as a distinct species on the wing; the most probable reason for our never having obtained it with the net until quite lately (in shady places in the big jungles above the ghâts, not in Karwar) is that it is a

dusk flier, for, since we became acquainted with *B. colaca* through breeding, we have caught pretty nearly everything resembling it, but all these captures turned out to be other species.

Larva.—Head dark chocolate, nearly black, with a white marginal band and a green clypeus ; for some distance round the clypeus the face is marbled with greenish ; such is the rains coloration ; in the dry weather, and indeed sometimes in the rains, the black is obsolescent ; colour of body bluish-white, or greenish-white, with a subdorsal and a lateral white stripe ; surface clothed with very short, erect hairs, longest at the margins of the body. Length 30 mm.

Pupa.—As in the description of the group ; colour green, with white longitudinal lines ; proboscis produced to the posterior margin of segment 12.

Habits.—The habits of the larva of *B. colaca* are the same as the habits of the larvæ of the preceding group ; it makes a lax cell; it pupates on the underside of a leaf, drawing the edges somewhat together. The larva feeds on soft, small grasses.

228. *Baoris subochracea*, Moore.

We have confounded this species and *B. mathias*, Fabricius, up to a few months back, when Captain E. Y. Watson drew our attention to the difference. In our former paper we called it *Chapra mathias*. In company with the next species *B. subochracea* is found throughout the district, around rice-fields and flowers in the more open parts, commonly ; it is a fast flier; is fond of the sunlight, and may be caught at flowers. We have bred many.

Larva.—As in the group ; head large, light green, with a red marginal band bordered on both sides by white, and a central darkish mark splitting down both sides of the clypeus ; colour of body grass-green with a yellow tinge ; a dark dorsal line, a faint yellow lateral line, and a marginal white line ; stouter than the larva of *B. colaca*. Length 34 mm.

Pupa.—Same as for the group ; colour grass-green, slightly glaucous ; a dark dorsal line, an indistinct subdorsal band, and a white lateral band. Length 25 mm.

Habits.—Larva lives on the open surface of a leaf, and the pupa is often formed on the top surface of the leaf ; the larva feeds on rice and grasses.

229. *Baoris mathias*, Fabricius.

We have bred a few of this butterfly from larvæ which we took to be the larvæ of *B. subochracea*, Moore, feeding on rice. We remember having noticed a few larvæ, which had black borders to their heads instead of red borders; these might have been the larvæ of this species; if this is so, the larva and pupa is in no particular distinct from those of the preceding species; the specific distinctness of the two species remains a point for future elucidation; the insect is not so common as the last.

GROUP F.

The imagos of this group rest with their wings closed over the back, but bask generally with them half-open; they are insects of damp and shade, frequenting the beds of nallas and damp evergreen portions of the district; they are not very strong fliers, and rest often and always close down near the ground, on a convenient upperside of a leaf. We have bred some individuals of *Udaspes folus*, Cramer, from pupæ that have lain over for nearly two months after the rains; the individuals differed from those obtained from pupæ that come out in the normal time in having the tip of the forewing decidedly bleached or faded. The larvæ are very stout when full-grown, and have the habit of resting with the first three segments after the head contracted so as to give the appearance of being humped about the anterior segments, the relatively small head lying with its apex pressed on the second segment; the body is flattened ventrally as the larva always lies closely applied to the resting surface; the anal segments are sloping, and the margin is closely applied to the leaf, rounded at the extremity and somewhat thickened at the edge; when at rest the fourth segment is more than twice as long as the head; the head is triangular when seen from in front, and narrowly bi-lobed and small for the body. The colour of the larva is some shade of indigo-green; there is often a white excretion on the abdomen laterally between the bases of the prolegs. The larva feeds upon *Scitamineæ*; the pupa is hardly distinguishable from the pupa of the last group; the larva makes a lax cell by turning over a triangular piece from the edge on to the upper surface of the leaf.

230. *Udaspes folus*, Cramer.

U. folus is a very common butterfly in the monsoon in Karwar; it frequents the jungle, and may be found any day basking on the ground, or on a leaf, or flitting about amongst the herbaceous ground plants.

The larva is to be had in any numbers during the rains. In the dry weather, owing to the food-plant dying down, it is not at all common anywhere.

Larva.—As in the description of the group ; head black, with the surface rugose and shiny ; each segment slightly swollen around the spiracles ; surface of body glabrous, greasy-looking ; colour of body a watery, very dark indigo-green, the tracheæ showing through as white threads ; a dark dorsal pulsating line ; end segment whitish ; segments 2 and 3 yellowish, as well as the margins of segments 4 and 5. Length 37 mm. A good deal more when fully stretched out.

Pupa.—As in group ; snout of head squarely blunt at tip ; colour is a watery bright green ; proboscis reaches to end of cremaster. Length 32·75 mm.

Habits.—As for the group ; the larva feeds on *Curcuma aromatica.*

231. *Notocrypta feisthamelii*, Boisduval (= *alysos*, Moore).

This insect is of common occurrence in moist thick jungles above the ghâts, especially in evergreen jungles ; it is probably found in similar situations below the ghâts. We have bred numbers, together with *Sancus pulligo*, Mabille, in the dry weather above the ghâts, though never in Karwar in the monsoon.

Larva.—Nearly exactly similar to that of the last species ; the head is here, however, chocolate-brown in colour ; the body dark indigo-green ; anal segment whitish-yellow. Length 31·25 mm.

Pupa.—Not distinguishable from the last.

Habits.—The habits are the same as those of the last ; the larva pupates in the cell ; larva feeds on *Maranta.*

232. *Notocrypta restricta*, Moore. (Plate VIII, Fig. 7.)

In the monsoon round Karwar this skipper is very plentiful in similar localities to the next ; it has a weakish flight, and is found basking low down among leaves, &c. We have reared many in the monsoon in Karwar and a few above the ghâts in the dry weather ; it is found throughout the district, though not common in the dry months.

Larva.—As in group ; with a black head, broadly whitish-yellow in the centre of each lobe. Length 37·5 mm.

Pupa.—As in the group ; proboscis produced well beyond the end of the cremaster ; same length as last.

Habits.—Same as the last ; pupa formed on the underside of a leaf.

233. *Sancus pulligo*, Mabille. (Plate VIII, Fig. 8.)

The imago is fond of damp shady places, like evergreen forests and beds of nallas. We have bred many at all seasons and in many parts of the district ; it is always plentiful where it exists—that is, where its food-plant grows. The flight is very weak ; the insect keeps low down near the ground and pitches often on leaves ; it is rarely found basking in the sun.

Larva.—As in the group; not to be distinguished from that of *N. feisthamelii*, Boisduval, except that the head is smaller. Length 31 mm.

Pupa.—As in the group ; not to be distinguished from that of *N. feisthamelii*, except by the snout (or beak) being slighty turned-up.

Habits.—The same as those of *N. feisthamelii* in every particular. A few months ago, when out at work in the ghâts, we noticed a skipper which we have never seen before in the district. It was resting on a cane-leaf with its wings closed over its back ; from a pretty close examination of the underside, previous to trying to bottle it in a tube (we had no net with us), it appeared to be a species of *Isoteinon*. This would make the fifty-seventh species occurring in the district.

Explanation of Plate VII.

Figs. 1, 1*a*... Larva and pupa of *Ismene gomata*, Moore, p. 23.
„ 2, 2*a*... „ „ „ *Hasora chromus*, Cramer, p. 26.
„ 3, 3*a*... „ „ „ *Ismene fergusonii*, de Nicéville, p. 24.
„ 4, 4*a*... „ „ „ *Sarangesa purendra*, Moore, p. 34.
„ 5, 5*a*... „ „ „ *Padraona gola*, Moore, p. 56.
„ 6, 6*a*... „ „ „ *Baoris oceia*, Hewitson, p. 57.
„ 7, 7*a*... „ „ „ *Baoris colaca*, Moore, p. 59.

Explanation of Plate VIII.

Figs. 1, 1*a*...Larva and pupa of *Celœnorrhinus ambareesa*, Moore, p. 37.
„ 2, 2*a*... „ „ „ „ *fusca*, Hampson, p. 37.
„ 3, 3*a*... „ „ „ *Odontoptilum angulata*, Felder, p. 31.
„ 4, 4*a*... „ „ „ *Caprona ransonnetii*, Felder, p. 30.
„ 5, 5*a*... „ „ „ *Tapena thwaitesi*, Moore, p. 36.
„ 6, 6*a*... „ „ „ *Hesperia galba*, Fabricius, p. 29.
„ 7, 7*a*... „ „ „ *Notocrypta restricta*, Moore, p. 62.
„ 8, 8*a*... „ „ „ *Sancus pulligo*, Mabille, p. 63.
„ 9, 9*a*... „ „ „ *Iambrix salsala*, Moore, p. 44.
„ 10, 10*a*... „ „ „ *Ampittia maro*, Fabricius, p. 54.
„ 11, 11*a*... „ „ „ *Baracus septentrionum*, Wood-Mason and de Nicéville, p. 51.

BIRDS' NESTING IN THE TONS VALLEY.

By B. B. Osmaston, Indian Forest Department.

(*Read before the Bombay Natural History Society on 18th March*, 1897.)

There is a great charm in birds' nesting, whether at Home or in India, but especially so in the latter country where there are so many birds of whose nidification nothing is as yet known, and where consequently there is ample scope for new discoveries.

What I now propose to do is to describe shortly the nests and eggs of a few birds which I found during a trip last hot weather up the river Tons. The nidification of about half a dozen of these species has not been previously recorded, and notes on a few other kinds have also been included chiefly where my observations differ from or tend to amplify those recorded in Hume's "Nests and Eggs of Indian Birds."

Before, however, I proceed to business, I may explain for the benefit of those who do not happen to be acquainted with the locality about which I am about to write, that the Tons is a large branch of the river Jumna rising in the snowy ranges of the Himalaya, and winding its way southward through Tehri-Garhwal and Jaunsar, traversing a forest-clad country from the zone of the juniper and the birch at 13,000 feet to that of the long-leafed pine at 3,000 feet.

The first nest to be described is that of the Himalayan Tree-creeper.

1 (341). Certhia himalayana.—The Himalayan Tree-creeper.

This bird is very common at elevations of from 5,000 up to 10,000 feet, but especially so in the spruce-fir zone. Previously its nest appears to have been found by Col. Marshall in Kashmir and Capt. Cock in Murree, only the former procuring the eggs. The latter remarks that this tree-creeper always selects tall trees to build upon, and that the nest is always placed at a height of some 40 or 50 feet from the ground. This is not, however, my experience. I found three nests of this species on the following dates :—

April 4th, containing 4 hard-set eggs.
„ 16th „ 5 fresh eggs.
May 26th „ 4 „ „

The two first nests were placed between the semi-detached bark and the wood of large spruce-fir trees, at heights of about 4 and 7 feet, respectively, from the ground, and the third was in a narrow rift

caused by radial splitting in the wood of a karshu oak, about 4 feet from the ground. The two first nests were at an elevation of about 8,000 and the third 9,000 feet above the sea. This shows that the Himalayan tree-creeper does not always nest at great heights from the ground.

The nests of this creeper were all very similar in structure. They consisted first of an irregular mass of spruce twigs, above which was a more or less distinct layer of dry rotten wood (touch wood), the cavity being lined with fur and feathers. The whole of the nest, except the lining, was studded with the silky egg-cocoons of some spider, some of which were red and others green. These served to bind the nest together and to attach it to the bark and wood of the tree.

The colour of the eggs is white, spotted with brick-red, in some all over, in others chiefly at the larger end, and bearing in addition a few indistinct greyish spots.

The dimensions of the eggs were as follows :—

Largest egg.....	·68″ × ·48″
Smallest egg	·64″ × ·50″
Average of 12 eggs	·65″ × ·49″

2 (241). PTERUTHIUS XANTHOCHLORIS.—*The Green Shrike-tit.*

Very little indeed seems to have been recorded about the habits of this shrike-tit, and nothing whatever on the subject of its nidification. It is not by any means a common bird, and its quiet habits, plain colours, and the thick nature of the forest it frequents do not tend to render it conspicuous.

On April 14th I found a nest of this bird containing two fresh eggs. The nest was at an elevation of about 8,000 feet, in mixed spruce and deodar forest, and was suspended like that of an oriole or white-eye from the slender horizontal forked twig of a deodar sapling, about 7 feet from the ground. It was in shape a deep cup, very thin and delicate, but neatly put together.

The ground-work of the nest consists of root fibres and a grey hair-like tree-lichen (*Usnea* sp.), decorated on the outside with ordinary grey leaf lichens, the whole structure being bound together with silky spider cocoons and threads. The deep cavity is lined with fine black hair-like fibres (the rhizomorph of a fungus), and the nest is attached to the twigs by the red egg-cocoons of a spider. The two eggs are long

ovals, white spotted rather sparingly and chiefly at the larger end with dark bay spots and specks. They measure ·75″×·54″ and ·74″×·52″, respectively.

Two appear to be the full complement of eggs for this species, as I waited two days after finding the nest, but no more eggs were laid.

3 (672). MERULA ALBICINCTA.—The White-collared Ouzel.

No account of the nidification of this ouzel seems to be on record, and all that we know of the eggs is from Hume's description of two specimens brought from Native Sikhim in June.

This fine ouzel is fairly common in the karshu oak zone from 8,000 to 10,000 feet where its fine mellow-noted song may be heard daily in the spring. I found two nests near Deoban at about 9,000 feet elevation on May 23rd and 24th. The first containing four fresh eggs was placed in a dense bushy "karshu" oak tree about 10 feet from the ground, and the second with three slightly set eggs was on the ground at the root of an old stump in oak forest. The nests were massive structures, made of moss and lined with fine grass not unlike those of the missel-thrush. The eggs are very pale blue, mottled all over with reddish-brown and with some inconspicuous pale grey markings as well.

They measured as follows :—

Largest egg.....	1·20″ × ·85″
Smallest egg	1·14″ × ·84″
Average of five eggs	1·16″ × ·85″

4 (831). MOTACILLA MADERASPATENSIS.—The Large Pied Wag-tail.

Hume in his "Nests and Eggs" says that this wag-tail does not, he believes, ascend the Himalayas above 3,000 feet. It may therefore be of interest to record in this connection that I found a pair breeding at about 5,000 feet elevation near the head of the Rama Serai Valley. The nest was built between the roof timbers of a small wooden temple in a field, and contained four fresh eggs.

5 (653). TARSIGER CHRYSÆUS.—The Golden Bush-robin.

This pretty little bird is fairly common, but only at high elevations of from 10,000 to 12,000 feet in the birch and rhododendron scrub, where it breeds. It is very shy and difficult to observe, and keeps chiefly to the dense patches of rhododendron. I found one nest only at about 12,000 feet on June 3rd, placed in a hole in the ground at

the root of a small bush in the open, but close to a patch of rhododendron bushes. It contained three hard-set eggs of a uniform pale blue colour. This bird does not descend below 8,000 feet in these parts, except in winter.

6 (832). MOTACILLA MELANOPE.—The Grey Wag-tail.

The grey wag-tail is common about 9,000 feet in the Tons Valley. I found a nest of this bird on June 4th, containing four fresh eggs. It was built in a faggot of sticks lying on the roof of a house in the middle of a village (Oshol). The nest was made of grass and lined with goat's hair, and the eggs were pale yellowish-brown with a fine black streak on each egg towards the large end. The nest of this bird has hitherto in India only been found in Kashmir.

7 (567). CYORNIS LEUCOMELANURUS.—The Slaty-blue Flycatcher.

The slaty-blue flycatcher is not nearly so common in the Tons Valley as its congener, the white-browed blue flycatcher (*C. superciliaris*). The latter is one of the commonest birds in these hills, between 5,000 and 9,000 feet, whereas the former is somewhat scarce, and is chiefly found between 9,000 and 11,000 feet. I found a large number of nests of *C. superciliaris* at various elevations between 6,000 and 9,000 feet, and three nests of *C. leucomelanerus* at about 9,000, 9,500 and 11,000 feet, respectively. I mention this as Hume says that this flycatcher breeds throughout the Himalayas from Nepal to Kashmir at elevations of from 5,000 to 7,000 feet, though my observations would appear to show that, at any rate in portions of its range, it prefers a higher zone to nest in.

The male birds were in all three cases indistinguishable from the females.

8 (199). HODGSONIUS PHŒNICUROIDES.—Hodgson's Short-wing.

This is another bird about whose habits very little is known, and nothing at all appears to be on record about its manner of nesting.

It is very common in the Tons Valley at elevations of from 10,000 to 11,000 feet, but is rarely seen owing to its being of shy and retiring habits. I found 12 nests between June 5th and 11th, all of which contained either 2 or 3 eggs, mostly fresh, and 3 seems to be the normal full complement. The nests were all placed in low bushes from 1 to 3 feet from the ground in open scrub forest. They were deeply cup-shaped, composed of coarse grass without, and lined with

finer grasses. The eggs are a pure dark blue, about intermediate in shade between those of *Crateropus canorus* and *Garrulax albigularis*, and give the following measurements :—

Largest egg.....	·94″ × ·67″
Smallest egg	·82″ × ·60″
Average of 18 eggs	·87″ × ·64″

9 (718). THARRHALEUS STROPHIATUS.—The Rufous-breasted Accentor.

Hodgson says of this bird that it breeds in the higher ranges of Nepal and Sikhim, building its nests on the ground in tufts of "sunputi" grass and laying 3 to 4 eggs. I found it very common in the low scrub jungle of juniper, dwarf rhododendron, *Lonicera* and *Berberis*, which is found clothing the hill-sides at about 12,000 feet in the Tons Valley. I found over a dozen nests, all in low bushes (chiefly of *Berberis* and *Lonicera*), from 1 to 2 feet from the ground. The nests which much resemble those of the English hedge sparrow, were made of moss and small twigs, lined with moss and hair (chiefly that of Burrhel or muskdeer). The eggs were mostly hard set, generally three, but sometimes two in number, and I never found as many as four in any nest. They were pale blue and measured as follows :—

Largest egg.....	·81″ × ·56″
Smallest egg	·75″ × ·54″
Average of 9 eggs	·78″ × ·55″

10 (651). CALLIOPE PECTORALIS.—The Himalayan Ruby-throat.

This pretty chat is fairly common in the hot weather on the rocky hill slopes just below the glaciers of the Harke Dun, where the Tons takes its rise, and its short lively song uttered from the top of a rock is most attractive and characteristic. In the cold weather it is a regular visitor to the Dehra Dun, where it may often be seen, especially in and about tea gardens. The only occasion on which the eggs of this species are said to have been obtained is recorded by Hume in his "Nest and Eggs," two eggs with a nest said to belong to this species, having been brought down from Native Sikhim. The eggs are described as being "of a uniform pale salmon buff" and the nest as having been placed "in a deep crevice in a rock" and to have been "saucer-shaped" and

composed of "*very* fine moss and fern-roots closely felted together." The above description, however, differs so entirely from my observations of the nests and eggs of the ruby-throat that I have no hesitation in saying that the eggs received by Hume must have belonged to some other bird. On June 7th and 9th, in the Harke Dun, at an elevation of about 12,000 feet, I was lucky enough to stumble on to two nests of this bird which, owing to the careful manner they were concealed, would certainly have escaped my notice had they not been betrayed in both cases by the sudden exit of the bird near my feet. The nest is a *domed* structure with a large opening on one side towards the top. It is rather loosely constructed of coarse grass and lined with finer grass. The locality selected was an open rocky slope with grass and low scrub between the stones and rocks, and the nests were placed on the ground among the grass and scrub. The eggs, fresh in both cases, were three in one nest and four in the other, of a rather dark bluish-green (more green than blue) with pale rufous markings, in some all over, in others chiefly in a zone at the large end.

The measurements of the eggs were as follows :—

Largest egg	·89″ × ·63″
Smallest egg	·80″ × ·58″
Average of 7 eggs	·85″ × ·61″

The domed character of the nest of *Calliope* would seem to be most exceptional for one of the *Turdidæ*.

11 (405). PHYLOSCOPUS AFFINIS.—Tickell's Willow-warbler.

Nothing is on record concerning the nidification of this willow-warbler. On June 7th, I noticed a small greenish-yellow bird frequenting the low scrub on the mountain side at about 12,000 feet elevation. This scrub consists chiefly of dwarf juniper, *Lonicera* and a small yellow-flowering rhododendron which grows only 2 or 3 feet high. There are few trees, except here and there a birch, and the bird keeps chiefly to the low scrub. It has a rather loud monosyllabic chirp which it frequently utters. After a considerable search I was rewarded by finding two nests of this species both in the above-described scrub and about 1 foot from the ground. The nests are domed with a small side entrance, and are made of grass and lined with feathers.

The eggs were four in each nest, very broad ovals and either pure white or white with a few very pale pink spots. They gave the following measurements:—

Largest egg ..... ·61″ × ·48″
Smallest egg ..... ·56″ × ·46″
Average of 8 eggs ..... ·60″ × ·47″

12 (850). ANTHUS ROSACEUS.—Hodgson's Pipit.

This species is fairly common in the Harke Dun, but I only succeeded in finding one nest. It was placed on a steep grassy slope at about 12,000 feet and was of the usual pipit type, a shallow cup of grass lined with hair and finer grasses, well concealed beneath a tuft of grass. It contained 3 hard-set eggs which are whitish, densely marked and speckled chiefly at the larger end with very dark grey. They might easily pass, except in size, for eggs of the common sparrow.

Two of the eggs measured ·88″ × ·64″ and ·87″ × ·63″ respectively.

13 (603). CHELIDORHYNX HYPOXANTHUM.—The Yellow-bellied Flycatcher.

The nest of this lively little fantail seems rarely to have been found. Jerdon had the nest brought to him at Darjeeling after the young had flown, and Hodgson has figured the nest and eggs. Mr. R. H. Thompson, too, saw the nest in the Kumaon Bhabar, but never took down the eggs. This bird is fairly common at high elevations in the Tons Valley during the hot weather, frequenting at that season forests of the high level silver-fir and birch at about 10,000 to 12,000 feet. It visits the plains in the cold weather but never remains there, or even low down on the hills, to breed, retiring to the higher ranges near the snows for that purpose. This only refers to Dehra Dun and the neighbouring hills, which is peculiar, for it must be borne in mind that Mr. Thompson found it breeding in the Kumaon Bhabar (the dry sub-Himalayan tract west of the river Sarda at an elevation of about 1,000 ft. only above the sea). On June 11th, I noticed a willow warbler (*Phylloscopus proregulus*) enter its nest high up on a bough of a silver-fir. My orderly was at once told off to scale the tree, which he did, bringing down the nest and eggs in safety. While he was thus engaged, I noticed a pair of yellow-bellied fantails in the same tree which seemed much upset by the intrusion. I watched them carefully and just as my man reached the ground I saw one of the fantails,

much to my satisfaction, settle down comfortably upon what looked like a little lump of moss on a small branch of the fir, not six feet from where the willow wren's nest had been. I could not risk losing such a treasure, so I climbed the tree myself and with no small difficulty managed to draw in the branch upon which the nest was placed. It contained two eggs, unfortunately hard set, but still preservable, and they with the nest were safely brought to the ground.

The nest is in shape rather cylindrical, $2\frac{3}{4}''$ in external diameter, and $1\frac{1}{4}''$ across the egg-cavity. The depth of the cavity is $1''$ and that of the nest $3''$. It consists of moss, firmly compacted together and covered with grey lichens. It has a scanty lining of moss fruits (with their stalks).

The eggs are cream-coloured with a cap of faint markings towards the broad end, similar in colour to, but of course much smaller than, those of the verditer flycatcher (*Stoparola melanops*).

They are the smallest eggs in my collection, measuring ·56 × ·44 and ·54″ × 43″, respectively.

14 (191). LARVIVORA BRUNNEA, Indian Blue-chat.

This is a very common bird throughout the Tons Valley, at elevation of from 8,000 to 11,000 feet, but only in the wooded portions.

In a former note written by me and inserted in this journal in Vol. IX of 1894, I wrongly identified this bird as *Ianthia indica*. I have since ascertained my mistake.

I found two nests which I attribute to this bird, but unfortunately I am not in a position to state the fact positively, as I never saw the parent birds actually visit or leave the nests. Moreover, the eggs are so totally different from those described in Hume's "Nests and Eggs" as belonging to this species, that I feel somewhat diffident in stating that I believe them to belong to *Larvivora*. On the other hand the only bird I ever saw approach either of the nests was a male of *Larvivora brunnea*, and this I saw on two separate occasions. Moreover, it was evidently breeding at the time, and showed evident signs of excitement when I approached the nest.

The nests were built on a bank by a frequented footpath at about 8,000 feet elevation, and were exactly similar, both in position and construction, to those of the English robin, but the eggs instead of being "pale greyish-green thickly mottled with reddish-brown" as

described by Hume for *Larvivora brunnea* were of a uniform pale blue, in shade about the same as in the eggs of the English starling. There were four eggs in each nest, the largest egg measuring ·84″ × ·78″, the smallest ·78″ × ·58″, and the mean of eight eggs ·80″ × ·60″. Next year I hope to revisit this locality and to be able to speak more positively as to their identity.

15 (1186). Glaucidium brodiei.—The Collared Pigmy Owlet.

I found a nest of this pretty little owlet on May 21st, close to the Deoban Forest bungalow, at an elevation of 9,000 feet. It was situated in a hole in a "karshu" oak tree, which had formerly been excavated by some woodpecker (probably *Dendrocopus himalayensis*) at a height of about 12 feet from the ground. The nest hole had to be enlarged with an axe, and when finally my hand was inserted it had a warm reception from the mother bird inside, who evidently knew how to use her beak and claws with the best possible advantage. She allowed herself, however, to be taken out of the hole and to be handed round for inspection, after which she was replaced. The nest contained four freshly-hatched young and one egg, very large for the size of the bird, very round and of the usual owl type. The owlet did not desert her nest, and I afterwards obtained a pair of her young which until quite lately were both alive in my possession, as tame as possible, and making very interesting pets with their comic gestures and grotesque movements.

Now, as I write, on a Peninsular and Oriental boat, I have only one, the female, who sits unabashed in her solitary cell, but with the guilt of fratricide heavy upon her.

A NEW KRAIT FROM SIND (*BUNGARUS SINDANUS*).

By G. A. Boulenger, F.R.S.

(*With a Plate.*)

(*Read before the Bombay Natural History Society on* 18*th March*, 1897.)

A short time after the publication of the Reptiles of the "Fauna of India," Mr. Blanford brought me a "krait" from Umarkot, Sind, received from Mr. H. E. Watson, which differed from *Bungarus cæruleus* in the number of scale-rows (17) and of ventral shields (237). Although both Mr. Blanford and I suspected at the time that the specimen might prove the type of a new species, we agreed that, considering its close affinity to *B. cæruleus*, it would be prudent to wait for further specimens which we were in hopes Mr. Watson would be able to procure. Owing to the death of this gentleman, no more was heard of the snake, the unique specimen of which was provisionally referred to *B. cæruleus*. I have now received from the Bombay Natural History Society two more specimens, obtained by Mr. L. J. Mountford at Sukkur, Sind, which remove my hesitation, and I proposed to designate the new "krait" as

Bungarus sindanus, sp. n.

Eye somewhat larger than in *B. cæruleus*, with vertically oval pupil. Rostral broader than deep, the portion visible from above measuring one-third to two-fifths its distance from the frontal; internasals about half as long as the præfrontals; frontal one and a half to one and two-thirds as long as broad, as long as or slightly shorter than its distance from the end of the snout, much shorter than the parietal; one præ- and two postoculars; temporals 1+2; seven upper labials, third and fourth entering the eye; three or four lower labials in contact with the anterior chin shields, which are as long as the posterior. Scales in 17 or 19 rows, vertibrals strongly enlarged, but none broader than long. Ventrals 220—237; anal entire; subcaudals 49—52, single or a few of the hindermost in pairs. Black above, white below; transverse series of white spots on the body forming interrupted cross-bands same as often present in *B. cæruleus*; rostral, upper labials, anterior nasal and præocular, white.

Total length 1,300; tail 150 millimetres.

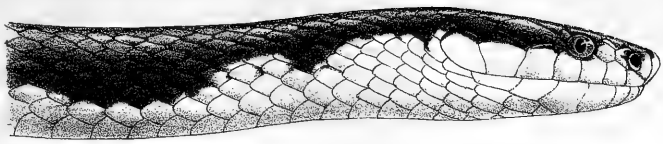
Mr. Mountford observes:—

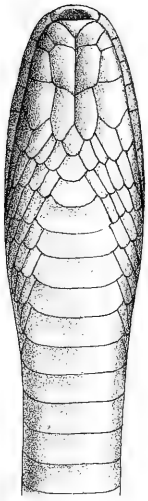
"This snake is common in the desert in Upper Sind. The large specimen is not supposed to be anything out of the way, as they are said to reach six feet commonly.*

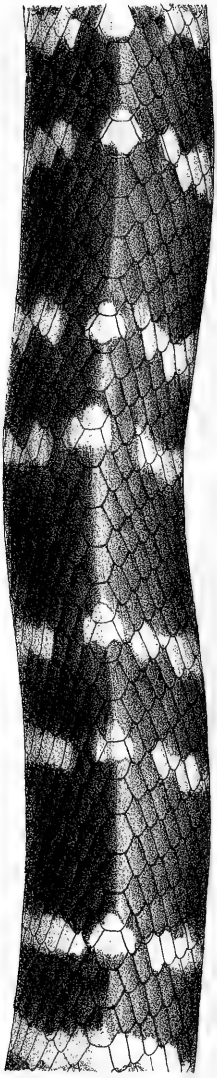
The natives call them "Pyân" (pronounced *pee-un*), meaning, "a drinker," being the same as the word "to drink." The snake is said to suck a man's breath while he sleeps, the result being that he dies at sunrise with a swollen face, but no mark of a bite on him. The belief is entertained by all the natives here, educated or uneducated. No one will sleep on the ground in the desert at this time of the year [September] through fear of the "Pyân."

"The snake lives at the roots of small bushes, some four feet or so down, and has frequently, so I am told, been found with the "junndi" (*Echis carinatus*) in its stomach. The natives admit that it *can* bite, if necessary, and fatally too, but it hardly ever does."

* The largest *Bungarus cæruleus* in the British Museum measures 1,080 millimetres (=3½ feet.)—G.A.B.







J. Green del. et lith.

Mintern Bros. imp. London.

BUNGARUS SINDANUS.

New Krait from Sind.

A LIST OF THE BIRDS OF ADEN.

By Col. J. W. Yerbury.

(*Read before the Bombay Natural History Society* 18*th March*, 1897.)

As considerable progress has been made in our knowledge of the birds of Aden since the publication by the late Lieutenant Barnes of the list given in the *Journal Bombay Natural History Society* (Vol. VII, p. 231), it is thought that a revised up-to-date list may be of interest :—

1. *Vultur monachus.*—Recorded by Barnes as *Gyps fulvus.* The specimen referred to is at present living in the Zoological Society's Garden.
2. *Neophron percnopterus.*
3. *Circus macrurus.*
4. *Milierax polyzonus.*
5. *Buteo vulgaris.*—A specimen living in the Zoological Society's Garden at the present time (January, 1897) is recorded in the List of Vertebrated Animals, &c., 9th Edition, as being from Aden and presented by Capt. Workman, 23rd October, 1894.
6. *Accipiter nisus.*
7. *Aquila imperialis.*
8. *Aquila chrysaëtus.*
9. *Haliaëtus leucogaster.*
10. *Milvus ægyptius.*
11. *Elanus cæruleus.*
12. *Falco peregrinus.*
13. *Falco punicus.*
14. *Tinnunculus alaudarius.*
15. *Pandion haliaëtus.*
16. *Bubo milesi.*
17. *Carine.* Sp. inc.
18. *Asio accipitrinus.*
19. *Scops giu.*
20. *Strix flammea.*
21. *Cypselus melba.*
22. *Cypselus affinis.*
23. *Caprimulgus nubicus.*
24. *Merops cyanophrys.*
25. *Merops persicus.*
26. *Merops* Sp. inc.
27. *Coracias garrula.*
28. *Coracias abysinnica* (*lorti* ?).
29. *Upupa epops.*
30. *Halcyon semiccerulea.*
31. *Cuculus canorus.*
32. *Coccystes jacobinus.*
33. *Centropus superciliosus.*
34. *Lanius lahtora.*
35. *Lanius nubicus.*
36. *Lanius isabellinus.*
37. *Lanius collurio.*
38. *Hypocolius ampelinus.*
39. *Musicapa grisola.*
40. *Terpsiphone cristata.*
41. *Hirundo rustica.*
42. *Ptyonoprogne obsoleta.*
43. *Monticola cyanus.*
44. *Cercotrichas melanoptera.*
45. *Argya squamiceps.*
46. *Pycnonotus arsinoë.*
47. *Pycnonotus xanthopygius.*
48. *Oriolus galbula.*
49. *Saxicola œnanthe.*
50. *Saxicola deserti.*
51. *Saxicola pleschanka.*
52. *Saxicola isabellina.*
53. *Myrmecocichla melanura.*
54. *Ruticilla.* Sp. inc.
55. *Prinia.* Sp. inc.
56. *Cisticola cisticola.*
57. *Phylloscopus.* Sp. inc.
58. *Burnesia gracilis.*
59. *Motacilla alba.*
60. *Motacilla feldeggi.*
61. *Nectarinia metallica.*
62. *Dilophus carunculatus.*
63. *Corvus affinis.*
64. *Corvus corax.*
65. *Corvus umbrinus.*
66. *Hyphantornis galbula.*
67. *Estrelda rufibarba.*
68. *Ædemosyne cantans.*
69. *Passer euchlorus.*
70. *Passer domesticus.*
71. *Pyrrhulanda melanauchen.*
72. *Galerita cristata.*
73. *Alœmon desertorum.*
74. *Mirafra.* Sp. inc.
75. *Vinago waalia.*
76. *Columba livia.*
77. *Turtur senegalensis.*

78. *Turtur risorius.*
79. *Œna capensis.*
80. *Pterocles exustus.*
81. *Pterocles lichtensteini.*
82. *Caccabis melanocephala.*
83. *Caccabis chukar.*
84. *Ammoperdix bonhami.*—With reference to my remark in *Ibis*, January 1896, p. 32, the specimen referred to by Lieutenant Barnes was presented by him to the Zoological Society's Gardens, *vide* List of Vertebrated Animals, &c., 9th Edition, 1896, and appears to have been correctly identified.
85. *Coturnix communis.*
86. *Coturnix delegorguei.*
87. *Turnix lepurana.*
88. *Eupodotis arabs.*
89. *Houbara macqueeni*
90. *Rallus aquaticus.*
91. *Gallinula.* Sp. inc.
92. *Crex pratensis.*
93. *Cursorius.* Sp. inc.
94. *Squatarola helvetica.*
95. *Charadrius pluvialis.*
96. *Œdicnemus scolopax.*
97. *Ægialitis mongolica.*
98. *Ægialitis cantiana.*
99. *Strepsilas interpres.*
100. *Dromas ardeola.*
101. *Hæmatopus ostralegus.*
102. *Himantopus candidus.*
103. *Totanus calidris.*
104. *Helodromas ochropus.*
105. *Tringoides hypoleucus.*
106. *Terekia cinerea.*
107. *Calidris arenaria.*
108. *Tringa alpina.*
109. *Tringa minuta.*
110. *Numenius arquata.*
111. *Numenius phœopus.*
112. *Gallinago cœlestis.*
113. *Larus affinis.*
114. *Larus ichthyaëtus.*
115. *Larus brunneicephalus.*
116. *Larus ridibundus.*
117. *Larus hemprichi.*
118. *Sterna albigena.*
119. *Sterna minuta.*
120. *Sterna bergii.*
121. *Sterna media.*
122. *Sterna anæstheta.*
123. *Sterna fuliginosa.*
124. *Sterna anglica.*
125. *Podiceps nigricollis.*
126. *Puffinus persicus.*
127. *Ardea cinerea.*
128. *Ardea alba.*
129. *Ardea gularis.*
130. *Ardea bubulcus.*
131. *Butorides javanica.*
132. *Nycticorax griseus.*
133. *Ardetta podiceps.*
134. *Ciconia abdimii.*
135. *Platalea leucorodia.*
136. *Scopus umbretta.*
137. *Phœnicopterus roseus.*
138. *Spatula clypeata.*
139. *Anas boscas.*
140. *Casarca rutila.*
141. *Mareca penelope.*
142. *Fuligula fuligula.*
143. *Querquedula crecca.*
144. *Querquedula circia.*
145. *Phalacrocorax.* Sp. inc. (Black.)
146. *Phalacrocorax.* Sp. inc. (Brown.)
147. *Sula fiber.*
148. *Pelecanus onocrotalus.*
149. *Phaëthon indicus.*

A comparison of this list with Lieutenant Barnes' shows 149 species instead of 126, and 12 species removed from sp. inc. as identified.

There still remain 10 sp. inc. awaiting identification, and it is to be hoped some resident of Aden will wipe out these blots. Thanks to the kindness of Messrs. Chevallier and Kelsall, I have been able to add seven species since the publication of my paper on "The Birds of Aden" in the *Ibis* of January, 1896.

BIRDS COLLECTED DURING FIVE YEARS' RESIDENCE IN THE HYLAKANDY DISTRICT, CACHAR.

Part III.

By C. M. Inglis.

(*Continued from Vol. X, page* 617.)

Family *Muscicapidæ*.

Genus *Siphia* (Hodgs., 1837).

Hume, No. 323 ; *Oates, No.* 562.

Siphia albicilla—The Eastern Red-breasted Flycatcher.

This is a common bird, but I have only managed to secure one with the chestnut breast. 67 Native Name—Tay-tay-ree.

Genus *Cyornis* (Blyth, 1843).

Hume, No. 304 ; *Oates, No.* 575.

Cyornis rubeculoides (Vigors).—The Blue-throated Flycatcher.

This is a very rare Flycatcher here. I have only got one specimen. 68

Hume, No. 308 ; *Oates, No.* 577.

Cyornis magnirostris (Blyth.).—The Large-billed Blue Flycatcher.

This species is very rare. I have only seen two since I have been collecting. 69

Genus *Culicicapa* (Swin., 1871).

Hume, No. 295 ; *Oates, No.* 592.

Culicicapa ceylonensis (Swains.).—The Grey-headed Flycatcher.

This is an exceedingly common Flycatcher and is found both in the open and in the jungle. 70

Genus *Niltava* (Hodgs., 1837).

Hume, No. 315 ; *Oates, No.* 595.

Niltava macgrigoriæ (Burt.)—The Small Niltava.

This is the only Niltava I have come across here and it is very rare. It frequents tree-jungle. 71

Genus *Terpsiphone* (Gloger, 1827).

Hume, No. 289 ; *Oates, No.* 599.

Terpsiphone affinis (Hay).—The Burmese Paradise Flycatcher.

Young males and adult females are very common ; chestnut males with lengthened median tail feathers are rarer ; but the adults in white plumage are exceedingly rare. 72 Native Name—Shah bulluli.

I found a nest of this bird, in construction, on a sapling at an elevation of about 5 feet from the ground. It was made in the shape of a paper cone, and consisted of dry leaves, moss and fibres. Unfortunately the nest got blown down in a storm before the eggs were laid. The adult males of this species I have only found in dense jungle, but the females and young males I have often shot in the tea seed gardens. This bird is generally found in company with a lot of small birds : *M. rubricapillus*, *C. ceylonensis*, &c.

Genus *Hypothymis* (Boie, 1826).

Hume, *No.* 290 ; *Oates*, *No.* 601.

HYPOTHYMIS AZUREA (Bodd.).—The Indian Black-naped Flycatcher.

73 This is a very common Flycatcher and may be seen wherever there is any tree-jungle.

Genus *Rhipidura* (Vigors and Horsf., 1826).

Hume, *No.* 291 ; *Oates*, *No.* 605.

RHIPIDURA ALBICOLLIS (Vicill.).—The White-throated Fan-tail Flycatcher.

Hume, "N. and E.," 2nd Ed., Vol. II, p. 35. LEUCORCERCA ALBICOLLIS, Inglis, "S. F.," Vol. IX, p. 249 ; Oates, "S. F.," Vol. X, p. 203.

74 This species is common here. It frequents bushes and the undergrowth more than trees. They have got a habit of dancing with outspread tails and are continually on the move.

Family *Turdidæ*.

Sub-Family *Saxicolinæ*.

Genus *Pratincola* (Koch., 1816).

Hume, *No.* 481 ; *Oates*, *No.* 608.

PRATINCOLA CAPRATA (Linn.).—The Common Pied Bush-Chat.

75 Very rare here. I have only procured a single pair.

Hume, *No.* 483 ; *Oates*, *No.* 610.

PRATINCOLA MAURA (Pall).—The Indian Bush-Chat.

76 This is by far the commonest Bush-Chat here. They frequent bushes, scrub and the tea and look very pretty, moving their tails up and down as they wait, perched on a bush, for any unfortunate insect. They are not shy and will allow close approach.

Hume, No. 484 ; *Oates, No.* 611.

PRATINCOLA LEUCURA (Blyth.).—The White-tailed Bush-Chat.

This is a very rare Bush-Chat here. I have only shot one male specimen. They frequent reeds. 77

Genus *Oreicola* (Bonap., 1854).

Hume, No. 487 ; *Oates, No.* 614.

OREICOLA JERDONI (Blyth.).—Jerdoni Bush-Chat.

This bird is fairly common in the cold weather. It is to be found on reeds or ekra grass, and is much shyer than the other Bush-Chats. 78

Oates in his Key to the Species of *Oreicola*, in Fauna, British India, Birds, Vol. II, says :—*O. jerdoni*, no supercilium; but in the specimens I have got, there is a decided supercilium.

Hume No. 486 ; *Oates, No.* 615.

OREICOLA FERREA (Hodgs.).—The Dark-grey Bush-Chat.

This species is rarer than *O. jerdoni*. For four years I did not see a single specimen, and then I got four or five in one season. 79

Sub-Family *Ruticillinæ*.

Genus *Henicurus* (Temm., 1823).

Hume, No. 586 ; *Oates, No.* 632.

HENICURUS SCHISTACEUS (Hodgs.).—The Slaty-backed Fork-Tail.

This is a rare Fork-Tail here, but it is sometimes found near streams in the jungle. 80

Hume, No. 585 ; *Oates, No.* 633.

HENICURUS IMMACULATUS (Hodgs.).—The Black-backed Fork-Tail.

This is the common Fork-Tail found here. It is found in all the streams, more especially where they run through the jungle. It has the habit when frightened of uttering a whistle and flying off a few yards and again settling on a stone or on the sand by the side of the stream, wagging its tail incessantly. I found a nest with three young ones on the 11th April. They were, I should say, about three days' old. The nest was in the crevice of a rock on the bank of the stream, about two and a-half feet above water-level. 81

Genus *Ruticilla* (Brehm., 1828).

Hume, No. 497 ; *Oates, No.* 644.

RUTICILLA RUFIVENTRIS (Vieill.).—The Indian Redstart.

This bird is rather rare in this district, though I believe elsewhere it is fairly common. I have only obtained one pair. 82

Genus *Cyanecula* (Brehm., 1828).

Hume, No. 514 ; *Oates, No.* 647.

CYANECULA SUECICA (Linn.).—The Indian Blue-Throat.

83 This bird is common here during the cold weather. I have found more females and young males than adult males ; the latter seem to be rather rare. They are insectivorous. I have never seen them feeding except on the ground.

Genus *Calliope* (Gould, 1836).

Hume, No. 512 ; *Oates, No.* 650.

CALLIOPE CAMTSCHATKENSIS (Gmel.).—The Common Ruby-Throat.

84 Fairly common here, frequenting brushwood and also the tea. I have several times seen it perched on a tea-bush, but always out of range. Both sexes are common, but if anything, I think male birds are oftener come across.

Genus *Copsychus* (Wag., 1827).

Hume, No. 475 ; *Oates No.* 663.

COPSYCHUS SAULARIS (Linn.).—The Magpie Robin.

Hume, "N. and E.," 2nd Ed., Vol. II, p. 80 ; Hume, "S. F.," Vol. II, p. 230 ; Inglis, "S. F.," Vol. V, p. 35 ; Hume and Dav., "S. F.," Vol. VI, p. 332 ; Oates, "S. F.," Vol. X, p. 212.

85 Native Name—Doy-al. This species is exceedingly common and may be found everywhere, coming into gardens, &c. It has a habit of raising its tail whilst singing, in which position it is very pretty. They are excellent songsters, being kept in cages by many people. I took a nest of this bird in a stump of a tree on the 10th April, 1895, containing four fresh eggs. They were of a greenish colour, mottled with brown.

Genus *Cittocincla* (Gould, 1836).

Hume, No. 476 ; *Oates, No.* 664.

CITTOCINCLA MACRURA (Gmel.).—The Shama.

86 Native Name—Shama. The Shama frequents mostly tree-jungle, and is a very shy bird ; when approached, it gives a jerk of its tail and utters a sound like "kurrick" and off it goes. It is a very good songster, and is easily kept in captivity.

Sub-Family *Turdinæ*.

Genus *Merula* (Leach, 1816).

Hume, No. 361 ; *Oates, No.* 676.

MERULA BOULBOUL (Lath.).—The Grey-winged Ouzel.

87 This Ouzel is rare here. I have very seldom come across it.

Hume, No. 361 ; *Oates, No.* 676.

MERULA ATRIGULARIS (Temm.).—The Black-throated Ouzel.

Planesticus atrogularis—Scully, "S. F.," Vol. IV, p. 140 ; *id.* Vol. VIII, p. 286 ; *Cichloides atrogularis*—Hume, "S. F.," Vol. I, p. 179.

Slightly commoner than *M. boulboul*. It sometimes comes into gardens, but keeps more to woods. I have only seen it in the cold weather. 88

Genus *Geocichla* (Kuhl., *teste* Gould, 1836).

Hume, No. 355 ; *Oates, No.* 686.

GEOCICHLA CITRINA (Lath.).—The Orange-headed Ground-Thrush.

This Ground-Thrush is rather rare here. I have seen it several times hunting for insects on the ground beneath the tea seed bushes. 89

Genus *Petrophila* (Swains, 1837).

Hume, No. 351 *bis* ; *Oates, No.* 692.

PETROPHILA SOLITARIA.—The Eastern Blue Rock-Thrush.

This bird is very common during the cold weather. It is generally to be seen perched on some elevated spot, such as a fence, rock, &c. One I shot was sitting on the top of my bungalow. 90

Genus *Oreocincla* (Gould, 1837).

Hume, No. 371 ; *Oates, No.* 698.

OREOCINCLA DAUMA (Lath.).—The Small-billed Mountain Thrush. 91

This Thrush is very rare here. I have only got a single specimen.

Family *Ploceidæ*.

Sub-Family *Ploceinæ*.

Genus *Ploceus* (Cuvier, 1817).

Hume, No. 694 *ter* ; *Oates, No.* 721.

PLOCEUS MEGARHYNCHUS (Hume).—The Eastern Baya. 92 Native Name—Tall chota.

This Weaver Bird is very common. They breed largely in the *busties*, hanging their nests from the betel-nut palms. They are gregarious, large numbers building their nests on the same palms. Whilst building, they keep up an incessant chirping. They feed on grain, doing great damage to the crops.

Hume, No. 696 ; *Oates, No.* 722.

PLOCEUS BENGALENSIS (Linn.).—The Black-throated Weaver Bird. 93

This species is much rarer than *P. megarhynchus*.

Sub-Family *Viduinæ*.

Genus *Munia* (Hodgs., 1836).

Hume, No. 698 ; *Oates, No.* 726.

MUNIA ATRICAPILLA (Vicill.).—The Chestnut-bellied Munia.

94 Native Name—Lall Munia. This Munia is exceedingly common, breeding here during the summer months and making its round nest usually in a clump of grass. It lays on an average six pure white eggs. When the paddy is ripe, large flocks of these birds come down to eat the grain. I have seen as many as fifty in one flock.

Genus *Uroloncha* (Cabanis, 1851).

Hume, No. 702 ; *Oates, No.* 727.

UROLONCHA ACUTICAIDA (Hodgs.).—Hodgson's Munia.

95 Native Name—Kalle Munia. This species is also very common. Its habits are the same as *M. atricapilla*.

Hume, No. 699 ; *Oates, No.* 735.

UROLONCHA PUNCTULATA (Linn.).—The Spotted Munia.

96 This Munia is not so common as the last two, but it is, all the same, comparatively common. It is not found in such large flocks as *M. atricapilla*.

Genus *Sporœginthus* (Cabanis, 1850).

Hume, No. 704 ; *Oates, No.* 738.

SPORÆGINTHUS AMANDAVA (Linn.).—The Indian Red Munia.

97 This is the rarest Munia we have here, only a few pairs being come across in a season.

Family *Fringillidæ*.

Sub-Family *Fringillinæ*.

Genus *Carpodacus* (Knap., 1829).

Hume, No. 738 ; *Oates, No.* 761.

CARPODACUS ERYTHRINUS (Pall.).—The Common Rose Finch.

98 Native Name—Tootee. This Finch is exceedingly rare in this district. I have only shot two pairs since I have been collecting.

Genus *Passer* (Briss., 1760).

Hume, No. 706 ; *Oates, No.* 776.

99 Native Name—Chora. PASSER DOMESTICUS (Linn.).—The House Sparrow.

The House Sparrow is found everywhere.

Sub-Family *Emberizinæ*.

Genus *Emberiza* (Briss., 1760).

Hume, *No.* 720 ; *Oates*, *No.* 791.

EMBERIZA PUSILLA (Pall.).—The Dwarf Bunting.

Far from common here ; affects grass lands and, as a rule, drier places than *E. spodocephala*. In the Happy Valley District these birds are very common. The white of the outermost tail feathers is very noticeable when in flight. 100

Hume, *No.* 717 ; *Oates*, *No.* 798.

EMBERIZA SPODOCEPHALA (Pall.).—The Black-faced Bunting.

This Bunting is fairly common here, coming to us in the cold weather. When the paddy is ripe, numbers are to be found in the fields, causing a considerable amount of damage. 101

Family *Hirundinidæ*.

Genus *Cotile* (Boie, 1822).

Hume, *No.* 87 ; *Oates*, *No.* 808.

COTILE RIPARIA (Linn.).—The Sand Martin.

The Sand Martin is very common, breeding in holes in sand-banks. Along the banks of the rivers the sides are simply honeycombed with their holes. 102

Genus *Hirundo* (Linn., 1766).

Hume, *No.* 82 *bis* ; *Oates*, *No.* 814.

HIRUNDO GUTTURALIS (Scop.).—The Eastern Swallow.

This is the commonest swallow we have, great numbers flying about catching insects. 103

Native Name—Badool chota.

Hume, *No.* 85 *bis* ; *Oates*, *No.* 822.

HIRUNDO NEPALENSIS (Hodgs.).—Hodgson's Striated Swallow.

This swallow is also common, but not as plentiful as *H. gutturalis*. 104

Family *Motacillidæ*.

Genus *Motacilla* (Linn., 1766).

Hume, *No.* 590 ; *Oates*, *No.* 827.

MOTACILLA LEUCOPSIS (Gould).—The White-faced Wagtail.

This Wagtail is very common here in the cold weather. 105

Hume, *No.* 591 ; *Oates*, *No.* 828.

MOTACILLA OCULARIS (Swin.).—The Streak-eyed Wagtail.

I have got several specimens of this Wagtail here during the cold season. 106

Hume, *No.* 592 ; *Oates*, *No.* 238.

MOTACILLA MELANOPE (Pall.).—The Gray Wagtail.

107 This Wagtail is very common here. It is the commonest of this genus.

Hume, *No.* 593 *ter* (*part*) ; *Oates*, *No.* 834.

MOTACILLA FLAVA (Linn.).—The Blue-headed Wagtail.

108 This Wagtail is also a common winter resident.

Genus *Anthus* (Bechst, 1807).

Hume, *No.* 596 ; *Oates*, *No.* 841.

ANTHUS MACULATUS (Hodgs.).—The Indian Tree Pipit.

109 Fairly common here during the cold weather, being found in the *busties* where these are fairly well wooded.

Hume, *No.* 600 ; *Oates*, *No.* 847.

ANTHUS RUFULUS (Vicill.).—The Indian Pipit.

110 This Pipit is exceedingly common here, frequenting the ground, especially where it is studded with tufts of long grass.

Genus *Alauda* (Linn. 1766).

Hume, *No.* 767 ; *Oates*, *No.* 861.

ALAUDA GULGULA (Frankl.).—The Indian Sky Lark.

111 Very rare here. I have only come across it once or twice.

Genus *Mirafra* (Horsf., 1821).

Hume, *No.* 754 ; *Oates*, *No.* 870.

MIRAFRA ASSAMICA (McClell.).—The Bengal Bush Lark.

112 Exceedingly common all over the district, frequenting open lands and grassy patches. They fly very like a quail as noticed by Hume, their flight being very short.

Family *Nectariniidæ*.

Sub-Family *Nectariniinæ*.

Genus *Æthopyga* (Cab., 1850).

Hume, *No.* 226 ; *Oates*, *No.* 882.

ÆTHOPYGA SCHERIÆ (Tick.).—The Himalayan Yellow-backed Sun-bird.

113 Native Name—Lall phool-poochee. This Sun-Bird is exceedingly common here during the cold weather. It breeds, according to Mr. Baker, in the North Cachar Hills.

Hume, *No.* 231 ; *Oates*, *No.* 890.

ÆTHOPYGA SATURATA (Hodgs.).—The Black-breasted Yellow-backed Sun-bird.

114 For four years I never came across a single specimen of this bird, till I gave one of my men the order to look out for *A. hasselti* I explained to him that *A. hasselti* was a dark-coloured bird, but forgot to tell him that it had no elongated tail feathers. After a few days he brought me in a couple of specimens of *Æ. saturata* thinking they were *A. hasselti* ; which, he said, he had shot in some bamboo jungle. Afterwards I kept continually getting specimens, but unfortunately they were all males. I never managed to get even a single female.

Genus *Arachnechthra* (Cab., 1850).

Hume, *No.* 233 *bis* ; *Oates*, *No.* 896.

ARACHNECHTHRA HASSELTI (Temm.)

115 I only shot one specimen of this Sun-Bird in this district, at Roopacherra. I got another one in the Happy Valley District which I have kept. The first one is now in the collection of Mr. Hole. Both my specimens were shot in March. The second one was killed by a boy with a pellet-bow quite close to my bungalow.

Sub-Family *Arachnotherinæ*.

Genus *Arachnothera* (Temm., 1826).

Hume, *No.* 223 ; *Oates*, *No.* 906.

ARACHNOTHERA MAGNA (Hodgs.).—The Larger-streaked Spider-hunter.

116 Native Name—Burra Kolapoochee. Some seasons I have found numbers of this bird, and others not a single specimen. It can hardly be called a common species here. It breeds, according to Mr. Baker, in the North Cachar Hills, principally above 2,000 ft.

Hume, *No.* 224 ; *Oates*, *No.* 909.

ARACHNOTHERA LONGIROSTRIS (Lath.).—The Little Spider-hunter.

117 Native Name—Chota Kolapoochee. This species is very common and may be generally found where plantain trees (*Musa*) are in flower. I saw an egg of this species

belonging to Mr. Hole. It was of a white colour, with a ring of about $\frac{1}{8}''$ broad of a brownish-red colour towards the thick end, and was speckled with the same colour over the remainder of the egg, diminishing towards the small end.

Genus *Chalcoparia* (Cabanis, 1850).

Hume, *No.* 233 *ses* ; *Oates*, *No.* 911.

CHALCOPARIA PHŒNICOTIS (Temm.).—The Ruby Cheek.

18 This bird is very common here. It frequents the jungle more than the other Sun-Birds. It is, I think, only a cold weather visitant. I have never come across its nest.

Family *Dicæidæ*.

Genus *Dicæum* (Cuvier, 1817).

Hume, *No.* 236 ; *Oates*, *No.* 912.

119 Native Name—Lall poochee. DICÆUM CRUENTATUM (Linn.).—The Scarlet-backed Flower-Pecker. This is the common kind of Flower-Pecker found here.

Hume, *No.* 237 ; *Oates*, *No.* 914.

DICÆUM CHRYSORRHŒUM (Temm.).—The Yellow-vented Flower-Pecker.

120 This species is much rarer than *D. cruentatum*, keeping more to the jungle than the open.

Hume, *No.* 241 ; *Oates*, *No.* 915.

DICÆUM IGNIPICTUS (Hodgs.).—The Fire-breasted Flower-Pecker.

121 I procured a single specimen shot near the Cutleecherra Tea Estate. This species is decidedly rare here.

Hume, *No.* 237 *ter.* ; *Oates*, *No.* 917.

DICÆUM OLIVACEUM (Wald.).—The Plain-coloured Flower-Pecker.

122 Very rare, being seldom seen. Mr. Hole notices in the *Asian* that he has seen them hunting about plantain trees. I have also noticed the same thing.

Hume, *No.* 238 ; *Oates*, *No.* 919.

DICÆUM RYTHRORHYNCHUS (Lath.).—Tickell's Flower-Pecker.

123 In Vol. X, No. 2, of this Journal, Mr. Baker says he has seen a specimen from this district. I have never come across any myself, but give it a place on such good authority.

Family *Pittidæ*.

Genus *Pitta* (Vicill., 1816).

Hume, *No.* 344 ; *Oates*, *No.* 927.

PITTA NEPALENSIS (Hodgs.).—The Blue-naped Pitta.

This Pitta is quite common here. I took a nest in June. It was placed in the fork of a tea-bush about 3 feet from the ground. It was very loosely put together, and was composed of small twigs, dry bamboo and tea leaves. The egg cavity, which opened from the side, was lined with root fibres. Size of nest 8″×11″. Egg cavity 4″×6″. In front of the mouth of the nest there was a platform composed of twigs and leaves. The nest contained four highly incubated eggs of a white colour blotched with rufous and pale lavender. 124

Hume, *No.* 346 ; *Oates*, *No.* 935.

PITTA CUCULLATA (Hartl.).—The Green-breasted Pitta.

This species is exceedingly rare here. I have only seen two specimens since I have been collecting. 125

(*To be continued.*)

PLANTS OF A BOMBAY SWAMP.

By G. Marshall Woodrow.

(*Read before the Bombay Natural History Society on* 18*th March*, 1897.)

The land from which the plants referred to were gathered is nearly enclosed by three lines—Clerk Road, the Vellard and the "Main Drain." Its altitude is nearly mean sea-level, and the greater part of it is said to be under water during the monsoon months. The soil when dry is a sandy loam heavily charged with salt.

Vegetation is confined to a bank a few inches higher than the general level; it is chiefly herbaceous, such woody plants as occur are under one year old, except *Tamarix*, which thrives on land submerged a portion of the year.

The species found are 79 in number, but it is very probable that further search may greatly increase the flora. The collection referred to here was made in November and December. No *Cryptogams* were found, and it is probable that a search made during September would reveal many.

In reviewing the plants in their order, according to the natural system, it is found that—

Capparideæ is represented by *Gynandropsis pentaphylla* DC., "Tilwan."

Portulaceæ by *Portulaca oleracea*, Linn., the "Ghol," of the Marathas, and Purslane of the English. Formerly much valued in salads and pickles. It has fallen out of use in Great Britain and in this country, and appears to be little valued by the well-to-do classes, as it is seldom seen in the bazaars.

Caryophylleæ by an elegant *Stellaria*, of which the specimen has been lost.

Tamariscineæ by a species of *Tamarix* not in flower.

Malvaceæ by seedlings of the Portia tree, *Thespesia populnea*, Corr. The "Bendi acha jhar," a well-known littoral plant, and species of cotton. *Gossypium Wightianum*, Tod., and *Malachra capitata*, Linn., a plant of tropical Africa and America which has spread all over the neighbourhood of Bombay. It yields a good fibre, and by some has been thought worth cultivating, but with "Sunn" and "Ambaree" to compete with, it does not get a front place.

RUTACEÆ by *Peganum Harmala*, Linn. "Ispanda, harmala,' an herb peculiar to salt-soils and having a strong odour, resembling Rue and credited with medicinal virtues, rather too wide to be deep.

AMPELIDEÆ by *Vitis carnosa*, Wall. "Ambat-vel," a common climbing plant in the Concan; the succulent trifoliolate leaves, when tasted, are at first a pleasant acid, but it soon becomes violently acrid. It is described as a domestic application to boils in "Pharmcographia Indica."

LEGUMINOSÆ by *Alysicarpus rugosus*, D.C., and *Erythrina indica*, Linn., "Pángárá." The solitary plant of this species is on the side of the Vellard and somewhat out of the reach of water. It has more the appearance of a truly wild tree than other examples near Bombay have—still it can scarcely be said to be indigenous to the district.

LYTHRACEÆ by *Ammania baccifera*, Linn., and numerous vigorous seedlings of *Lawsonia alba*, Lamk. "Mendi" or "Hinna." Those seedlings indicate the class of soil adapted for this plant should the vagaries of fashion again call for its production as a commercial product.

ONAGRACEÆ by *Ludwigia parviflora*, Roxb., which is found on the muddy banks of tanks throughout the country.

PASSIFLORACEÆ by *Carica papaya*, Linn. "Papay" in numerous healthy seedlings.

CUCURBITEAÆ by *Luffa echinatus*, Roxb., and by another plant so far spent as to be difficult to determine, it is probably *Citrullus fistulosus*, Stocks., a bitter form of the water melon.

FICOIDEÆ by *Trianthema monogyna*, Linn. "Vishkáprá" and two widespread species of *Mollugo*—*M. hirta*, Thunb., and *M. spergula*, Linn., "Jharas."

UMBELLIFERÆ by those useful plants FENNEL: *Fœniculum vulgare*, Gærtn., "Bari shopha," and *Carum copticum*, Benth., "Ajwan." The vigour of both species shows that they are indifferent to salt in the soil.

COMPOSITÆ by the widespread weed *Vernonia cinerea*, Less., "Sahadevi." Used to promote perspiration. Also *Ageratum conyzoides*, Linn., *Blumea membranacea*, D.C.,

B. amplectans, D.C., *Var. maritima*, and two more species of *Blumea* that are undetermined and offer to any member of the Society, who is expert in the identification of plants of this genus, a nice opportunity for the exercise of a valued talent.

Eclipta alba, Hursk. "Máká," a common weed whose variable medicinal virtues are recounted in the "Pharmacographia Indica." *Sphœranthus indicus*, Linn., "Mundi." *Cœsulia axillaris*, Roxb., had evidently dried up soon after the water went off. *Sonchus oleraceus*, Linn., the Sow Thistle.

BORAGINEÆ by *Cordia rothii*, Rœm. and Sch., "Gondani" and *Heliotropium indicum*, Linn., a true halophyte, was decidedly vigorous.

CONVOLVULACEÆ by a species of *Convolvulus*, of which only a single specimen was obtained. It appears different from any described in the Flora of British India, and there is nothing like it in the Herbarium at the College of Science, but one must not dogmatise from a single specimen with very few flowers available for dissection. *Cressa crética*, Linn., "Khardi" "Rudantitka," was frequent. This little herb affects salt and moist land so generally that by some people it is supposed to cause moisture. *Ipomœa sepiaria*, Kœn, "Ambti," occurs on the higher portion by the side of the Vellard.

SOLANACEÆ by *Physalis minima*, Linn., *Datura fastuosa*, Linn. *Lycopersicum esculentum*, Miller, the "Tomatoe," *Solanum nigrum*, Linn., *S. melongena*, Linn., "Benguin" or "Aubergine," and *S. zanthocarpum*, Schrad and Wend.

Those six species are all well-known plants which thrive on rich moist soil; they appear to be indifferent to salt in the soil.

ASCLEPIADS, APOCYNADS, and GENTIANS would come in here, and their absence is remarkable.

SCHROPHULARINEÆ by *Scoparia Dulcis*, Linn., a remarkable sporadic plant not hitherto recorded from the Bombay Presidency, but recently abundant in Bengal; five specimens only were gathered after a long search; next year they will probably be abundant.

PEDALINEÆ by *Sesamum indicum*, D.C., the "Til" plant well devoloped, but dried up completely; in soil similarly moist yet without salt this plant would probably have retained some verdure till December.

ACANTHACEÆ by *Peristrophe bicalyculata*, Ness ab E., and *Lepidagathis cristata*, Willd., "Talimkhana."

VERBENACEÆ by *Lippia nodiflora*, Rich. "Vakkan," considered by Hindus to be a febrifuge and diuretic.

LABIATÆ by *Ocimum canum*, Sims., one of the species known as "Ran tulas," was growing vigorously.

AMARANTACEÆ by *Celosia argentea*, Moq., "Kurdu." *Amarantus spinosus*, Linn., "Kátemáth."

A. viridis, Linn.

A. polygamus, Linn.

A. tenuifolius, Willd., "Tandoolja."

Nothosaerua brachiata, Wight.

Ærua lanata, Juss., "Kapur-madhur."

Alternanthera sessilis, B. Br., "Doodhsagar."

Achyranthes aspera, Linn., "Aghada," occurred on the higher portions.

CHENOPODIACEÆ by *Suæda fruticosa*, Forsk., one of the plants called "Morus," which are burned in the preparation of alkali.

The variable colour of this and of many other plants which affect salt land is remarkable; there may be found in proximity plants of the palest green, and also plants of intermediate shades up to deep purple. The genus *Brassica* is another salt-loving group in which the pale green of cauliflower and the dark purple of red cabbage may be seen.

EUPHORBIACEÆ by *Euphorbia thymifolia*, Burm. *E. hypericifolia*, Linn., and the castor oil plant, *Ricinus communis*, Linn.

URTICACEÆ by a solitary seedling of the Banyan tree, *Ficus bengalensis*, Linn., "Wad," which had germinated on the ground, a very rare condition for this tree. It is interesting to observe how Nature has provided for the rotation of crops

by requiring that the fruit of the Banyan, which falls to the ground, may rarely germinate, although it is well matured, as may be proved by sowing on crushed bricks kept moist. If the seed germinated under the parent tree a forest of weakly plants would appear on a soil exhausted by producing the parent.

CYPERACEÆ by *Cyperus rotundus*. *Mariscus microcephalus*, Presl., and *Scirpus maritimus*, Linn.

GRAMINEÆ by *Paspalum distichum*, Linn., a littoral grass remarkable for its variability in habit under different conditions; the specimens exhibited would scarcely be believed to be the produce of the same species; one simple stem grows upright and bears long leaves and flowers; another spreads on the ground, branches freely, and bears very short leaves. It is to this grass that the great beauty of newly-formed lawns in Bombay is due; it has a deep green colour and a dense velvety growth, but as it grows in its native habitat in company with "Hariyali" the two species are mixed in making a lawn and *Paspalum distichum*, Linn., either does not get enough salt or does not bear lawn treatment well. It grows well for a time, but soon abdicates in favour of the hardier "Hariyali." The lawn at the rear of the Municipal Building at first had a predominance of this grass, but now it has little else than "Hariyali," which has a greyish green tint.

The vernacular name of this grass has not been ascertained; it is easily distinguished from "Hariyali" by the inflorescence having only two divergent branches, while the other grass has from one to five branches.

Paspalum sanguinale, Lamk., occurs on this land sparsely and looks happier on the roadside out of reach of the salt.

Eriochloa polystachya, H.B. & K. The many-stemmed woolly grass as we may translate its name is as glabrous as a grass may be. It is abundant and vigorous on this land.

Panicum punctatum, Burm., is probably the most abundant of all plants on the land under consideration, occupying generally the higher parts of the banks; it is decidedly vigorous.

It is also the principal grass in the cultivated meadows of the district which have an altitude a few feet higher than the land on which those plants were found.

Panicum colonum, Linn.

Ischæmum rugosum, Salisb.

Iseilema laxum, Hack, and

Pennisetum typhoideum, Pers.

All occur in weakly tufts.

Sporobolus glaucifolius, Hochst, appears vigorous and at home ; its plant body resembles "Hariyali" in a striking degree, but the flowers are quite distinct.

Cynodon dactylon, Pers. "Hariyali," is an extremely widespread grass; it occurs from the south of England to Australia thriving on moist sandy soils, but capable of bearing much drought, and apparently indifferent to salt. It may be observed growing up through the stable refuse forming the Esplanade ride, while its companion on the adjoining land, *Ischæmum ciliare*, Retz. is not vigorous enough during the cold season, to pierce the covering.

Chloris barbata, Swartz.

Eleusine indica, Gaertn. and

Leptochloa arabica are grasses of a weedy habit growing anywhere, but

Diplachne fusca, Beauv., is characteristic of moist and salt tracts. It is very abundant near Bombay, but does not appear to have been observed until recently.

The last plant to be presented is *Æluropus littoralis*, *Parl.*, a creeping grass characteristic of salt tracts.

The plants of the foregoing list may be separated into true halophytes or salt-loving plants : plants indifferent to salt; marsh plants and weedy plants which grow almost anywhere.

HALOPHYTES.

Peganum Harmala, Linn.

Blumea amplectans, *D.C.*, *Var. maritima.*

Heliotropium indicum, Linn.

Cressa cretica, Linn.

Suæda fruticosa, Forsk.

Scirpus maritimus, Linn.
Eriochloa polystachya, H. B. & K.
Sporobolus glaucifolius, Hochst.
Æluropus littoralis, Pers.

PLANTS INDIFFERENT TO SALT.

Portulaca oleracea, Linn.
Thespesia populuea, Corr.
Malachra capitata, Linn.
Carica papaya, Linn.
Mollugo hirta, Thunb.
M. Spergula, Linn.
Fœnicalum vulgare, Gœrtn.
Carum copticum, Benth.
Cordia Rothii, Rœm. & Sch.
Ricinus communis, Linn.
Cynodon dactylon, Pers.

MARSH PLANTS.

Tamarix sp., not in flower.
Ammania baccifera, Linn.
Ludwigia parviflora, Roxb.
Cœsulia axillaris, Roxb.
Lepidagathis cristata, Willd.
Lippia nodiflora, Rich.
Panicum punctatum, Burm.
Diplachne fusca, Beauv.

The remainder may be included in the section—Plants of a weedy character.

THE BURMESE GOAT-ANTELOPE, OR SEROW.

Nemorhœdus sumatrensis.

By Veterinary-Captain G. H. Evans.

(*With a Plate.*)

(*Read before the Bombay Natural History Society, on 18th March*, 1897.)

Burmese Names: Taw-Seik [Jungle Goat]. Taw-Myin [Jungle Horse]. Kāba-Gya [Precipice Tiger].

From the above names it will probably be inferred that the goat-antelope is at least a strange looking animal, to have conveyed impressions that it resembled a goat, a horse, and a tiger! I fancy the latter name was given by some one who was overcome by the somewhat ferocious appearance of the creature, or, perhaps, from a more intimate acquaintance. The head and horns no doubt led to its being described as a goat, and the presence of a mane to its being likened to a horse. Be this as it may, it will, I think, be admitted by those who have seen this animal, that there is some excuse for those who applied the names; for the "taw-seik" is without doubt an ugly nondescript beast.

They are generally distributed over nearly all the hill ranges of the province, and are also found in the Chin Hills and Shan States, and it is probable that they extend into the Lushai country, parts of Manipur, Yunnan and Siam. They may be met with at elevations varying from 700 feet in the smaller hills, to seven or eight thousand feet in the Chin and other mountain chains. They are more or less solitary and are nowhere numerous, though at times a few may be discovered living on the same hill. As a rule they inhabit dreadful ground, their favourite haunts being the most craggy hill sides, or rugged forest-clad ground, where during the day they rest in caves, or under the eaves of over-hanging rocks; they may also lie up under the shade of a large tree, but more frequently prefer to retire to the very dense cover often found in sheltered ravines. They are very shy, and this, coupled with the precipitous ground they hide in, renders approach to them a matter of some difficulty. The early hours of the morning and late in the evening are their feeding times, and they are

generally careful to confine this operation to places not far from more or less impassable ground, so that on the least suspicion of danger, it is an easy matter for them to escape. Their food consists of grasses, and the leaves of various trees. They rarely feed low down on the hill sides, but I have more than once seen their tracks, &c., in old jungle clearings, and on parts that had recently been cleared by fire; Karens informing me that visits to such places were for the purpose of eating the ashes which contained salt.

The ordure of these creatures is usually found in heaps about their regular haunts, and there is a distinct goaty smell about places they have laid up in.

Two methods may be tried for circumventing the Serow, *viz.*, stalking and driving. The former, though the more charming and sporting, is certainly the least successful, the animals being sharp, shy, and inhabiting such difficult ground. Even when it can be got over, there is the constant chance of a slant of wind, or of starting a loose stone to warn them of impending danger. When disturbed there is a loud snort followed by a clatter of stones, after which it is usually a good plan to return to camp. Stalking is however good fun and always excellent exercise. To be successful, an intimate knowledge of the ground is essential, as it enables the sportsman to make an early start and so get above their haunts by daybreak, or as soon after as possible, the advantage being that danger is nearly always anticipated from below. A position under cover may be taken up on one of their paths, and a sharp look-out kept with glasses over all likely ground.

In driving, it is also desirable to get the beaters out early, in order to allow them to get to the ground by a long route. The beaters are usually Karens or other hill men, who are, needless to say, good cragsmen, but they, like the Burmans, are often very lazy and difficult to get out. The beat should be as silent as possible, only tapping of sticks being allowed. The stops can always give news of animals trying to break. Local men post the guns on the likely paths—a startled snort, accompanied by a clatter of rolling stones announces that a Serow is on the move. As Karens and other hill men say that these animals when wounded are often vicious, it is just as well to be careful, as the places guns are frequently posted at are such

From Photographs. A. C. Chowdhary lith.

THE BURMESE GOAT-ANTELOPE, OR SEROW.

that a good butt might mean a very nasty fall, or even a broken limb or neck.

During the dry season the Chins occasionally have some extensive beats. They go out armed with matchlocks and spears. As a rule the drive is in a big ravine, and when everyone is posted the jungle is fired when every living thing worthy of a Chin's digestion (and there are few things that are not) has a warm time of it, as few escape. Serow frequently come to grief in these beats.

Like all goats the Serow is a fine climber, very nimble, and quite at home on precipitous ground, though they are not so good on the flat. I know of two instances where animals were driven on to fairly level ground. One was cut down with dahs, the other, a young but full grown doe, was after a hard fight captured, but she met with such a severe handling, that the poor creature died a few days after.

In common with many other animals, these creatures sometimes lose their heads and act in a strange manner. On one occasion when after them, I regret to say that I did the same. My gunbearer and I were going over what I considered very dangerous ground; being anything but an expert cragsman, I determined to try another route hard by, and while busily engaged seeking nice places for my feet, I flushed a Serow a few paces from me. We stared at each other whilst I felt a fool, not having my gun, and expected every moment to be shown a shorter cut down the hill than the one I had taken up it, when suddenly it began to rush here and there not attempting to escape, till I called to the gunbearer who had stuck to the old track. This was too much for the Serow, as he then dashed over some fearful ground and disappeared. He certainly deserved to break every bone in his carcase, but I dare say he had been there before many a time.

I am of opinion that more does than bucks are killed. The only reasons I can assign for this are that these animals are usually hunted between February and April, during which months it is probable that the bucks live apart, or perhaps it is that they hide more than the does. Serow are very fond of their haunts, and though often disturbed, will return to them. The best weapons are a ·450

express, a double-barrelled scatter gun loaded with ball or, better still, a gun built to take the "Paradox" bullet.

The female has four teats; the period of gestation is between six and seven months, and it is said that there is only one kid at a birth.

The flesh, when fresh, is rather coarse and possesses a decided flavour, but, if kept for a little time, is, to a not over-fastidious person, very good eating, and is at all times a welcome change from fowl. In appearance the "taw-seik" is, to my mind, an under-bred, ungainly-looking creature. No doubt the mane, large head, long ears, more or less shaggy coat, and short, sturdy limbs, tend to the impression that he is a heavy, awkward beast. The head, as I have noted, is large and rather long. The ears are donkey-like and from six to eight inches in length; the muzzle is naked and beardless. In colour the eyes are a darkish sea-green, though sometimes the irides appear very dark brown. Beneath the eyes are the sub-orbital glands, the orifices of which at times look like small sores, and from which a whitish-coloured secretion exudes. In the skull are large lachrymal fossæ of medium depth for the reception of these glands. The neck is short, thick, and is provided with a mane, running from the nape to the withers, the hair of which varies from $4\frac{1}{2}$ to 6 inches or more in length. The coat is coarse, rather thin (on those found on the lower elevations) and of moderate length. Both sexes are very similar in size and general appearance.

In height they stand from 36 to 38 inches at the shoulder. The length of body from nose to end of tail is from 60 to 64 inches. The tail is provided with a tuft of hair three or four inches in length. The feet are goat-like, and the hoofs measure from $1\frac{3}{4}$ to 2 inches in length. The supernumerary digits on the fore and hind limbs measure from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches. The knees are callous from lying on hard ground. I should think that a full-grown animal would scale from 170 to 190 pounds.

The colour of these animals varies so much in different specimens that it is difficult to describe. Some are so dark as at a distance to make them appear almost black, while others are very much lighter in colour.

These variations are, no doubt, greatly influenced by the different climatic conditions under which they exist. The colour may vary from a grizzled-black, or blackish-grey-roan, to a rufous-brown. In the darker specimens, the mane, head and neck are blackish with a hoary tinge; the hair (coat) on the upper parts is a grizzled-black. The colour of the hair about the muzzle, under the chin, and sometimes for a short distance under the abdomen is a dirty yellowish-white, as also is the hair inside the ears; these latter are tipped with black. The throat, inside of flanks and thighs is of a tan or reddish-brown colour, which is also the case with the limbs from just above the knees and hocks down to the feet [tan stockings]. Most of the red hairs are tipped with white. On the quarters the colour is rufous, with white and black hairs running through it. In the lighter-coloured examples the blackish colour passes into a rusty-grey intermingled with black on the sides, quarters, chest, inside thighs, &c. A dorsal stripe may also be noticed in such specimens.

Horns are common to both sexes, and there is scarcely any difference in size and appearance. They are black in colour and conical in shape. They are closely and irregularly ringed for three-quarters of their length. This is best seen on the posterior surface. In young animals the rings are often complete, but as the animals grow older they become effaced on the anterior surface, excepting perhaps for an inch or so from the base; this is probably due to butting or rubbing their horns on rocks, trees, &c. In some specimens the rings are broken by longitudinal striæ. The horn cores spring fairly close together, are continuous with the facial plane, then taking a slight backward curve, and diverging towards the tips. This, of course, is also the case with the horns which are invariably sharp-pointed. In length they may run to ten or eleven inches and more. The best head I have seen measured was nine and three-quarters inches. This head was from one of the red specimens, and was shot by a Chin Chief at a considerable elevation in the Southern Chin Hills. From numerous heads measured I am inclined to think that anything over eight inches might be considered a good head. The circumference at the base of the horns of a good head measures from 4½ to 5 inches.

SOME MEASUREMENTS OF "TAW SEIK."

		I	II	III	IV	V	VI	VII	Remarks.
1	Height at shoulder	37″	37¾″	38″	37½″	35½″	36″	39½″	The measurements of one and two were kindly given me by Mr. Weston of the Forest Dept., and those of three and four by Mr. Trapmann, P.W.D.
2	Girth behind forearm	39″	38″	42″	35½″	34″	37½″	38″	
3	Nose to base of horns	9″	10″			9″	10¼″	10″	
4	Length of tail	5″ 5′-2″	6″ 5′-6″	* 4′-7½″	* 5′-0½″	4″ 5′-2″	6″ 5′-2¼″	6″ 5′-5″	
5	Length base horns, root of tail ...	48″	50″			49″	47″	49″	
6	Length of tail tuft	3″	4″	.....	.....	3″	3″	4″	
7	Length of hair of mane ...	6½″	6″	4½″	5″	4½″	5¼″	5″	
8	Length mane, nape to withers ...	.....	.....	.....	22″	.....	.....	.....	
9	Length of ears	.....	.....	.....	.....	7¾″	6¾″	6½″	
10	Length of horns	7″	5¾″	9″	9½″	8″	6¾″	8½″	
11	Spread of horns	.....	.....	5¾″	5½″	4⅞″	5⅛″	5⅞″	
12	Girth round base of horns ...	.....	.....	.....	5½″	5¼″	4¼″	6″	

* Not over curves.

MEASUREMENTS OF TWO GOOD SKULLS.

Extreme length of skull from occipital condyles to end of premaxillary bone	$14\frac{5}{8}''$	$14\frac{7}{8}''$
Length from base of horns to end of premaxillary bone	$9\frac{1}{4}''$	$10''$
Breadth between orbital cavities	$4\frac{1}{8}''$	$4\frac{7}{8}''$
Breadth between zygotmatic arches	$8\frac{3}{4}''$	$8\frac{1}{4}''$
Length of horns	$9''$	$9\frac{1}{4}''$
Spread between tips	$5\frac{1}{4}''$	$5\frac{3}{4}''$
Girth round the base	$6''$	$5\frac{7}{8}''$

My thanks are due to Mr. A. Weston, of the Forest Department, for some information on certain points, and also to Mr. F. Bagley and Mr. Rennie for the photographs here reproduced.

DESCRIPTIONS OF SOME NEW SPECIES OF SCORPIONS FROM INDIA.

By R. I. Pocock, of the British Museum of Natural History.

(*Read before the Bombay Natural History Society on* 18*th March*, 1897.)

Part I.—*Introductory Remarks.*

In the spring of 1896 I undertook, at Mr. R. C. Wroughton's request, to identify for the Bombay Natural History Society any Indian scorpions that might be forwarded to me, subject to the reservation that representatives of the species examined and the typical example of any that proved to be new might be retained for the national collection. Upon my gladly acquiescing in the proposed plan of operations, which offered such a splendid and wholly unexpected opportunity of confirming and extending our knowledge of these interesting animals, Mr. Wroughton with characteristic energy and despatch applied himself to the task of amassing material by appealing for specimens to various members of the Society quartered in different parts of India.

The net result, up to the present time, of this collecting raid upon the scorpions has been ; firstly, the capture of a thousand or so specimens of various genera and species from a large number of localities ; secondly, the addition of some dozen new species to science and of some fourteen new forms to the Indian fauna ; thirdly, an immense increase in our knowledge of the range of structural variation and geographical distribution of the previously known species ; and, fourthly, the enrichment of the national collection by upwards of 450 specimens, including examples of all the species obtained, and of the Museum of the Bombay Natural History Society by a named collection containing the larger part of the known Indian species.

It may be added that every specimen, as it passed through Mr. Wroughton's hands, was carefully measured and labelled with a number corresponding to a number on a MS. table on which was carefully entered the measurements, locality and collector's name.

It is my intention finally to write a complete account of the scorpions of India, with figures of the different species, and an introduction on the structural terminology, classification, distribution, &c., to be published, by permission of Mr. Phipson, in a series of

parts, in the Journal of the Bombay Natural History Society. But since the preparation and publication of such a report will necessarily occupy much time, it seems to me advisable to describe without further delay the new species that have lately come into my hands. And I the more readily adopt this course on account of the hope that before the final revision of the species is undertaken, I shall have received fresh material from the Society, so that the work may be more complete than if it were entered upon now. There is of course every reason to suppose that many more species will yet turn up if collecting is carried on in the future with an energy comparable to that of the past year. There are still many districts in India from which we have no specimens at all ; and the new and interesting forms obtained, for example, by Messrs. Kemball and Ryan in Scinde show promise of a rich and practically unknown fauna all down the valley of the Indus from Kashmir southwards, that is to say, along the line where the Indian fauna blends with that of Afghanistan and Baluchistan. So too to the eastward, where India passes into Burma, we know but little of the scorpions beyond the bare fact that no species, so far as has been ascertained with certainty, are common to the two countries. Other points requiring investigation are the distance to which the Persian and Afghan elements extend into Central India, and the number of species that are common to South India and Ceylon, and the nature of those, if any there be, that are peculiar to the last-named island.

To the appended list of the new species obtained by the members of the Bombay Natural History Society have been added descriptions of a few others that have come into my hands during the past half-dozen years. These increase the total up to eighteen.

PART II.—*Description of new Species.*

Family BUTHIDÆ.

Genus PRIONURUS, Hempr. and Ehrenb.

(1.)—PRIONURUS FINITIMUS, sp. n.

Colour.—A tolerably uniform yellow, the legs and chelæ clearer than the trunk ; the tail with its fifth segment and vesicle pale greenish-or brownish-black, the dark pigment spreading on to the sides and lower surface of the fourth segment.

Sculpturing of the trunk, limbs and tail like that of the Persian species *P. crassicauda*, the inferior and inferior lateral intercarinal spaces of the tail finely granular. Tail increasing in width to the middle of the third segment, the fourth either a trifle narrower than the third (♀) or equalling it in width (♂), the fifth segment never so wide as the second, and in the ♀ a little narrower than the first, in the ♂ equal to the first in width or a trifle wider; the lateral keels of the fifth as well as of the other segments not so strongly elevated as in *P. crassicauda*; the first segment a little broader than long, the second a little longer than broad (♂, ♀); the third as broad as long (♂), or a little longer than broad (♀); the length of the second in the ♀ just about equalling the width of the third.

Chelæ resembling those of *P. crassicauda*. Pectinal teeth; ♀, 20-25, average about 23 : ♂, 28-33, averaging about 30.

Measurements in millimetres of ♂ (*Type*). Total length 76, length of carapace 8, of tail 47, width of first segment a little over 6, of third 7.

Locality.—Scinde, Haidarabad, and Kotri (Type) (*G. M. Ryan*); also a large number of examples from Haidarabad, Kashmir Bund, and the Khelat Frontier (*A. V. Kemball*).

Differing from the Persian and Mesopotamian *P. crassicauda*, of which perhaps it will ultimately prove to be a sub-species, in its pale colouring, the typical *crassicauda* being a black or deep brown species. The colouring of *P. finitimus* at all ages is very like that of the North Egyptian form *P. libycus*, except that in young examples of the former the infuscation of the end of the tail is much fainter, the vesicle being quite pale, the pigment gradually increasing in intensity with age, whereas in *P. libycus* the pigment in the young is much stronger than in the adult.

The genus *Prionurus*, which ranges from Morocco to Egypt in Africa and thence through Arabia and Persia, is new to the Indian fauna. It seems probable that the form here described is the most easterly representative of the genus.

Genus BUTHUS, Leach.

(2.)—BUTHUS ODONTURUS, sp. n.

Closely allied to *Buthus doriæ*, Thor., from Teheran in Persia, but differing in the following particulars :—

The sternal plates of the abdomen and the coxæ of the cephalothoracic appendages are covered with fine granules; and there are

four longitudinal granular crests on the fourth abdominal sternite, traces of them being visible on the third. In *B. doriæ* the coxæ and sterna are smooth, and there are no granular keels on the fourth sternum. The tuberculiform teeth, present on the lower surface of the tail, which are so characteristic of *B. doriæ*, are also developed in *B. odonturus*, but to a lesser degree, being smaller, farther apart and triangular in shape, whereas in *B. doriæ* they are apically rounded. Again in *B. doriæ* the large teeth forming the anterior transverse crest on the second and third segments are only 4 in number, while in *B. odonturus* they are 6, and lastly the lateral protuberance on the fifth segment, which projects on each side of the anal orifice is bilobed in *B. doriæ*, trilobed in *B. odonturus*. Pectinal teeth (♂), 28-29.

Total length 58, length of tail 37, carapace 6.

Locality.—Khelat Frontier, Upper Scinde (*A. V. Kemball.*)

(3.)—BUTHUS ATROSTRIATUS, sp. n.

Colour.—♀. Yellow, variegated with black bands and spots; the front border of the carapace with its ocular tubercle and keels black; the three keels, of the terga black, and usually an additional black spot on each side; keels on lower side of tail irregularly fuscous, the dark pigment spreading laterally on to the sides of the fourth and fifth segments; vesicle lightly infuscate at the sides; chelæ yellow, the upper and outer sides of the brachium and hand irregularly lined with fuscous, patches of the same colour being also present upon the upper side of the trochanter and humerus and also upon the femora and tibiæ of the legs.

Trunk with its intercarinal spaces weakly granular; the keels on the terga granular and parallel; frontal keels of the carapace complete and granular; the area on each side between their apices and the lateral eyes coarsely granular; the median central and median posterior keels forming an irregular series. Sternal plates smooth, the last granular at the sides, and marked with four finely granular crests. *Tail* of medium thickness, about five times the length of the carapace, with it normal keels well developed and finely granular, the median lateral almost absent on the third, occupying the posterior half of the area on the second; the intercarinal spaces of the sides and lower surface of the tail finely granular, the keels only

sparsely hairy ; the inferior lateral keels on the fifth segment furnished posteriorly with lobate dentiform tubercles, tree such tubercles situated upon the anal lobe of the segment ; vesicle sub-globular and granular.

Chelæ with normal keels developed and granular, and finely granular intercarinal spaces ; hand smooth, punctured, hairy, considerably wider than the brachium, the movable digit about one-third longer th[a]n the hand-back, both digits lobate, the movable furnished with 11 median rows of teeth, those at the base crowded together. Legs granular and granularly crested ; the feet furnished below with two rows of setiform spines. Pectinal teeth, 18-20.

♂. Smaller than ♀, digits more strongly lobate ; tail five and a half times the length of the carapace. Pectinal teeth, 22-26.

Measurement in millimetres. ♀. Total length 48, length of carapace 5, of tail 27.

Locality.—Kashmore Bund, Upper Scinde (*A. V. Kemball*).

Related to *B. philippsii*, Poc., from Bushire on the Persian Gulf, but easily distinguishable by having the tail shorter and narrower, with its first segment wider than the third instead of equal to it in width, and the intercarinal spaces granular instead of smooth, etc. Also the pectinal teeth are more numerous in *B. philippsii*, being 23-26 in the ♀, and 27-30 in the ♂.

(4.)—BUTHUS RUGISCUTIS, sp. n.

Closely related to the scorpion of India known as *T. tamulus nigrolineatus* or *T. martensii*, but smaller, rougher, with thicker tail and fewer pectinal teeth.

♂. *Colour.*—Ranging from fulvous to fulvo-fuscous, the keels of the trunk and tail usually emphasized by a black tint.

The upper surface of the *trunk* entirely covered with coarse granules, amongst which the normal keels stand up as granular ridges, the frontal keels of the carapace not traceable for more than half-way across the triangular interocular area. First four sternal plates smooth, the last finely granular with four nearly smooth crests.

Tail.—About five times as long as the carapace, thickly and coarsely granular below and at the sides, the upper surface also granular though less coarsely than the sides ; keels forming the normal granular crests, the median lateral present on the fourth ; the segments wider

and higher as compared with their length than in *nigrolineatus*, the width of the first excelling the lateral length of the third and almost equal to that of the fourth ; width of second and third approximately equal to that of first ; height of the second equal to its length. (In specimens of *B. nigrolineatus*, the length of the second far exceeds its height, and the length of the third exceeds the width of the first.)

Chelæ.—With manus equalling brachium in width, brachium weakly granular above, movable digit slightly less than twice the length of the hand back and furnished with 12 rows of teeth. Pectinal teeth 21-20 (18-21).

♂. Smaller than ♀, with pectines larger, furnished with 21-24 teeth, hand much wider than brachium and digits strongly lobate at the base.

Measurements in millimetres. ♀. Total length 53, length of carapace 55, of tail 27. ♂. Total length 44, length of carapace 5, of tail 25·8.

Locality.—Mahableshwar, 5,000 feet altitude (*Mrs. Wroughton, types*) ; also examples ticketed Mahableshwar Tal, Satara, S. Dekhan (*A. D. Wilkins*).

(5.)—BUTHUS PACHYURUS, sp. n.

Colour.—Black, tinted in parts with deep red, fingers and sometimes the hand of chelæ brownish-red, tarsal segments of legs yellowish.

With the exception of the ocular tubercle which is smooth, the whole carapace is covered, though not quite closely, with coarse granules, amongst which the keels are scarcely traceable. The tergal plates of the abdomen are also coarsely granular, but the normal keels are distinct and either granular or nearly smooth. The sternal plates are smooth and polished, the last only being sparsely granular at the sides and furnished with four granular crests.

Tail.—Stout, thickly hairy, rather more than four times the length of the carapace, increasing in breadth to the middle of the third segment, all the segments, except the fifth, considerably wider than long, the width of the third almost equal to the length of the fifth ; the upper side of the segments rather deeply hollowed and smooth, the sides and lower surface thickly and uniformly covered with coarse granules, each segment with ten granular crests, though the median lateral keel is weak on the fourth ; vesicle coarsely granular.

Chelæ.—With the brachium finely granular above, but without the upper anterior crest, the hand smooth, hairy not crested, equal to the brachium in width, digit less than twice the length of the hand-back, furnished with twelve rows of teeth.

Legs.—Weakly granular externally.

Pectinal teeth 23-23 in type ; 21-22 in other examples.

♂. More coarsely granular than the female, with tail a little thinner, the width of the fourth segment being equal to its length. Pectines larger, with 24 teeth ; the hand much wider than the brachium, the digits basally lobate.

Length of ♂, ♀ 46 mm.

Locality.—Mundla, Central Provinces (*A. N. Caccia* ; *Types*) ; Kamptee, Central Provinces (*J. Marten*) ; Nasik, N. Dekhan (*W. S. Millard*) ; Wai Tal and Karad Tal, Satara (*A. D. Wilkins*).

Belonging to the *hottentotta* section of *Buthus* and resembling *B. judaicus* in its dark colour, but differing in the greater thickness of the tail, etc.

Genus Butheolus, Simon.

(6.)—Butheolus bicolor, sp. n.

Colour.—Upper side of trunk deep green ; fourth and fifth segments of the tail with the vesicle also deep green ; but the first and second segments (and usually the third) ochre-yellow ; legs lemon-yellow with blackish tint on the femora ; humerus and brachium of chelæ also blackish, the rest of the appendage yellower.

Trunk.—Entirely covered above with close-set granules, the two interocular ridges alone being smooth.

Tergal plates of segments 3-6 distinctly tricarinate. *Abdominal sterna* mostly smooth, the first finely granular anteriorly and laterally, the fourth also granular in the depressions, the fifth smooth only in the middle ; its crests evanescent.

Tail.—Posteriorly expanded, the fourth and fifth segments approximately equal in width and wider than the rest, the upper surface of all the segments mesially granular, the upper crests granular and present only on the first, evanescent on the second, the sides of segments 1-3 punctured, the lower surfaces with 4 keels ; the fourth and fifth segments smooth, without crests, but covered below and laterally with large punctures ; the inferior lateral keel, however, present on the fifth

segment posteriorly and distinctly lobate; vesicle small, coarsely punctured, not granular.

Chelæ.—With humerus thickly granular above, brachium nearly smooth, with keels strong and crenulate; nine rows of teeth on the digits.

Legs.—With femora coarsely and patellæ more finely granular. Pectinal teeth in ♀ 17-19, ♂ 19-21.

Length of ♀ 38, mm. ♂ 33.

Locality (of type).—Kandala Tal, Satara, S. Dekhan (*A. D. Wilkins*); also examples from Wai Tal (*A. D. Wilkins*). The latter differ from the specimen from Kandala Tal in having the basal segments of the tail darker.

This species resembles the type of the genus *Butheolus*, namely *B. thalassinus* from Aden, in having the tergal plates tricostate, but differs entirely from it in having the fourth and fifth segments of the tail smooth and punctured below instead of granular and carinate.

(7.)—BUTHEOLUS PALLIDUS, sp. n.

Colour.—Trunk, tail and appendages entirely pale yellow throughout, the eyes alone black.

Trunk.—Closely and finely granular above; ocular tubercle smooth in front. *Tergal plates* with one median crest; *sterna* mostly smooth, the last finely granular, with four evanescent keels, the first and fourth granular as in *B. bicolor*.

Tail.—Posteriorly expanded, the fourth and fifth segments sub-equal in width and wider than the rest; segments 1-3 with ten granular keels (the median lateral weak on the third), with granular intercarinal spaces; the lower surface of the fourth covered with granules, with evanescent keels and obsoletely punctured, the sides of this segment distinctly punctured; fifth segment punctured laterally and below, but the posterior half of its lower side thickly granular; the inferior lateral keels distinct, finely granular behind, dentate posteriorly; a weak median granular crest; upper surface of all the segments weakly granular; vesicle small and punctured.

Chelæ.—Humerus weakly granular above, brachium smooth with finely crenulate keels; digits with eight rows of teeth.

Legs.—With femora somewhat coarsely granular, patellæ smooth but with finely granular crests.

Pectinal teeth ♀ 16-17, ♂ 21-29.

Length up to 35 mm.

Locality.—Upper Scinde, Khelat Frontier (*Types*) and Kashmore Bund (*A. V. Kemball*); also a single example from Haidarabad, Scinde (*G. M. Ryan*).

Resembling the Persian *B. melanurus*, Kessler, and the Transcaspian *B. conchini*, Sim., in having the terga unicostate, but differing from both in being entirely pale coloured, instead of deep green, and from *B. melanurus* in having the lower surface of the fourth and fifth segments granular, and from *B. conchini*, which it appears to resemble in having the lower surface of the fourth and fifth segments rugose (granular), in having the legs and upper side of the tail granular.

(8.)—BUTHEOLUS FLAVESCENS, sp. n.

Very closely allied to *B. pallidus*, which it resembles in colour, except that the tergal plates are infuscate, but differing in having the tail much smoother. For example, the inferior keels on the first segment are smooth and the fourth and fifth segments are scarcely granular below, though very coarsely punctured.

Pectinal teeth ♂ 20.

Length about 28 mm.

Locality.—Karagora in Kathiawar (*H. Bulkley*).

Genus ARCHISOMETRUS, Kraepelin.

(9.)—ARCHISOMETRUS CRASSIMANUS, sp. n.

Colour.—Blackish-brown without any very distinct yellow pattern, tail paler; vesicle and hands of the palpi and distal segments of legs clear yellow; basal segments of legs and palpi blackish.

Carapace.—Somewhat finely granular; its anterior border somewhat coarsely so. *Terga* conspicuously, though not very coarsely, granular in the posterior half, the posterior border of the carapace and of the first and second terga tri-emarginate; the terga conspicuously tricastate (the first obsoletely so); sterna smooth and punctured, the last almost without crests and without granules, merely faint traces of two of the crests. *Tail* of medium length and thickness, less than four times the length of the carapace, the median lateral crest weak on the first, but represented by a posterior series of granules on the second and third; the keels denticulate, the intercarinal spaces sparsely

granular and densely punctured ; *vesicle* nearly smooth, punctured, sparsely granular, merely angled beneath the aculeus, without definite spine.

Chelæ.—Heavy, granular ; the hand smooth, rounded, very large, much wider than the brachium ; digits short, the movable about equal to the hand-back in length.

Pectinal teeth 12 in ♀. Length 28 mm.

♂, with larger hand, tail posteriorly expanded ; pectinal teeth 14-5. Length 21 mm.

Locality.— Panch Mahals, in Guzerat (*W. A. Wallinger*).

Resembling *A. tricarinatus* in possessing three tergal crests, but differing essentially in having no spine beneath the aculeus of the vesicle, a much broader and heavier hand, small number of pectinal teeth, short spurs on the legs, etc.

(10.)—ARCHISOMETRUS RUGOSUS, sp. n.

Colour.—Nearly black, variegated with yellow ; legs clear yellow with black bands ; chelæ blackish, with hand entirely pale yellow.

Trunk.—Very coarsely granular above ; terga without lateral keels; sterna coriaceous ; the fourth as well as the fifth granular ; the latter with four granular crests, the former with two.

Tail.—Slender, nearly four times the length of the carapace ; the keels and intercarinal spaces granular ; the first three segments with ten keels ; a strong spine beneath the aculeus.

Chelæ.—Slender, coarsely granular, hand narrower than brachium, pectines large, furnished with twelve teeth.

Locality.—Raipur, Central Provinces (received from *H. M. Phipson*). Recognisable at a glance from the rest of the Indian species of the genus by its coriaceous and granular sterna and small number (12) of pectinal teeth.

(11.)—ARCHISOMETRUS HENDERSONI, sp. n.

Colour.—Trunk, legs, tail and cheliceræ densely infuscate, variegated with yellow, a conspicuous < shaped yellow mark on the terga ; manus and digits entirely yellow.

Carapace.—Finely and evenly granular throughout, a little shorter than the first two tail segments, its anterior border lightly emarginate.

Abdominal terga.—Closely and finely granular throughout, without trace of lateral keel.

Sterna.—Smooth and polished, the fifth finely granular, and furnished with four keels.

Tail.—Robust, about four and a half times the length of the carapace, intercarinal spaces finely granular, keels well developed, finely granular, terminal granule of upper keels not enlarged ; segments 1-3 furnished with ten keels, the median lateral keel on the third weak ; the superior lateral keels on the fifth very sharply defined, the area between them elevated, *vesicle* small, smoothly carinate below, aculeus long, spine conspicuous.

Palpi.—Normally keeled, finely granular ; brachium convex behind, not keeled and almost smooth ; manus about as thick as the brachium ; smooth and not keeled above ; digits long, contiguous, the movable more than twice the length of the hand-back and armed with 6-7 median rows of teeth.

Legs.—Normally keeled, granular ; tibial spurs on the fourth and fifth very long, about a third of the length of the succeeding segment ; feet furnished below with two series of close-set hair.

Pectinal teeth 17-18.

Total length 34 mm, of carapace 3·5, of tail 18·5.

Locality.—Yercaud, in the Sheveroy Hills (*J. R. Henderson*) ; a single female example.

This species belongs to the same category as *Archisometrus tricarinatus*, *A. shoplandi* and *A. scaber*. It differs from them in the following respects. From *A. tricarinatus* in having no lateral keels on the terga, in having a more conspicuous median lateral keel on the third caudal segment, in having fewer pectinal teeth (17-18), as compared to over 20 (21-25), and much longer fingers, etc. From *A. shoplandi* in having the ante-ocular region of the carapace evenly and closely granular like the rest of the surface, in having a well developed supero-lateral granular keel on the fifth caudal segment, a smaller number of pectinal teeth, etc.; from *A. scaber* in having very long instead of very short tibial spurs on the third and fourth legs, in having the external keels on the fifth abdominal sternite well developed, the ocular tubercle granular, etc.

I have great pleasure in dedicating this species to my friend Mr. J. R. Henderson of the Christian College, Madras.

(12.)—ARCHISOMETRUS LÆVIFRONS, sp. n.

I propose this new specific name for the example of *Archisometrus* from Calcutta, which I previously assigned to the Burmese species named *A. shoplandi* by Oates. I am now of opinion that the differences that obtain between this example and the type of *A. shoplandi*, coupled as they are by a difference of locality, are sufficient to justify the establishment of a new species for the former.

It differs from *A. shoplandi* in two main features—(1) in having the legs variegated black and yellow, instead of wholly yellow, and (2) in having the digits much longer as compared with the length of the hand-back, the movable digit being more than twice the length of the hand-back in *A. lævifrons* and less in *A. shoplandi*. Probably other differential characters will be discovered when well-preserved specimens come to hand. There are 22 pectinal teeth.

Total length 31 mm.

Locality.—Calcutta.

In structural characters this species lies between *A. shoplandi* and *A. hendersoni*, resembling the latter in its long digits and spotted legs, and the former in the absence of fine granulation from the ante-ocular area of the carapace and in the absence of distinctly-defined supero-lateral keels on the fifth caudal segment.

Genus ISOMETRUS, Hempr. and Ehrenb.

(13.)—ISOMETRUS RIGIDULUS, sp. n.

Colour.—Fuscous, variegated with yellow above, anterior portion of carapace entirely black; the fourth and fifth sterna infuscate.

Trunk.—Coarsely granular above; sterna smooth; the last granular, with four distinct granular keels.

Tail.—About five times the length of the carapace, robust, the first segment only provided with 10 keels, the intercarinal spaces finely granular; the terminal granule of the superior keel of the second a little enlarged, of the third long and spiniform; the upper surface of the fifth segment convex, elevated, the width and height of this segment almost equal to half its length; vesicle with a strong spine beneath the aculeus.

Chelæ.—Moderately long; hand smooth, a little wider than the brachium, the back of the hand about three-quarters the length of the movable digit.

Pectines furnished with 13—15 teeth.

Length about 30 mm.

Locality.—Bhopal, Central India (*Surgn.-Lieut.-Col. Dane*).

Recognisable by the following characters :—(1) the fifth segment of the tail is short and stout, its width and height being nearly half its length ; in the other Indian species the width and height are only about one-quarter of the length ; (2) the movable digit is only a little longer than the hand-back instead of about twice the length ; (3) the superior terminal keel of the third segment terminates in a long upstanding spine.

(14.)—ISOMETRUS THWAITESII, sp. n.

♀. Closely allied to the cosmopolitan *I. maculatus*, but differing in the following particulars :—The black bands on each side of the pale anteocular patch on the carapace converge anteriorly and meet in the middle line on the anterior border of the carapace. The hands and digits of the chelæ may be described as fuscous, but mottled with yellow, whereas in *I. maculatus* the hands are yellow, spotted black externally, and the digits are of a uniform brownish-red tint. Correlated with this distinction in colour is an important character connected with the pectines, these organs being armed with 15-16 teeth, and having the base of the shaft produced into a semi-circular rounded prominence much resembling that which is seen in the allied South American genus *Tityus*. So far as I am aware this feature is found in no other species of the genus *Isometrus*. The male of this form is unfortunately not yet known.

Length 34 mm.

Locality.—Ceylon (Thwaites's collections).

Family SCORPIONIDÆ.

Genus PALAMNÆUS (*Thorell*).

(= *Scorpio* + *Palamnæus*, Pocock, Journal, Bombay Nat. Hist. Soc., November, 1892).

(15.)—PALAMNÆUS LIURUS, sp. n.

Coloured like *P. fulvipes*, with reddish-yellow legs and vesicle, but allied to *P. bengalensis* in the form and sculpturing of the hand of the *chelæ* and in most other characters appertaining to the trunk and

limbs; but easily distinguishable by its much shorter and smoother tail. The tail in the male is a little more than three times the length of the carapace which is equal to its first two segments and half the third, the first four segments being much less than twice the length of the carapace. In the male of *P. bengalensis* the carapace just exceeds the length of the first two segments, the first four being about twice its length. In this new form, moreover, the crests on the tail, with the exception of those on the lower side of the fifth and the superior crests on segments 1—4, which have a terminal granule, are not denticulate, being merely roughened and notched by the pores from which the bristles arise; so too are the intercarinal spaces and the vesicle smooth; whereas in *P. bengalensis* the vesicle and all the crests, except the inferior ones on segments 1—3, are denticulate, and the superior and lateral intercarinal spaces are partially granular. The female differs in corresponding features from the female of *P. bengalensis*, having a short tail, of which the vesicle and crests are not granular, the tail is less than three times the length of the carapace, which is as long as the first two segments and two-thirds of the third, while twice the length of the carapace, and exceeds the length of the first four segments and half the fifth.

The sexual characters are well marked, the male having finely granular terga, longer and thinner chelæ, larger pectines with 14—16 teeth, the genital operculum wider than long, the tail longer, and the vesicle inflated (*see* measurements). In the female the terga are smooth, the operculum is posteriorly narrowed and longer than wide, the pectines have 10—13 teeth, and the vesicle is small.

Measurements in millimetres. ♂. Total length 80, length of carapace 12, of tail 39, width of fifth segment 3, of vesicle 4, height of vesicle 3·5, length 5·3, length of hand-back 11, width of hand 8. ♀. Total length 76, of carapace 12, of tail 35, width of its fifth segment 2·8, of vesicle 3, height of vesicle 2·8, length 4·8; length of hand-back 9, width of hand 9·2.

Locality.—Gwalior in Central India, adults and young of both sexes obtained by the Medical Officer of H. H. the Maharajah of Scindia; also Bhopal in Central India, a single adult male sent by Surgeon-Lieutenant-Colonel Dane.

(16.)—PALAMUÆUS XANTHOPUS, sp. n.

Coloured like *P. fulvipes*, with reddish-yellow legs and vesicle. Resembling that species also in other respects, but certainly different.

♀. Carapace granular in front and laterally, as long as the first two segments of the tail and one-third of the third; terga almost entirely smooth. *Tail* about three times the length of the carapace, inferior keels of the third segment roughened, of the fourth granular, superior and superior lateral keels denticulate; vesicle small and denticulate.

Chelæ.—With numerous denticles above and in front, smooth below; upper crest of brachium granular; hand thick, rounded above, especially externally, the inner border strongly produced and denticulate, forming a widely rounded posterior lobe, covered above with a network of ridges which pass into granules at the base of the fingers; lower surface of hand almost entirely smooth, without crests; the width of the hand equal to the length of the movable digit, which is a little less than the median length of the carapace measured from the base of the emargination.

Pectinal teeth 14—15.

♂. With carapace mere granular and terga finely granular (tail absent). Chelæ longer; width of hand less than length of movable digit, which a little exceeds the median length of the carapace.

Pectinal teeth 13—15.

Measurements in millimetres. ♀. Total length 74, length of tail 34, of carapace 11, of hand-back 6·5, of movable digit 9, width of hand 9. ♂. Length of carapace 11, of hand-back 8, of movable digit 10·3, width of hand 8·7.

Locality.—Kadao Tal, Satara, S. Dekhan (*A. D. Wilkins*).

Easily recognisable from *P. fulvipes* by the shape and sculpturing of the hand, that of *P. fulvipes* being covered above with distinct bead-like tubercles, and furnished below with granules and a pair of granuliform crests.

Genus IOMACHUS, Pocock.

(17.)—IOMACHUS PUNCTULATUS, sp. n.

Closely allied to *I. lœviceps*, Poc.

♂. Trunk, limbs, and tail black or reddish-black; vesicle orange-yellow.

Tail.—Three and a half times the length of the carapace, which is equal to the length of its first two segments.

Chelæ.—Longer than in *I. læviceps*, the movable digit quite as long as the carapace and only slightly shorter than the hand-back. ♀ In *I. læviceps* there are two conspicuous bristle pores on the basal half of the immovable digit, the first of which is quite at the base of the finger, while in *I. punctulatus* there are *three* pores, the first on the base of the digit being of small size, while the two large ones are farther along the segment. The process at the base of the brachium is also smaller in *I. punctulatus*; and lastly in *I. læviceps* the lower side of the tarsi is furnished with two pairs of bristles, one on each side of the median row of spicules, but in *I. punctulatus* the external distal bristle is converted into a spine.

♀. Chelæ and tail shorter than in the ♂, the tail about three times the length of the carapace, which is as long as its first two segments and one-third of the next.

Pectinal teeth 5.

Measurements in millimetres. ♂. Total length 62, tail 30, carapace 8.

Locality.—Koimbatur, Anamallai Hills (*W. Davidson*).

Genus HORMURUS (*Thorell*).

(18.)—HORMURUS NIGRIPES, sp. n.

Most nearly related to *Hormurus australasiæ*, which is widely distributed from Burma throughout Indo- and Austro-Malaya.

Colour.—Piceous above, paler below; vesicle clear yellow.

Trunk finely punctulate above, without granules, carapace with a deeper median excision, the triangular frontal selerite small.

Tail.—A little more than twice the length of the carapace, much less strongly compressed than in *H. australasiæ*, the first segment with four teeth at the hinder end of the lower surface, the second with its four lower keels strongly dentate, keels of the third and fourth smooth, except for the presence of a terminal granule on the superior keels.

Chelæ.—Differing from those of *H. australasiæ* in having a much smaller basal process on the brachium, the posterior external angle of the hand more prominent, and the posterior surface of the inner lobe considerably more oblique.

Pectinal teeth 6.

Measurement in millimetres. Total length 35, length of tail 14, of carapace 6·3.

Locality.—Panch Mahals in Guzerat (*W. A. Wallinger*; *Type*); also a second specimen from Sutna, Central India (*Surg.-Major Gimlette.*)

THE FLORA OF WESTERN INDIA.

By G. Marshall Woodrow, Lecturer in Botany,
College of Science, Poona.

Part I.

(*Read before the Bombay Natural History Society on 18th March*, 1897.)

Since the date of the Bombay Flora, by Dalzell and Gibson, a considerable advance has been made in the number of plants observed; and a few interesting links in the chain of relationship to each other and to foreign floras having been found, it is thought desirable to publish a synopsis of the Flora of Western India—as at present known—within the limits of the Bombay Presidency. The list will include the scientific and vernacular names, reference to a description, and state the place whence and the time when specimens were procured. The greater part of the observations are the work of the members of the Botanical Survey, Bombay*, when otherwise, the name of the observer will be given; and it is hoped that during the progress of the publication numerous facts will be presented, which may be embodied in an appendix. In work of this nature, we meet with the names of men who have devoted part of their time and talents to the elucidation of the flora, and a wish to know more of the lives and doings of those men, grows with the study of their work; and it is probable that members of the Society may be in possession of facts regarding those early workers in the Botany of Western India, and also regarding some others, whose names have been omitted, which it is desirable to record.

Of the names connected with our botanical history, Jacquemont, Hügel and Hove have left indelible marks; of Graham and Gibson the names and virtues are carved in stone; Stocks and Dalzell have left voluminous records of their interest in botany; Law and Nimmo, Noton, Ritchie, Sykes and Vaupel are names one seeks to know more about; De Crespigny, Medical Officer at Ratnagiri, who was the friend and companion of Stocks and communicated much of his work to the herbarium at Poona, went over, in the winter of 1894-95 full of years and honour; of Sakharam Arjun and Narayen Daji we have pupils and co-adjutors with us who hold their names in reverence. Recently we

* Dr. Theodore Cooke, Principal, College of Science, 1890-93; Mr. G. Marshall Woodrow, Lecturer in Botany, College of Science, 1890 *et seq.*; Mr. N. B. Ranade, Herbarium Keeper, College of Science, 1890 *et seq.*

have lost Chester MacNaghten, Principal of the Rajkot College, who was untiring in work at botanical problems, and Carstensen, who restored the faded beauty of the Victoria Gardens. The brothers Sir George and the Hon. H. M. Birdwood; Theodore Cooke, Nairn, Young, and Wellington Grey have returned to Europe, but continue their interest unabated. Lisboa's devotion to the study of grasses has unfortunately injured his health severely, still we hope yet to benefit by his admirable ability in research.* From MacDonald and Kirtikar, Talbot, Gleadow, Dalgado, Jaikrishna and B. B. Nene we may still look forward to years of good work; and from Masani and Ranade, as yet in their botanical adolescence, we have much to expect.

In a review of this kind it must not be forgotten that a very important share of our work is due to the authorities of the Botanical Gardens at Kew and Calcutta. Our facilities for the determination of species are as yet so sparse, that it is not safe to describe a plant as new without reference to those centres; and their courteous attention to specimens submitted requires grateful acknowledgment.

In the following list Mr. N. B. Ranade, Herbarium Keeper in the College of Science, has given the vernacular names and much assistance in verifying statements. Many of the Southern names have been taken from Mr. Talbot's Systematic List of the Trees, Shrubs and Woody Climbers, Bombay Presidency.

ABBREVIATIONS.

F. B. I.=Flora of British India, Hooker.

B. F.=Bombay Flora, Dalzell and Gibson.

Watt. Dict.=Watt's Dictionary of Economic Products of India.

Roxb. F. I.=Roxburgh's Flora Indica.

Kew Bull.=Bulletin of Miscellaneous Information, Royal Gardens, Kew.

Graham Cat.=Graham Catalogue of Bombay Plants.

Hook. Icon.=Hooker's Icones Plantarum.

SYNOPSIS OF THE FLORA OF WESTERN INDIA.

I.—RANUNCULACEÆ.

1. *Clematis.*

C. smilacifolia, *Wall.*, F.B.I.—I-3. Evergreen forests, N. Kanara, *Talbot.*

C. triloba, *Heyne*, F.B.I.—I-3. *Mor-vel, Ranjái.* Mawal, Poona. Oct.

C. Gouriana, *Roxb.*, F.B.I.—I-4. *Mor-vel.* W. Ghats, Nasik, Belgaum. Dec.

* Dr. J. C. Lisboa died at Poona, 1st May 1897.

C. Hedysarifolia, DC., F.B.I.—I-4. *Bendrichi-vel.* Dang, Mahableshwar. N. Kanara. Oct.-Nov.

C. Wightiana, *Wall.*, F.B.I.—I-5. *Mor-vel.* Mahableshwar. Jan.

C. sp. Specimens imperfect. *Morchatha.* Waghai, Dang.

2. *Naravelia.*

N. zeylanica, DC., F.B.I.—I-7. Divimana, N. Kanara. Dec.

3. *Thalictrum*

T. Dalzellii, *Hook.*, F.B.I.—I-13. Purandhar. Aug.

7. *Ranunculus.*

R. seleratus, *Linn.*, F.B.I.—I-19. Banks of Indus, Sukker. March.

15. *Delphinium.*

D. dasycaulon, *Fresn.*, F.B.I.—I-25. Hills near Junnar, Khadkala. Aug.-Sept.

II.—DILLENIACEÆ.

6. *Dillenia.*

D. indica, *Linn.*, F.B.I.—I-36. *Motha Karmal.* Bansda, Wadee, Hirdoshee.

D. pentagyna, *Roxb.*, F.B.I.—I-38. *Karmal.* Dang, Sakarpathar, W. Ghats. Feb.-Mar.

III.—MAGNOLIACEÆ.

6. *Michelia.*

M. champaca, *Linn.*, F.B.I.—I-42. *Sonchapha.* Widely planted.

IV.—ANONACEÆ.

2. *Uvaria.*

U. narum, *Wall.*, F.B.I.—I-50. *Narampanal.* Parwar Ghat, Feb.-Mar.

5. *Artabotrys.*

A. odoratissimus, *R. Br.*, F.B.I.—I-54. *Hirvà cháphá.* Gardens widely.

A. zeylanicus, *H. f. & T.*, F.B.I.—I-54. Divimana. Nov.-Feb.

9. *Unona.*

U. farinosa, *Dalz.*, F.B.I.—I-58. Hatkhambe near Ratnagiri. Oct.

U. discolor, Var. I., F.B.I.—I-59. Sivapur Wadi, in fruit, Feb.

U. Lawii, *H. f. & T.*, F.B.I.—I-59. Konkan, *Law.*

10. *Polyalthia.*

P. longifolia, *Benth. & Hooker*, F.B.I.—I-62. *Ashok.* Planted widely. Mar.-Apl.

P. fragrans, *Benth. & Hooker*, F.B.I.—I-63. *Gaurik.* Sivapur Wadi.

P. cerasiodes, *Benth. & Hooker*, F.B.I.—I-63. *Humb.* Thul Ghat. Feb.-Mar.

15. *Goniothalamus.*

G. cardiopetalus, *H. f. & T.*, F.B.I.—I-75. Divimana Ghat. Feb.

16. *Anona.*

A. squamosa, *Linn.*, F.B.I.—I-78. *Shitaphal*, custard apple. Cultivated.

A. reticulata, *Linn.*, F.B.I.—I-78. *Ramphal*, bullock's heart. Planted.

A. muricata, *D. C.*, B.F. Supp. 2. *Kate ramphal*, Sour-sop. Planted. Nov.-Feb.

19. *Miliusa.*

M. indica, *Lesch*, F.B.I.—I-86. Potali, Nilkund, N. Kanara. Mar.-May.

20. *Saccopetalum.*

S. tomentosum, *Hooker*, F.B.I.—I-88. *Wumb.* Tulkut Ghat, *Dalzell.* April.

22. *Orophea.*

O. zeylanica, *Hooker, f. & T.*, F.B.I.—I-90. Bodeli, in fruit, April.

23. *Bocagea.*

B. Dalzellii, *H. f. & T.*, F.B.I.—I-92. *Sajeri, Undi.* Matheran, N. Kanara, *Talbot.* Oct.-Nov.

V.—MENISPERMACEÆ.

3. *Tinospora.*

T. malabarica, F.B.I.—I-96. *Miers.*, Konkan, *Dalzell.*

T. cordifolia, *Miers.*, F.B.I.—I-97. *Gulvel.* Konkan, widely planted. April.

6. *Anamirta.*

A. cocculus, *W. & A.*, F.B.I.—I-98. *Kákmári.* Marmagoa, Konkan, in fruit Jan.

10. *Cocculus.*

C. macrocarpus, *W. & A.*, F.B.I.—I-100. *Vatoli.* Matheran road, Konkan. Feb.

C. villosus, *DC.*, F.B.I.—I-101. *Vásan-vel.* Western India, widely. Sept.-Feb.

C. Leæba, *DC.*, F.B.I.—I-102. *Parwatti, Vehri, Illar-billar.* Sind.

12. *Stephania.*

S. hernandifolia, *Walp.*, F.B.I.—I-103. *Vanatik tika.* Hills near Junnar, in fruit. Oct.

13. *Cissampelos.*

C. Pareira, *Linn.*, F.B.I.—I-103. *Veni-vel.* Tullegaum, Poona, Guzerat, widely. Sept.

14. *Cyclea.*

C. Burmanni, *Miers.*, F.B.I.—I-104. *Pakur.* W. Ghats, Konkan. May.

C. peltata, *H. f. & T.*, F.B.I.—I-104. *Par-vel.* Konkan.

VII. NYMPHÆCEÆ.

2. *Nymphæa.*

N. lotus, *Linn.*, F.B.I.—I-114. *Kamal.* Widely planted in tanks. Aug.-Feb.

N. stellata, *Willd.*, F.B.I.—I-114. Rarely planted in tanks.

5. *Nelumbium.*

N. speciosum, *Willd.*, F.B.I.—I-116. *Bishee Kamal, Padma,* Sacred Lotus. Widely cultivated in tanks.

VIII.—PAPAVERACEÆ.

1. * *Argemone.*

A. mexicana, *Linn.*, F.B.I.—I-117. *Pivlá dhotrá, Ringan,* Peint Taluka.

IX.—FUMARIACEÆ.

4. *Fumaria.*

1. F. parviflora, *Lamk.*, F.B.I.—I-118. *Shátra, Pit-papda.* Deccan, Khandesh. Sept.-Dec.

X.—CRUCIFERÆ.

5. *Nasturtium.*

N. officinale, *R.Br.*, F.B.I.—I-133. Water-cress. Streams in Poona City, Panchgani. Spring.

N. indicum, *DC.*, F.B.I.—I-134. Poona. Jan.

8. *Cardamine.*

C. subumbellata, *Hook.*, F.B.I.—I-138. Ahire, 10 miles west of Poona. Aug.

C. hirsuta, *Linn.*, var. sylvatica, F.B.I.—I-138. Khandalla, W. Ghats. Dec.

11. *Farsetia.*

F. Jacquemontii, *Hook., f. & T.*, F.B.I.—I-140 *Farid buti.* Sibi, Sind. Aug.-Jan.

F. Hamiltonii, *Royle*, F.B.I.—I-140. Sind.

24. *Brassica.*

B. nigra, *Koch.*, F.B.I.—I-156. *Mohari.* Cultivated.

B. campestris, *Linn.*, F.B.I.—I-156. Swedish Turnip. Rarely cultivated.

B. „ *Napus.*, F.B.I.—I-156. *Shalgam*, Turnip. Cultivated in gardens.

B. „ *Rapus.*, F.B.I.—I-156. *Sarson, pivli rai.* Cultivated in fields.

B. juncea, *H. f. & T.*, F.B.I.—I-157. *Mohari.* Cultivated.

26. *Eruca.*

E. sativa, *Lamk.*, F.B.I.—I-158. *Safed Sursu.* Gardens as a weed.

27. *Moricandia.*

M. tortuosa, *Hook., f. & T.*, F.B.I.—I-158. Sind.

28. *Capsella.*

C. Bursa pastoris, *Mœnch.*, F.B.I.—I-159. Shepherd's Purse. Mahableshwar. Jan.

29. *Lepidium.*

L. sativum, *Linn.*, F.B.I.—I-159. *Aliv.* Cress.

Senebiera.

S. didyma, *Pers.*, Hook., Flor. Brit. Isles. 37. Garden weed, Ruk Junction, Sind. March.

32. *Thlaspi.*

T. arvense, *Linn.*, F.B.I.—I-162. Kirtar Mts., Sind, March.

36. *Dipterygium.*

D. glaucum, *Decaisne*, F.B.I.—I-164. Jacobabad, Sind. Sept.

40. *Physorhyncus.*

P. brahvicus, *Hook.*, F.B.I.—I-165. Bullo Khan, Sind. August.

41. *Raphanus.*

R. sativus, *Linn.*, F.B.I.—I-166. *Mula*, Radish. Cultivated. Oct.-Jan.

R. sativus caudatus. *Mougri.* Cultivated.

XI.—CAPPARIDEÆ.

1. *Cleome.*

C. monophylla, *Linn.*, F.B.I.—I-168. Bodeli, Guzerat, Gokak, Badami, Dharwar. Nov.

C. papillosa, *Steud.*, F.B.I.—I-168. Thano Balo Khan Road, 34 miles from Karachi. Aug.

C. quinquenervia, *DC.*, F.B.I.—I-168. Laki, Sind. Oct.

C. Stocksiana, *Boiss.*, F.B.I.—I-169. Laki, Sind. Oct.

C. simplicifolia, *H. f. & T.*, F.B.I.—I-169. Poona. July.

C. brachycarpa, *Vahl.*, F.B.I.—I-169. Karachi. Dec.-May.

C. aspera, *Koenig.*, F.B.I.—I.-169. Badami, Dharwar. August.

C. Burmanni, *W. & A.*, F.B.I.—I-170. Hyderabad, Sind, *W. Strachan.*

C. viscosa, *Linn.*, F.B.I.—I-170. *Pivli tilwan, kánphuti.* Deccan, widely. Sept.-June.

C. Chelidonii, *Linn.*, F.B.I.—I-170. Khadkalla., Dang. July-Feb.

2. *Gynandropsis.*

G. pentaphylla, *DC.*, F.B.I.—I-171. *Pandhri-tilwan.* Deccan, Guzerat. Cold season.

4. *Mœrua.*

M. arenaria, *H. f. & T.*, F.B.I.—I-171. Yoat, Poona Dist. Nov.-Mar.

5. *Cratœva.*

C. religiosa, *Forst.*, F.B.I.—I-172. *Hádvarná, Váyavarná.* Hoolicul, Kanara. March.

6. *Cadaba.*

C. indica, *Lamk.*, F.B.I.—I-172. Surat, Bijapur. Nov.-Dec.

7. *Capparis.*

C. spinosa, *Linn.*, F.B.I.—I-173. Edible caper. *Kabar, Kalvari.* Mahableshwar, Khirtar Mts., Sind. Jan.-Mar.

C. zeylanica, *Linn.*, F.B.I.—I-174. *Wágáti, Govindphal.* Alandi, Poona, Dharwar. Mar.-April.

C. Heyneana, *Wall.*, F.B.I.—I-74. Divimana, N. Kanara. May.

C. divaricata, *Lamk.*, F.B.I.—I-174. Dharwar, Rajewadi, Alandi, S. M. Ry. Feb.-April.

C. aphylla, *Roth.*, F.B.I.—I-175. *Nepti.* Deccan, Sind, widely. Nov.-Mar.

C. Moonii, *Wight*, F.B.I.—I-175. *Wágháti.* W. Ghats, widely. Dec.

C. Roxburghii, *DC.*, F.B.I.—I-175. *Wágháti.* Believed to be synonymous with C. Moonii.

C. grandis, *Linn.*, F.B.I —I-176. *Páchundá.* Buleshwar, 30 miles E. of Poona. Bankepur, Dharwar, hot season. April.

C. pedunculosa, *Wall.*, F.B.I.—I-176. *Kolisna.* Konkan, *Stocks.*

C. longispina, *H.f. & T.*, F.B.I.—I-176. Mahableshwar.

C. sepiaria, *Linn.*, F.B.I.—I-176. *Kanthar.* Deccan, widely. March.

C. horrida, *Linn.*, F.B.I.—I-177. *Kirur, Wágháti, Govindi.* Deccan, Sind, S. Maratha country. Dec.-Feb.

C. tenera, *Dalz.*, F.B.I.—I-179. Kumta, Sirsi Road. March.

XII.—RESEDACEÆ.

1. *Reseda.*

R. pruinosa, *Delile*, F.B.I.—I-181. Bulo Khan, Sind. March.

2. *Oligomeris.*

O. glaucescens, *Cam.*, F.B.I.—I-181. Khirtar Mts., Sind. March.

3. *Ochradenus.*

O. baccatus, *Del.*, F.B.I.—I-182. Hyderabad, Sind, Karachi.

XIII.—VIOLARIEÆ.

1. *Viola.*

V. cinerea, *Bois.*, F.B.I.—I-185. *Banafsha.* Thorala, Rajkot. *C. MacNaghten.* Tata, Sind. July-Aug.

2. *Ionidium.*

I. suffruticosum, *Ging.*, F.B.I.—I-185. *Ratan purus.* Broach, Badami, Dharwar. Oct.

XIV.—BIXINEÆ.

1. *Cochlospermum.*

C. Gossypium, *DC.*, F.B.I—I-190. *Kathlyagond.* Poona. Feb.

2. *Scolopia.*

S. crenata, *Clos.*, F.B.I.—I-191. W. Ghats, S. of Ramghat, *Dalzell.*

3.* *Bixa.*

B. Orellana, *Linn.*, F.B.I.—I-190. *Kesri, Shendri.* Arnatto tree, widely planted. Sept.

4. *Flacourtia.*

F. montana, *Graham*, F.B.I.—I-190. *Attak.* W. Ghats, Ankola. Nov.-Dec.

F. ramontchi, *L'Herit.*, F.B.I.—I-193. *Tambat.* W. Ghats, widely. May-Sept.

F. sepiaria, *Roxb.*, F.B.I.—I-194. *Tambat Atrun.* W. Ghats, widely. April.

9. *Hydnocarpus.*

H. Wightianus, *Blume.*, F.B.I.—I-196. *Kadu Kavath.* W. Ghats, widely. Jan.-Apr.

XV.—PITTOSPOREÆ.

1. *Pittosporum.*

P. floribundum, *W. & A.*, F.B.I.—I-199. *Yekaddi.* Mahableshwar. July.

P. dasycaulon, *Miquel*, F.B.I.—I-199. Yacombi, N. Kanara. Jan.

XVI.—POLYGALEÆ.

1. *Polygala.*

P. abyssinica, *Fresen.*, F.B.I.—I-202. Sind. Dec.

P. persicariæfolia, *DC.*, F.B.I.—I-202. Hills near Poona. Aug.-Sept.

P. erioptera, *DC.*, F.B.I.—I-203. Nasik, Ankleswar, Broach. August.

P. elongata, *Klein.*, F.B.I.—I-203. Savantwadi, Badami. Aug.-Nov.

P. chinensis, *Linn.*, F.B.I.—I-204. *Phutani.* Poona, Dharwar. Oct.-Mar.

XVIII.—CARYOPHYLLEÆ.

5. *Saponaria.*

S. Vaccaria, *Linn.*, F.B.I.—I-217. *Sabni.* Nasik, Poona, Mahableshwar. Feb.

6. *Silene.*

S. noctiflora, *Linn.* Poona, weed in gardens. Dec.-Jan.

10. *Cerastium.*

C. indicum, *W. & A.*, F.B.I.—I-227. Purandhur. Sept.

11. *Stellaria.*

S. media, *Linn.*, F.B.I.—I-230. Mahableshwar. Dec.

13. *Arenaria.*

A. neelgherrensis, *W. & A.*, F.B.I.—I-239. Yacombi, N. Kanara. Feb.

16. *Spergula.*

S. arvensis, *Linn.*, F.B.I.—I-243. Khirtar Mts., Sind.

18. *Polycarpon.*

P. Lœflingiæ, *Benth. & Hook.,f.*, F.B.I.—I-245. Mahableshwar, Lanowli. Apr.-June.

19. *Polycarpæa.*

P. corymbosa, *Lamk.*, F.B.I.—I-245. Badami, Dharwar, Poona. Nov.-Jan.

P. diffusa, *W. & A.*, F.B.I.—I-245. Badami. Sept.

P. spicata, *W. & A.*, F.B.I.—I-246. Porebandar, Mangrol, Tata, Sind. Nov.-Feb.

XIX—PORTULACEÆ.

1. *Portulaca.*

P. oleracea, *Linn.*, F.B.I.—I-246. *Ghol.* Deccan, Guzerat, Sind. Oct.-Dec.

P. Wightiana, *Wall.*, F.B.I.—I-247. Londa,, Belgaum. Oct.-Nov.

P. quadrifiida, *Linn.*, F.B.I.—I-247. *Ranghol, Raya ghol.* Badami, Dharwar. Nov.

P. tuberosa, *Roxb.*, F.B.I.—I-247. *Junglee gajar.* Mulier river, Karachi. Aug.

P. suffruticosa, *Wight*, F.B.I.—I-247. Ahmedabad. Nov.

2. *Talinum.*

T. cuniefolium, *Willd.*, F.B.I.—I-247. Singhur, Purandhur, Poona, Dist. Nov.

XX.—TAMARISCINEÆ.

1. *Tamarix.*

T. gallica, *Linn.*, F.B.I—I-248. *Jhavrajhad.* Sind. Dec.

T. dioica, *Roxb.*, F.B.I.—I-249. *Jhau.* Broach, Sind. Nov.

T. ericoides, *Rottl.*, F.B.I.—I.-249. *Khadsherni.* Poona, Broach, Gulgeri. Nov.

XXI.—ELATINEÆ.

2. *Bergia.*

B. odorata, *Edgew.*, F.B.I.—I-251. Sibi, Sind, Dahoi, Porbunder. Oct.-Nov.

B. æstivosa, *W. & A.*, F.B.I.—I-251. Rajkot, *C. MacNaghten.* Poona.

B. ammannioides, *Roxb.*, F.B.I.—I-251. Poona, Karachi, Bhubak, Sind. Nov.-Dec.

B. verticillata, *Willd.*, F.B.I.—I-252. Dasgaon, Konkan. Oct.

XXIII.—GUTTIFERÆ.

1. *Garcinia.*

C. indica, *Chois.*, F.B.I.—I-261. *Kokam ratamba.* Ambeghat, Matheran. Jan.

G. Morella, *Dess.*, F.B.I.—I-264. *Arsinagurgi, Nardala.* Siddapur, N. Kanara. Nov.

G. Xanthochymus, *H.-f.*, F.B.I.—I-269. *Ont, Jharambi.* W. Ghats, widely. March.

G. ovalifolius, *H.-f.*, F.B.I.—I-269. *Haldi, Tavir.* Matheran, W. Ghats, in fruit. March.

2. *Ochrocarpus.*

O. longifolius, *B. & H.*, F.B.I.—I-270. *Surangi*, Khandalla, Kudgal, N. Kanara. Feb.-Mar.

3. *Calophyllum.*

C. inophyllum, *Linn.*, F.B.I.—I-273. *Undi.* Ratnageri, Kumta. January.

C. Wightianum, *Wall.*, F.B.I.—I-274. *Bobbi, Irai.* Yellapur, *Talbot,* in fruit. March.

5. *Mesua.*

M. ferrea, *Linn.*, F.B.I.—I-277. *Nag-chappa.* Konkan. Nov.-Jan.

XXV.—DIPTEROCARPEÆ.

2. *Ancistrocladus.*

A. Heyneanus, *Wall.*, F.B.I.—I-299. *Kardor, Kurdul.* Divimana, W. Ghats, Thana District. Jan.-Mar.

5. *Shorea.*

S. Talura, *Roxb.*, F.B.I.—I-304. Sirsi, Siddapur, N. Kanara. Feb.-Apl.

6. *Hopea.*

H. Wightiana, *Wall.*, F.B.I.—I-309. *Haiga Kavsi.* Londa, Castle Rock, W. Ghats. June.

8. *Vateria.*

V. indica, *Linn.*, F.B.I.—I-313. *Dhupada.* Siddapur and Sirsi Districts. Feb.-Apl.

XXVI.—MALVACEÆ.

1. *Althæa.*

A. Ludwigii, *Linn.*, F.B.I.—I-319. Karli, Poona, Hyderabad, *Schwan,* Sind. Mar.-July.

A. rosea, *Linn.*, F.B.I.—I-319. *Hollyhock.* In gardens. Jan.-Mar.

3. *Malva.*

M. rotundifolia, *Linn.*, F.B.I.—I-320. *Khaparkhuti.* Deccan, widely. Sept.-Jan.

M. parviflora, *Linn.*, F.B.I.—I-321. *Narr, Gogi Sag.* Magarpir, Sind. March.

4. *Sida.*

S. humilis, *Willd.*, F.B.I.—I-322. Guzerat, Sind, widely. Oct.-Nov.

S. mysorensis, *W. & A.*, F.B.I.—I-322. Deccan, widely. Nov.-Jan.

S. spinosa, *Linn.*, F.B.I.—I-323. Deccan, Guzerat. Nov.

S. grewioides, *Guill. & Perr.*, F.B.I.—I-323. Karachi. December.

S. carpinifolia, *Linn.*, F.B.I.—I-323. *Chikna.* Poona, Marmagao. December.

S. rhombifolia, *Linn.*, F.B.I.—I-323. *Bala, Jungli Methi.* Poona, Belgaum. Oct.-Dec.

S. cordifolia, *Linn.*, F.B.I.—I-324. Gokak, Belgaum, Badami, Dharwar. Oct.-Nov.

5. *Abutilion.*

A. polyandrum, *Schl.*, F.B.I.—I-325. W. Ghats, widely. Nov.-Jan.

A. Ranadei, *Woodrow and Staph., Kew Bull.* 1894, fol. 99. Ambeghat, W. Ghats. Dec.-Mar.

A. indicum, *G. Don.*, F.B.I.—I-326. *Mudra.* Deccan, widely.

A. graveolens, *W. & A.*, F.B.I.—I-327. *Barkanghi.* Sehwan, Sind. March.

A. muticum, *G. Don.*, F.B.I.—I-327. Deccan, widely. Jan.-July.

A. crispum, *G. Don.*, F.B.I.—I-327. Badami, Dharwar. November.
A. ramosum, *Guill. and Perr.*, F.B.I.—I-328. Ahmedabad, Karachi. Dec.
A. fruticosum, *Guill. and Perr.*, F.B.I.—I-328. *Pat til.* Banks of Mulier, Karachi. Aug.-Sept.

5.* *Malachra.*

M. capitata, *Linn.*, F.B.I.—I-329. *Ran bhendi.* Bombay abundant. Nov.-Jan.

6. *Urena.*

U. lobata, *Linn.*, F.B.I.—I-329. *Vanabhend.* Kalyan, Belgaum. Oct.-Dec.
U.————var. scabriuscula, *DC.*, Belgaum. December.
U. sinuata, *Linn.*, F.B.I.—I-329. Londa. Oct.-Nov.

7. *Pavonia.*

P. glechomifolia, *A. Rich.*, F.B.I.—I-330. Kathiawad, Sind.
P. arabica, *Hochst.*, F.B.I.—I-331. Sind.
P. zeylanica, *Cav.*, F.B.I.—I-331. Ahmednagar, Broach, Sind. November.
P. ceratocarpa, *Dalz.*, F.B.I.—I-331. Karachi, December.

8. *Decaschistia.*

D. trilobata, *Wight*, F.B.I.—I-332. Amboli, Castle Rock, W. Ghats. Nov.

11. *Senra.*

S. incana, *Cav.*, F.B.I.—I-333. Karachi. December.

12. *Hibiscus.*

H. Trionum, *Linn.*, F.B.I.—I-334. Deccan, Sind, widely. February.
H. surattensis, *Linn.*, F.B.I.—I-334. *Rán bhendi.* Kumta. Nov.-Dec.
H. furcatus, *Roxb.*, F.B.I.—I-335. Castle Rock, W. Ghats. Oct.-Feb.
H. radiatus, *Willd.*, F.B.I.—I-335. Junnar (Poona Dist.), Dhulia. Sept.-Oct.
H. hirtus, *Linn.*, F.B.I.—I-335. *Dupari.* Matheran, Khandala, Poona. Aug.-Feb.
H. micranthus, *Linn.*, F.B.I.—I-335. Poona, Guzerat, Sind, widely. October.
H. scindicus, *Stocks.*, F.B.I.—I-336. Sind, *Stocks.*, specimen wanted.
H. intermedius, *A. Rich.*, F.B.I.—I-336. Sind, *Stocks.*, Kathiawad, *Dalz.*, specimens wanted.
H. Solandra, *L. Her.*, F.B.I.—I-336. Guzerat, Dharwad. November.
H. collinus, *Roxb.*, F.B.I.—I-338. Gardens.
H. panduræformis, *Burm.*, F.B.I.—I-338. Chinchwad, Poona District. Oct.
H. vitifolius, *Linn.*, F.B.I.—I-338. *Vankapas.* Bahuli, Poona Dist. Revadanda, Oct.-Dec.
H. cannabinus, *Linn.*, F.B.I.—I-339. *Ambadi.* Cultivated, widely.
H. Gibsoni, *Stocks.*, F.B.I.—I-339. Deccan, Concan. Sind, *Stocks.*, not found.
H. punctatus, *Dalz.*, F.B.I.—I-340. Karachi. Aug.-Dec.
H. Sabdariffa, *Linn.*, F.B.I.—I-340. *Lal ambadi.* Cultivated widely. Oct.-Dec.
H. ficulneus, *Linn.*, F.B.I.—I-340.
H. Manihot, *Linn.*, F.B.I.—I-341. In gardens.
H. tetraphyllus, *Roxb.*, F.B.I.—I-341. *Jungli bhendi.* Amboli, Jambulpada. October.

H. angulosus, *Mast.*, F.B.I.—I-341. Concan.
H. Abelmoschus, *Linn.*, F.B.I.—I-342. *Kasturi bhendi.* In gardens.
H. tiliaceus, *Linn.*, F.B.I.—I-343. Planted.
H. esculentus, *Linn.*, F.B.I.—I-343. *Bhajichi bhendi.* Gardens.
H. rosa sinensis, *Linn.*, F.B.I.—I-344. *Jasundi.* Gardens.
H. mutabilis, *Linn.*, F.B.I.—I-344. Gardens.
H. syriacus, *Linn.*, F.B.I.—I-344. „
H. schizopetalus. Gardens.

13. *Thespesia.*

T. Lampas, *Dalz. & Gibs.*, F.B.I.—I-345. *Ran bhendi.* W. Ghats, widely. Aug.-Sept.
T. populnea, *Corr.*, F.B.I.—I-345. *Bhendi.* Shrivardhan. Sept.

14. *Gossypium.*

G. Stocksii, *Mast.*, F.B.I.—I-346. Wild cotton of Sind. Near Karachi. Dec.
G. arboreum, *Linn.*, F.B.I.—I-347. *Narma* or *Deokapas*, a tall fastigiate shrub with deeply-lobed leaves, purple flowers, lanceolate stipules and seeds covered with white wool over-lying green down. In gardens.
G. neglectum, *Tod.*, Watt. Dict., IV.—7. *Deshi* at Ahmednagar, Bengals of commerce. Resembling G. arboreum in habit of growth and form of leaf, but with yellow flowers with a purple centre. Evidently a hybrid or selection from G. arboreum.
G. religiosum, *Roxb.* ... A vigorous diffuse shrub, thriving in moist sandy soil; stipules, cordate acuminate; flowers, yellow, large; down, adherent to seeds; wool, white or tawny.
G. braziliense, *Macf.* ... Pernambuco or Brazilian cotton; resembling *G. ligiosum*, but with coherent seeds.
G. Wightianum ... ... Hinganghat cotton.
G. sp., wild, Badami, Dharwar—A climber in hedges on sandy soil; leaves 3—5 fid, pubesence stellate; gulfs between the lobes, variable, often with a blunt tooth; stipules falcate; bracts cordate, toothed.

15. *Kydia.*

K. calycina, *Roxb.*, F.B.I.—I-348. Ghats. Nov.

15.° *Adansonia.*

A. digitata, *Linn.*, F.B.I.—I-348. *Gorakhchinch*, widely planted, Caranja, naturalised.

16. *Bombax.*

B. malabaricum, DC., F.B.I.—I-349. *Savar*, Katesavar, Deccan, Konkan, widely. Mar.-April.
B. insigne, *Wall.*, F.B.I.—I-349. N. Kanara. Mar.-Apl.

17. *Eriodendron.*

E. anfractuosum, *DC.*, F.B.I.—I-350. *Pandhrisavar.* Mawal, Poona Dist. January.

XXVII.—STERCULIACEÆ.

Sterculia.

S. fœtida, *Linn.*, F.B.I.—I-354. *Devdar.* Konkan, planted. Mar.-Apl.

S. urens, *Roxb.*, F.B.I.—I-355. *Saldhol, Candol.* W. Ghats, Konkan, widely. December.

S. villosa, *Roxb.*, F.B.I.—I-355. *Cowichá.* Gadhvi, Dang. February.

S. guttata, *Roxb.*, F.B.I.—I-355. *Kukar, Goldar.* W. Ghats, widely. February

S. colorata, *Roxb.*, F.B.I.—I-359. *Khaushi.* W. Ghats. March-April.

S. alata, *Roxb.*, F.B.I.—I-360. Burboli Ghat, N. Kanara, recently widely planted, Poona, Khandala.

S. populifolia, *Roxb.*, F.B.I.—I-361. Hewra, planted.

S. Campanulata, *Wall.*, F.B.I.—I-362. Follicles membranaceous 1-seeded, dorsally winged, planted. Khandala Hotel. Mar.

5. *Kleinhovia.*

K. Hospita, *Linn.*, F.B.I.—I-364. Planted.

6. *Helicteres.*

H. isora, *Linn.*, F.B.I.—I-365. *Kewan, Murudsheng.* Guzerat Deccan, Konkan, widely. July-Nov.

7. *Pterospermum.*

P. suberifolium, *Lam.*, F.B.I.—I-367. *Muchkund.* N. Kanara. Poona, planted. December.

P. acerifolium, *Willd.*, F.B.I.—I-368. *Kanakchapha.* Deviman Ghat : widely planted. Dec.-Feb.

P. reticulatum, *W. & A.*, F.B.I.—I-369. Poona, planted : W. Ghats, southward.

P. Heyneanum, *Wall.*, F.B.I.—I-369. Dharwad, *Dalz.*

8. *Eriolæna.*

E. Stocksii, *Hook.f.*, F.B.I.—I-370. Knkan, *Stocks*, specimens wanted.

E. Candollei, *Wall.*, F.B.I.—I-370. *Bothi, Hadang.* Konkan, *Dalz.*; deciduous forests, N. Kanara, *Talbot.*

E. quinquelocularis, *Wight.*, F.B.I.—I-371. *Budjaridhaman.*

9. *Pentapetes.*

P. phœnicea, *Linn.*, F.B.I.—I-371. *Tambdidupari.* Birchy, N. Kanara, Sehwan, Sind, in gardens. Aug.-Nov.

10. *Melhania.*

M. incana, *Heyne*, F.B.I.—I-372. Badami. November.

M. tomentosa, *Stocks.*, F.B.I.—I-373. Sind.

M. Denhami, *Br.*, F.B.I.—I-373. Hills near Karachi. December.

11. *Melochia.*

M. corchorifolia, *Linn.*, F.B.I.—I-374. Near Godhra, Bombay. Sept.-Nov.

M. velutina, *Bedd.*, F.B.I.—I-374. Poona, planted. November.

12. *Waltheria.*

W. indica, *Linn.*, F.B.I.—I-374. Badami, Dharwad. August.

13. *Abroma.*

A. augusta, *Linn.*, F.B.I.—I-375. *Ulat-kambal.* Widely, in gardens. Jan.

14. *Guazuma.*

G. tomentosa, *Kunth.*, F.B.I.—I-375. *Rudrakshi.* Planted widely. Mar.-Aug.

XXVIII.—TILIACEÆ.

6. *Grewia.*

G. columnaris, *Sm.*, F.B.I.—I-383. Santaveri, *Talbot*, in fruit. December.

G. orientalis, *Linn.*, B.B.I.—I-384. Western India, *De Crespigny.*

G. heterotricha, *Mast.*, F.B.I.—I-385. Nilkand, N. Kanara, *Talbot.* November.

G. populifolia, *Vahl.*, F.B.I.—I-385. *Gango, Gangi* (Sind.) Badami, Dharwad, Sind. Aug.-Oct.

G. salvifolia, *Heyne.*, F.B.I.—I-386. *Bihul* (Sind). Badami. June-Aug.

G. tiliæfolia, *Vahl.*, F.B.I.—I-386. *Dhaman.* Bhimashankar, Hills near Poona, May-Aug.

G. asiatica, *Linn.*, F.B.I.—I-386. *Phalsa.* Cultivated widely.

G. carpinifolia, *Juss.*, F.B.I.—I-387. Londa, Dharwad. October.

G. pilosa, *Lam.*, F.B.I.—I-388. Badami. August.

G. villosa, *Willd.*, F.B.I.—I-388. Porebunder, in fruit. October.

G. lævigata, *Vahl.*, F.B.I.—I-389. Karwar, Halyal, *Talbot.* Aug.-Oct.

G. Ritchiei, *Mast.*, F.B.I.—I-389. Konkan, *Stocks*, W. Ghats, *Ritchie.*

G. abutilifolia, *Juss.*, F.B.I.—I-390. .....

G. hirsuta, *Vahl.*, F.B.I.—I-391. Bowdhan, near Poona. Aug.-Sept.

G. polygama, *Roxb.*, F.B.I.—I-391. Matheran, Amboli, W. Ghats. Oct.-Dec.

G. microcos, *L.*, F.B.I.—I-392. Castle Rock, W. Ghats. November.

SOME LAND AND FRESH-WATER SHELLS COLLECTED IN THE ISLAND OF BOMBAY.

By A. J. Peile, R.A.

(*Read before the Bombay Natural History Society on* 18*th March*, 1897.)

The object of this paper is to give an account of the land and fresh-water *Mollusca* already collected in Bombay which will enable collectors to name their specimens, and also to draw the attention to this branch of Natural History of those who generally look on the "snail" as an annoying visitor to the garden. It does not take any notice of species, however common, that have not been found in the island itself; and the descriptions, it is feared, will not be elaborate enough to distinguish some of the species from others closely resembling them to be found in other localities. This, in many cases, can only be done by comparison with a good collection—a thing that the Society should have, and for which the co-operation of members is asked.

The species described are fairly typical of those to be found all over India.

The land *Mollusca* are particularly interesting to the Naturalist, as affording evidence of geographical distribution, and also on account of their extremely interesting and varied shapes.

The fresh-water *Mollusca*, on the other hand, show prevailing forms very widely distributed.

A very convenient way to divide our species for the purposes of classification is into operculate and inoperculate. This, to all intents and purposes, separates them into two natural orders to which they as univalves belong, *viz.*, *Prosobranchiata* and *Pulmonata*. To the first of these two orders belong also a number of the marine *Mollusca*, some of which are operculate and some not, such as whelks and cowries. The land and fresh-water families belonging to it are all operculated.

The land families, while resembling the other members of the order in many points of their anatomy, have the ctenidium, or breathing organ, replaced by a pulmonary sac to enable them to breathe air.

The families belonging to the second order, the *Pulmonata*, are almost without exception inoperculate and breathe by means of a pulmonary sac. Whether all the fresh-water members rely altogether on this sac for their air-supply seems uncertain. The animals are hermaphrodite, whereas in the first order the sexes are distinct.

For the sake of still greater convenience, we will divide the species for purposes of description into two groups according to their habits.

PART I.—TERRESTRIAL.

The only family of the operculated Land Snails represented in our catalogue is the *Cyclophoridæ* and that by only one species, *C. indicus* (Deshayes). The family is very well represented in India by a large number of very interesting species, some of the smaller ones being very remarkable for their curious forms, and it is to be hoped that a more thorough investigation will bring some to light in our island.

C. indicus is the largest and most solid of our Bombay snails. It is not very common, and, like all the rest of the species to be described, is never found except in the monsoon. The shell is turbinate in shape, about 1″ in height, with a large umbilicus, or central hole round which the shell is coiled. Colour white, mottled with brown, the lower part of the whorl carrying a fairly well-defined brown streak, with finer, somewhat broken, lines running parallel to it on the underside. The perfect shell has a reflexed lip and a circular aperture, $\frac{3}{4}$″ across. The inside of the lip is red. The animal has a circular, spirally-formed operculum with which it can completely close the mouth of its shell.

Of the *Pulmonata* we have several land families represented, the first to be described being the *Limacidæ*.

This family is very strongly represented in this country by the *Naninidæ* or snails with caudal mucous pores, of which India possesses about 200 species. The old writers describe these species as *Helix*. The *Naninidæ* are divided into a number of sub-genera, and we have in Bombay the following species.

Ariophanta lævipes (Muller), which also rejoices in the specific names of *trifasciata* (Chemnitz) and *spadicea* (Gmelin), is one of the commonest of our snails. The shell is sinistral, flattened, about 1″ across, umbilicus very small. The full-grown animal forms a fairly solid lip. The shells frequently bear conspicuous marks of old lips, marking periods of growth. As to colour, the shell may be said to be white, striped with three bands of brown; but, on account of the variation in these bands, specimens are met with varying from an almost black colour to almost pure white.

The animal is nearly always of the same yellowish colour, and it would be interesting to know what is the cause of the variation in the shell; dark specimens seem to abound in some localities and light ones in others.

The animal has the mucous pore on its tail plainly defined, but it is not surmounted by any protuberance, neither does any part of the mantle overlap the shell at the aperture to form what are known as shell-polishing lobes.

The absence of these characters is distinctive of the genus *Ariophanta*.

Ariophanta bajadera (Pfeiffer) is also a sinistral shell, not quite as large as *A. lævipes*, but deeper and more globular, also much more fragile, of a greenish-yellow colour. The shell is beautifully corrugated radially, and the last whorl is large in proportion to the others.

The animal is somewhat similar to *A. lævipes*.

The shell being very thin and transparent, some of the anatomy of the animal can easily be discerned through it, including the kidney and the pulsating heart.

This species does not appear common in Bombay, but is fairly plentiful at Matheran, where it seems to grow a stronger shell.

Nanina pedina (Benson) is quite our commonest garden snail; the shell is dextral, rather larger and more fragile than that of *A. lævipes*, being about $1\frac{1}{2}''$ across and of a brownish colour. It is more or less flattened in shape, but different individuals vary a little in the raising of the spire. The umbilicus is small.

The animal has a prominent horn-shaped protuberance on its mucous pore, and two shell-polishing lobes to its mantle almost like feelers in shape, one doubled back on the centre of the whorl, the other pointing forwards in prolongation of the suture. The animal at times, when disturbed, secretes mucous very profusely, for exactly what purpose it is hard to say; it may be some protection from the attacks of insects—ants for instance. The heart can also be observed pulsating in this species. I have reason for suspecting this snail of cannibal propensities.

This species is exceedingly common at Matheran.

Nanina (*Microcystina*) *tenuicola* (Adams) is a very much smaller species than the foregoing, the shell being only from $\frac{1}{4}''$ to $\frac{3}{8}''$ across, thin and transparent, of a greenish-yellow colour, dextral in shape, the spire a good deal raised. The animal has no shell-polishing lobes,

the horn on the mucous pore is fairly long. This species is not uncommon, but is inconspicuous owing to its small size.

Nanina (*Microcystina*) *perrotteti* (Pfeiffer) is also a small dextral species; the shell about $\frac{3}{8}''$ across, much flatter than *M. tenuicola* and of a brownish colour, has the general appearance of a very young *N. pedina*. The animal is of a bluish colour and very lively, the horn on the mucous pore is well marked, and the mantle has two broad shell-polishing lobes about $\frac{1}{16}''$ broad, one protruding back, and the other forward, over the shell.

This species often escapes notice from its small size and general resemblance to a young *N. pedina*.

The next family, the *Helicidæ*, is that to which all the common English snails belong.

Of *Helix* proper we have only one species, but we have some species belonging to genera of which it is doubtful whether they belong here or to the *Pupidæ*.

Our *Helix* is *H.* (*Trichochloritis*) *propinqua* (Pfeiffer). It is, as far as I know, uncommon in Bombay, and I have never found an adult specimen alive. I have specimens of what appears to be the same species from Mahableshwar and Panchgani, where it seems to be not uncommon.

It is an elegant shell, from $\frac{5}{8}''$ to $\frac{3}{4}''$ across; the spire is rather flat in some specimens and a little raised in others. The adult animal forms a reflexed lip, the aperture pointing slightly downwards. Colour whitish with a single dark line running on the line of the suture. It is a dextral shell, and but for that, is easily mistaken for a small *Ariophanta* (*lævipes*), which is perhaps partly why it has escaped notice.

To the third family, the *Pupidæ*, so called from their resemblance to a chrysallis, belong five of our species, including two species which should perhaps be classed as *Helicidæ*.

The first species, *Pupa* (*Leucochila*) *cœnopicta* (Hutton) is a small brown cylindrical shell $\frac{1}{4}''$ in length and less than $\frac{1}{8}''$ in breadth. The aperture is oval and the adult shell has a wide lip of a lighter colour. This species seems fairly common.

Buliminus (*Mastus*) *insularis* is a small, solid, whitish-coloured cylindrical shell about $\frac{3}{8}''$ long and $\frac{3}{16}''$ broad. The adult forms a slightly strengthened lip. I have never yet found it alive in Bombay, but it seems to affect somewhat drier localities than most of our land

species. I have specimens of what appear to be the same species from the Punjab, and of a variety of the same from Aden.

Buliminus moussonianus (Petit)—*Abyssinicus* var., is perhaps the most beautiful of our snails. The shell is $\frac{3}{4}''$ long and $\frac{3}{8}''$ broad, with a rather wide lip in the adult, and a small umbilicus. Colour light brown, specimens almost white are occasionally found. The surface of the shell is beautifully sculptured or corrugated with ridges running parallel to the aperture. The animal is of a pinkish colour, and when killed by dipping in boiling water has a curious smell not at all unpleasant. This species appears uncommon.

The next two species should perhaps be classed with the *Helicidæ*.

Buliminus (*Rachis*) *bengalensis* (Lmk.) is a shell of much the same size and shape as the last, but a little longer and not quite so stout, and the lip not so pronounced. The surface of the shell is smooth, colour whitish, with two lines running round the shell, the lower of the two the darker in colour, the upper one following the suture. Apex black.

This species is fairly common.

Buliminus (*Rachis*) *punctatus* (Anton) is very similar in many ways to the last, but is smaller and more pointed ; colour light brown with a dark line on the suture with a light line immediately below it. The surface of the shell is covered with minute spots of a darker colour, whence the name.

This species is common, and I have specimens from the Punjab.

The fourth family, the *Stenogyridæ*, has two representatives on our list: the first, *S. gracilis* (Hutton), is a slender, somewhat pointed cylindrical shell about $\frac{3}{8}''$ to $\frac{1}{2}''$ in length and $\frac{1}{8}''$ in breadth, of a yellowish colour, minutely sculptured radially ; aperture elongated. Is fairly common.

The other, *Glessula* species, has not yet been found by me alive nor in a perfect state. It appears to be arboreal in its habits. It is a cylindrical shell much larger and stouter than *S. gracilis*.

The fifth family, the *Succinœidæ*, is represented by one species, *S. vitrea* (Pfeiffer). It is a small, somewhat globular shell, about $\frac{1}{4}''$ to $\frac{3}{8}''$ long, spire very small, and last whorl very large in proportion ; shell very delicate, colour whitish. The well-known English representative of this family ranks more as a fresh-water than as a land-shell, but ours is generally found on trees in wet weather. It is a common species, but large specimens are not often found.

LIST OF BIRDS IN THE GWALIOR STATE MUSEUM, COLLECTED IN THE GWALIOR STATE.

By C. Maries, F.L.S., Curator.

25	Aquila vindhiana...	...(Frankl.)	... The Tawny Eagle.
23	„ mogilnick...	...(Gmel.)	... The Bifasciated Eagle.
38	Haliætus leucogaster	...(Gmel.)	... The White-bellied Sea Eagle.
51	Pernis ptilorhynchus	...(Tem.)	... The crested Honey Buzzard.
47	Circus æruginosus...	...(Lin.)	... The Marsh Harrier.
44	Circus macrurus ...	...(S.G. Gmel.)	The Pale Harrier.
44	Circus macrurus ...	...(S.G. Gmel.)	The Pale Harrier (Female.)
49	Milvus govinda ...	...(Sykes)	... The common Pariah Kite.
48	Haliastur indus ...	...(Bodd.)	... The Maroon-backed or Brahminy Kite.
52	Elanus cæruleus ...	...(Desf.)	... The Black-winged Kite.
42	Butastur teesa ...	...(Frankl.)	... The White-eyed Buzzard.
19	Astur badius ...	...(Gmel.)	... The Shikra or Indian Sparrow Hawk.
10	Falco jugger ...	...(J. E. Gr.).	.. The Laggar Falcon.
14	Falco chiquera ...	...(Daud.)	... Red-headed Merlin.
15	Cerchneis tinnunculus	...(Lin.)	... The Kestrel.
53	Strix javanica ...	...(Gmel.)	... Indian Screech Owl.
72	Ninox lugubris ...	...(Tick.)	... The Brown Hawk Owl.
55	Syrnium ocellatum	...(Less.)	... The Mottled Wood Owl.
69	Glaucidium malabaricum	...(Bly.)	... The Malabar Owlet.
74	Hirundo filifera ...	...(Steph.)	... The Wire-tailed Swallow.
97	Merops sumatranus	...(Raffl.)	... The Malayan Bee-eater.
95	Merops phillippinus	...(Lin.)	... The Blue-tailed Bee-eater.
99	Coracias indica ...	...(Lin.)	... The Indian Roller.
102	Halcyon smyrnensis	...(Lin.)	... The White-breasted Kingfisher.

104	Alcedo bengalensis	...(Gmel.)	... The common Indian Kingfisher.
106	Ceryle rudis ...	...(Lin.)	... The Pied Kingfisher.
118	Palæornis purpureus	...(P. L. S. Mull.)	The Rose-headed Parraquet.
128	Picus mahrattensis	...(Lath.)	... The Yellow-fronted Woodpecker.
149	Brachypternus aurantius	...(Lin.)	... The Golden-backed Woodpecker.
158	Megalæma caniceps	...(Frank.)	... The common green Barbet.
165	Cuculus canorus ...	...(Lin.)	... The European Cuckoo.
177	Endynamis honorata	...(Lin.)	... The Koel or Black Cuckoo.
175	Coccystes jacobinus	...(Bodd.)	... The Pied-crested Cuckoo.
170	Hierococcyx varius	...(Vahl.)	... The common Hawk-Cuckoo.
181	Centrococcyx rufipennis	...(Ill.)	... The common Coucal or Crow Pheasant.
213	Lanius lahtora ...	...(Sykes.)	... The Indian Grey Shrike.
230	Pericrocotus speciosus	...(Lath.)	... The large Minivet.
236	Buchanga atra ...	...(Herm.)	... The common Dronga Shrike or "King Crow."
239	Buchanga cærulescens	...(Lin.)	... The White-bellied Drongo.
246	Terpsiphone paradisi	...(Lin.)	... The Paradise Fly-catcher.
249	Rhipidura albifrontata	...(Frankl.)	... The White-browed Fantail.
254	Alseonax latirostris	...(Raffl.)	... The Earth-brown Fly-catcher.
274	Muscicapa albicilla	...(Pall.)	... The Eastern White-tailed Robin Fly-catcher.
294	Monticola cyanus...	...(Lin.)	... The Blue Rock-thrush.
296	Monticola cinclorhyncha	...(Vig.)	... The Indian Rock-thrush.

315	Pyctorhis sinensis	...(Gmel.)	... The Yellow-eyed Babbler.
385	Pycnonotus hæmorrhous	...(Gmel.)	... The common Madras Bulbul.
394	Oriolus kundoo ...	...(Sykes.)	... The Indian Golden Oriole.
398	Copsychus saularis	...(Lin.)	... The Magpie Robin.
403	Thamnobia cambaiensis	...(Lath.)	... The Brown-backed Indian Robin.
406	Pratincola maura...	...(Pall.)	... The Indian Bush-chat.
411	Ruticilla rufiventris	...(Vicill.)	... The Indian Red-start.
	Saxicola picta ...	...(Blythe.)	... The Stone-chat.
472	Motacilla maderaspatensis	...(Gmel.)	...The Pied Wagtail.
528	Dendrocitta rufa ...	...(Scop.)	...The common Indian Magpie.
533	Sturnus vulgaris	...(Lin.)	...The common Starling.
537	Acridotheres tristis	...(Lin.)	...The common Mynah.
538	Acridotheres ginginianus	...(Lath.)	...The Bank Mynah.
547	Pastor roseus ...	...(Lin.)	...The Rosy Starling.
541	Sturnia pagodarum	...(Gmel.)	...The Black-headed Mynah.
562	Passer domesticus	...(Lin.)	...The common House Sparrow.
565	Petronia flavicollis	...(Frankl.)	...The Yellow-necked Sparrow.
	Passer hispanidensis	...(Temn.)	...The Willow Sparrow.
599	Crocopus phœnicopterus	...(Lath.)	...The Bengal Green Pigeon.
519	Corone macrorhyncha	...(Wagl.)	...The Indian Corby.
622	Pterocles fasciatus	...(Scop.)	...The Painted Sand Grouse.
638	Francolinus pictus	...(Jerd. and Selb.)	...The Painted Partridge.
653	Turnix joudera ...	...(Sykes.)	...The Large Button Quail.
645	Perdicula argoondah	...(Sykes.)	...The Rock Bush Quail.
623	Pterocles exustus...	...(Tem.)	...The common Sand Grouse.

657	Cursorius coromandelicus.	(Gm.)	...The Indian Courser or Courier Plover.
660	Squatarola helvetica	...(Lin.)	...The Grey Plover.
668	Vanellus vulgaris...	...(Bechst.)	...The Crested Lapwing or "Peewit."
670	Chettusia villotæi	...(And.)	...The White-tailed Lapwing.
671	Lobivanellus indicus	...(Bodd.)	...The Red-wattled Lapwing.
672	Lobipluvia malabarica	...(Bodd.)	...The Yellow-wattled Lapwing.
684	Gallinago cœlestis	...(Frenzel.)	...The Common Snipe.
685	Gallinago gallinula	...(Lin.)	...The Jack Snipe.
686	Rhynchœa bengalensis	...(Lin.)	...The Painted Snipe.
687	Limosa ægocephala	...(Lin.)	...The Small Godwit.
690	Machetes pugnax	...(Lin.)	...The Ruff.
692	Tringa alpina	...(Lin.)	...The Dunlin.
693	Tringa minuta	...(Leisl.)	...The Little Stint.
695	Rhyacophila glareola	...(Lin.)	...The Spotted Sandpiper.
678	Grus lencogeranus	...(Pall.)	...The Snow Wreath or Great White Crane.
696	Totanus ochropus	...(Lin.)	...The Green Sandpiper.
698	Totanus glottis	...(Lin.)	...The Green-shanks.
699	Totanus stagnatilis	...(Bechst.)	...The little Green-shanks.
700	Totanus fuscus	...(Lin.)	...The Spotted Red-shanks.
702	Himantopus candidus	...(Bonn.)	...The Still or Long Legs.
705	Hydrophasianus chirurgus.	(Scop.)	...The Pheasant-tailed Jacana.
707	Fulica atra	...(Lin.)	...The Bald Coot.
708	Gallinula chloropus	...(Lin.)	...The Water Hen.
709	Erythra phœnicura	...(Penn.)	...The White-breasted Water Hen.
674	Æsacus recurvirostris	...(Cuv.)	...The Large Stone Plover.
758	Mareca penelope	...(Lin.)	...The Widgeon.
753	Anas pœcilorhyncha	...(Frost.)	...The Spotted-billed Duck.
751	Spatula clypeata	...(Lin.)	...The Shoveller.
749	Casarca rutila	...(Pall.)	...The Brahminy Duck.

747	Dendrocygna javanica	...(Horsf.)	...The Whistling Teal.
746	Nettopus coromandelianus.	(Gm.)	...The Cotton Teal.
745	Sarcidiornis melanonotus	...(Penn.)	...The Nukhta or Comb Duck.
737	Ibis melanocephala	...(Lath.)	...The White Ibis.
738	Inocotis papillosus	...(Tem.)	...The Black Ibis or King Curlew.
722	Herodias alba	...(Lin.)	...The White Heron.
726	Bubulcus coromandus	...(Bodd.)	...The Cattle Egret.
719	Dissura episcopa	...(Bodd.)	...The White-necked Stork.
720	Ardea cinerea	...(Lin.)	...The Heron.
725	Herodias garzetta	...(Lin.)	...The Little Egret.
727	Ardeola grayi	...(Sykes.)	...The Pond Heron.
728	Butorides javanica	...(Horsf.)	...The little Green Heron.
733	Nycticorax griseus	...(Lin.)	...The Night Heron.
759	Querquedula crecca	...(Lin.)	...The Common Teal.
	Porzana akool	...	...The Brown Rail.

The numbers refer to the Lucknow Museum List.

PROCEEDINGS OF THE MEETING HELD ON 16TH DECEMBER, 1896.

A meeting of the members was held at the Society's rooms on Wednesday, the 16th December, 1896, Mr. E. M. Slater presiding.

NEW MEMBERS.

The election of the following new members was announced :—Mr. Narrotum Morarjee (Life Member) (Bombay), Captain Dalme-Radcliffe (Nowgong), Mr. Lencastro Pereira d'Andrade (Marmugoa), Mr. Arthur J. Moon (Belgaum), Captain L. T. Bowles (Agra), Surgeon-Lieutenant A. Hooton (Poona), Mr. B. R. R. Rambant, R.A. (Karachi), Captain Malcolm Campbell, R.A. (Rawul Pindi), Lieutenant A.B.R. Hildebrand, R. E. (Bombay), Brigade-Surgeon-Lieutenant-Colonel P. de Haig (Bunna), Mr. George F. F. Foulkes (Madanapolli), Mr. S. Cox (Vizagapatam), Miss E. E. Spragge (Poona), Mr. William M. Bell (Bombay), Mr. F. B. Manson (Darjeeling), Mr. F. T. Welsh (Bombay), Mr. A. T. Whittle (Wadhwan), Surgeon-Major C. S. Rundle (Thayetmyo), Captain F. E. G. Skey, R.E. (Roorkee), Mr. B. R. Bomonjee (Saharanpur), and Mr. G. A. Hope, R.A. (Ellichpur).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged the receipt of the following contributions to the Society's Museum since the last meeting :—

Contribution.	Description.	Contributor.
1 Scaly Ant-eater (alive). ...	Manis pentadactyla ...	Lieut. F. Prideaux.
1 Phoorsa	Echis carinata	Major R. Light.
A number of Snakes ...	Zamenis fasciolatus... ...	Capt. E. Y. Watson.
	Bungarus arcuatus	Do.
	Tropidonotus plumbicolor ...	Do.
	Dipsas trigonata	Do.
	Silybura madurensis ...	Do.
	Lycodon jara	Do.
	Simotes splendidus	Do.
	Simotes theobaldi	Do.
	Tropidontus stolatus ...	Do.
	Psammophis sp.	Do.
2 Pigeons	Carpophagus bicolor... ...	Mr. F. E. Dempster, C.I.E.
3 Ruffs	Philomactrus pugnax ...	Mr. Chas. Maries.
2 White-tailed Plovers ...	Chuttsia villotœi	Do.
2 Little Stints	Tringa temmincki	Do.
2 Black-tailed Godwits ...	Limosa ægocephala	Do.
2 Spotted Sandpipers ...	Actitis glariola	Do.
1 Stilt	Himantopus candidus ...	Do.
1 Striolated Bunting ...	Emberiza striolatus... ...	Lieut. C. D. Lester.
A number of Marine Shells.	.....	Capt. Finny, R. I. M.
2 Chamæleons (alive) ...	Chamæleon calcaratus ...	Major R. Light.
1 Long-legged Buzzard ...	Buteo ferox	Capt. A. Newnham.
1 Florican	Sypheotides aurita	Mr. N. C. Macleod.
Marine Specimens	.....	Capt. E. Shopland.
2 Eggs of the Bronze-winged Jacana	Para indica	Mr. F. C. Dwane.
1 Snake (alive)	Zamenis diadema	The Karachi Zoological Gardens.
6 Black Cobras (alive) ...	Naga tripudians	Do.

Contribution.	Description.	Contributor.
1 Snake (alive)	Eryx johnii	The Karachi Zoological Gardens.
2 Kraits	Bungarus sindanus	Mr. L. Mountford.
1 Tree Snake (alive) ...	Dipsas trigonata	Mr. T. J. Spooner, C. E.
1 Snake	Trop. piscator	Mr. J. S. Betham.
1 Do.	Dipsas trigonata	Do.
1 Indian Wolf (mounted)....	Canis pallipes	Deposited (belonging to the late Mr. N. S. Symons).
1 Head of Wild Boar ...	Sus cristatus	Do.
2 Mahseer	Barbus tor	Do.
2 Sambur Heads	Cervus unicolor	Do.
1 Pair Sambur Horns ...	Do.	Do.
5 Bison's Skulls	Bos gaurus	Do.
Curiously deformed Tiger's Skull	Felis tigris	Capt. R. Wapshare.
1 Scaly Ant-Eater	Manis pentadactyla... ...	Mr. C. F. Harold.
Geological Specimens ...	.....	Mr. J. B. Goff.
1 Snake (alive)	Eryx johnii	The Hon. Mr. T. D. Mackenzie, C. S.
1 Marbled Teal	Chaulelasmus angustirostris.	Major Olivier, R. E.
1 Snake	Psammophis leithii	Major R. Light.
1 Do.	Zamenis ventrimaculatus ...	Do.
1 Do.	Lycodon aulicus	Do.
1 Indian Water Rail ...	Rallus indicus	Mr. G. Duxbury.
1 Krait	Bungarus arcuatus	Mr. W. Murray.
1 Snake (alive)	Tropidonotus stolatus ...	Mr. Faulkner.
1 Do. (alive)	Trop. piscator	Do.
1 Large piece of Coral ...	.....	Capt. J. H. St. John.
A number of Shells from Persian Gulf	.....	Mrs. Pearson.
1 Gannet	Sula bassana	Mr. Wm. Murray.
1 Tufted Pochard	Fuligula cristata	Mr. J. B. Adams.
1 King Crab	Lemulus sp.	Capt. Stebbing (s. s. Byculla).
1 Green Tree Snake ...	Dryophis mycterizans ...	Mr. Collins.
1 Malay Tiger Bittern (alive)	Goisakius melanolophus ...	Lieut. N. F. Wilson, R.I.M.
1 Zanzibar Monkey ...	Cercopithecus talapoin ...	Mr. G. A. Hope, R. A.
1 Black-capped Black-bird (alive)	Merula nigrepileus	Mrs. Pearson.

Mr. N. C. Macleod recorded having shot a specimen of the Lesser Florican (*Sypheotides auritra*) across the harbour near Pen towards the end of last month.

Mr. W. S. Millard showed a specimen of the Black-capped Kingfisher (*Halcyon pileata*) which he obtained at Rewa Danda a fortnight ago. This species, which is a Malay form, has very rarely been recorded as occurring in India.

Mr. E. Comber exhibited a number of most successful photographs of the Great Indian Hornbill (*Dichoceros bicornis*) which he had taken from the live specimens in the Society's rooms.

Lieutenant F. N. Wilson, R. I. M., drew attention to the live specimen of the Malay Tiger Bittern (*Goisakius melanolophus*), which he had presented to the Society, and stated that this rare bird flew on board the R. I. M. S. Canning when she was near Cochin on the Malabar Coast.

The Honorary Secretary mentioned that the two large kraits, received some time ago from Mr. L. Mountford in Sind, had been sent to Mr. G. A. Boulenger, at the British Museum, who states that they have enabled him to establish a new species, which he proposes to call *Bungarus sindanus*. An illustration of this new Indian snake will be given in an early number of the Society's Journal.

SCORPIONS.

In response to the appeal made by Mr. Robt. C. Wroughton specimens of scorpions were received from the following members :—Surg.-Major A. M. Crofts (Gwalior), Mr. E. G. Oliver (Dharwar), Mr. Thomson (Deesa), Lieut. H. A. D. Fraser, R.E., and Colonel Freeman (Mahableshwur), Surg.-Major Dimmock (Bombay), Mr. C. P. George (Secunderabad), Col. Fulton (Dharmsala), Mr. G. M. Ryan (Sind), Mr. R. Roberts (Secunderabad), Major O'Donnell (Kathiawar), Mrs. Pearson (Kharaghora), and Col. A. G. Burn (Madras).

CONTRIBUTIONS TO THE LIBRARY.

Transactions of the Zoological Society of London, Vol. XIX, Part II, from Mr. W. F. Sinclair ; Proceedings of the Zoological Society of London, 1896, Part III, from Mr. W. F. Sinclair ; List of the Animals at the Zoological Gardens, London, from Mr. W. F. Sinclair ; Annals and Mag. of Nat. Hist, Vol. XVIII, No. 105, purchased ; The Indian Forester, Vol. XXII, No. VIII in exchange; Dictionary of Economic Products of India from the Government, and North American Fauna, No. 12, in exchange.

A special vote of thanks was passed to Mr. Chas. Maries, of Gwalior, for the trouble he had taken in collecting and mounting the group of wading birds now exhibited in the Society's rooms. The exquisite finish of the work was greatly admired, and every one was glad to hear that Mr. Maries had kindly undertaken to set up a similar case of Ducks for the Society's Museum.

PAPERS READ.

The following papers were then read :—

1. Notes on the Indian Sloth Bear, by Reginald Gilbert ; 2. On the poisonous properties of *Plumbago zeylanica*, by Surg.-Maj. K. R. Kirtikar ; 3. Food of the Bull-Frog and Musk-rat, by J. A. Betham ; 4. On the Occurrence of Marshall's Iora in Cutch, by Lieut. C. D. Lester ; 5. A curious malformed Tiger's Skull, by Capt. R. Wapshare; 6 .Note on the same, by Doctor P. W. Bassett-Smith, R. N. ; 7. Nests taken from March to June at Kohat and Mussooree, by Capt. R. H. Rattray ; 8. Birds collected during 5 years' residence in the Hylakandi District, Cachar, by C. M. Inglis ; 9. On *Pericrocotus speciosus*, by E. C. Stuart Baker ; and 10. Description of two new species of Butterflies, by L. de Nicéville.

PROCEEDINGS OF THE MEETING HELD ON 18TH MARCH, 1897.

A meeting of the members took place at the Society's Rooms on Thursday last, the 18th March, 1897, Dr. D. Madonald presiding.

NEW MEMBERS.

The election of the following new members was announced:—Prince Kumar Shri Ranjit Singhji of Sanjeli (Poona), Mr. L. S. Hudson (Bombay), Mr. J. G. Counsell (Bombay), Mr. W. H. H. Vincent, I.C.S. (Alipore), Mr. Robert W. R. Pennington (Bombay), Lieut. J. H. Whitehead (Mandalay), Mr. E. Gabbett, C.E. (Rangoon), Major K. S. Dunsterville, R.A. (Allahabad), Capt. L. M. Foster (Kirkee), Mr. F. J. Varley, I.C.S. (Dhulia), Mr. John L. Morres (Poona), Lieut. G. Warnford (Manipur), Mr. H. H. Hains (Jalpaiguri), Lieut. K. E. Nangle (Ellichpore), Mr. E. Ernest Green, F.E.S. (Ceylon), Mr. J. Hope Simpson, I.C.S. (Jhansi), Mr. F. J. Donald (Jalpaiguri), Mr. Maung Po Hla (Burma), Mr. Henry Partridge (Burma), Capt. R. P. Cobbold, F. G. S. (Bombay), Mr. Robert L. H. Clerk, I.C.S. (Bulandshahr), Mr. Richard Davidson (Jalpaiguri), Mr. William Finly (Jalpaiguri), Sir George F. Hampson, Bart., F.Z.S., F.E.S. (England), Captain W. J. Ryder (Dharmsala), Mr. T. M. Rodes (N. Cachar Hill), and Mr. W. Moylan (N. Cachar Hills), William L. Edmiston (Kotagiri).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting:—

Contribution.	Description.	Contributor.
1 Green Tree Snake (alive) ...	Trimeresurus strigatus...	Mr. Simmonds.
2 Gazelles (alive) from Suakim.	Lithocranius walleri ...	Major R. G. Egerton.
1 Cobra (alive)	Naga tripudians ...	Lieut. R. S. Gillespie, R.E.
4 Turtles (alive)...	Emyda vittota	Do.
A collection of dried plants ...	.....	Mr. G. M. Woodrow.
1 Snake	Dipsas trigonata ...	Vet.-Col. J. Anderson.
A number of land-shells ...	.....	Mr. F. Ede.
A number of fresh-water shells.	.....	Mr. A. Constable.
1 Dun Bird	Fuligula rufina... ...	Major A. Fraser.
A collection of Assam Butterflies	.....	Mr. G. Warneford.
1 Snake	Dipsas trigonata ...	Mr. H. W. Barrow.
1 Chameleon (alive)	Chameleon calcaratus ..	Mrs. Gilbert.
1 Steppe Eagle	Aquila bifasciata ...	Major R. Light.
1 Albino Large Grey Bush Babbler (alive).	Argya malcomi... ...	Lieut. H. Capper.
1 Black-capped Blackbird ...	Merula nigropileus ...	Mr. W. F. Jardine.
3 Grey Jungle-Fowls (alive) ...	Gallus sonnerati ...	Do.
9 Painted Partridges	Francolinus pictus ...	Do.
2 Chukor Partridges	Caccabis chukor ...	Capt. A. E. Hatch.
Larva from the Volcano on Reunion Island	.....	Lieut. J. D. St. John, R.I.M.
1 Zanzibar Monkey (alive) ...	Corcopithecus sp. ...	Capt. L. Vidal.
Land and Fresh-water Shells from Aden.	.....	Capt. A. Newnham.
1 Yellow-crested Cockatoo (alive)	Psittacus moluccensis...	Surg.-Lieut.-Col. J. S. Wilkins.
1 Albine Partridge	Ortygornis pondiceriana	Lieut. C. D. Lester.
1 Red-crested Pochard	Fuligula rufina... ...	Lieut. W. J. Cates.
Skin of Wild Dog	Cyon dukhunensis ...	Mr. C. A. Brendon.
1 Tree Snake (alive)	Dr. yophis mycterizans	Capt. T. R. Montgomery.
2 Wolf Cubs (alive)	Canis pallipes	Mr. H. Bulkley.
1 Snake	Dipsas trigonata ...	G. McCorkell, I.C.S.

MINOR CONTRIBUTIONS, SCORPIONS, &c.

From Capt. Hicks; Mr. W. C. Morley ; the Dewan of Kolhapore ; Major A. H. Fraser, Chief Medical Officer, Gwalior ; Surg.-Major G. H. Gimlette ; Dr. Bocarro ; and Dewan Kassarram (Kashmir).

CONTRIBUTIONS TO THE LIBRARY.

The Fauna of Brit. India, Moths ; Vol. IV., from Mr. W. F. Sinclair ; the Zoological Record, for 1895, from Mr. W. F. Sinclair ; The Coccidæ of Ceylon (Green), Part I, (with 23 Plates), from Mr. E. Ernest Green ; Proceedings of the Linnean Society of N. S. Wales, for 1896, in exchange ; Memoirs of the Geological Survey of India, Vols. XXV and XXVI in exchange ; Bulletin Societé de France, 1896, in exchange.

THE ACCOUNTS FOR 1896.

Mr. A. Abercrombie, the Honorary Treasurer, placed before the meeting a statement of the accounts of the Society for the year ending 31st of December last, showing a cash balance in favour of the Society of Rs. 1,211-8-3, and an investment in Government Paper of Rs. 4,800. It was resolved that the accounts be passed, subject to the usual audit.

ELECTION OF COMMITTEE.

The President, Vice-Presidents, and Members of the Managing Committee for 1896 were duly re-elected for the ensuing year.

THE FLORA OF MAHABLESHWAR AND MATHERAN.

The Honorary Secretary stated that the revised edition of the "Flora of Mahableshwar and Matheran," by the Hon'ble Mr. H. M. Birdwood, had been corrected by the author and was now being sold by the Society at Re. 1 per copy.

THE BACK NUMBERS OF THE JOURNAL.

The Honorary Secretary drew attention to the circular relating to the cost of the back numbers of the Society's Journal, and strongly recommended the members to replace any missing numbers while the opportunity offered, as the complete series would in a short time become very valuable. Title pages for Vols. I, II and III could be obtained in the Society's Office, free of cost.

LAND AND FRESH-WATER SHELLS.

Mr. H. J. Peile, R. A., exhibited a collection of Land and Fresh-Water Shells which he had made within the limits of the Island of Bombay, and read some interesting notes on the subject. Mr. Peile expressed a hope that, when the rains set in, members in all parts of India, Burma and Ceylon would assist the Society's collection by contributing specimens.

PAPERS READ.

The following papers were then read and discussed :—

1. The Burmese Goat-Antelope, or Serow, by Vet.-Capt. G. H. Evans.
2. The Birds of Aden, by Col. J. W. Yerbury.
3. The Plants of a Bombay Swamp, by G. Marshall Woodrow.

4. A new Krait from Sind, by G. A. Boulenger, F.R.S.
5. Description of some new Species of Scorpions, from India, by R. I. Pocock.
6. Birds Nesting in the Tons Valley, by B. B. Osmaston.

Miscellaneous Notes :—

(*a*) The Destructive Work of *Termites*, by W. F. Sinclair.

(*b*) Distribution of the Black-capped Purple Kingfisher (*Halcyon pileata*), by G. W. Vidal, I.C.S.

(*c*) Deflection of Bullets on a Tiger's Skull, by Lieut. J. H. Vanderzee, I.S.C.

(*d*) The White-faced Duck (*Erismatura leucocephalus*), by Capt. H. J. Sherwood, R.E.

(*e*) Leopard *versus* Chital, Pig *versus* Leopard, by Major G. S. Rodon.

(*f*) Nidification of the Thick-billed Flower-pecker (*Piprisoma agile*), by Capt. R. M. Betham.

These papers will be published in the next number of the Society's Journal, which is now in the press.

MISCELLANEOUS NOTES.

No. I.—THE DESTRUCTIVE WORK OF *TERMITES*.

In yesterday's *Nature* there occurs a passage (quoted below) referring to "the attack of fungi on timber or trees previous to the destruction of the wood by *Termitidæ*," in the Royal Botanic Gardens, Trinidad. The Editor observes that, "so far as observations at present go, it seems that the primary cause of the destruction of wood by termites is the mycelium of some fungus."

Now "the mycelium of some fungus" is an usual agent in what we call "rot" in wood, especially in living wood. But it seems to require something to go before. Insufficient nutriment, heat, light, or ventilation; unsuitable environment in the case of exotics; or even wounds inflicted by man or natural forces are apt to make the plant a fit subject of attack to the fungus.

In the course of many years' observation of white-ants' work in our province, I found that where the white-ants' covered ways are on the stem of a tree there will be broken or diseased branches higher up. The white-ant follows death and disease; he does not cause it. But when we come to his attacks on *dead* vegetable matter, such as paper, and animal matter, such as boots or leathern book covers, is there previous disease to prepare his way? Apparently sound deal boxes are often attacked. Are they really in a state of decay, only to be detected by the white-ant or in the laboratory? Is an infection of some mould or other the cause of his attacks upon carpets? In short, is he simply an eater of dead vegetable and animal matter, or of the fungi that attack it? And is the attack of the fungus a condition precedent to that of white-ant in all or most cases?

Our members have a good deal of opportunity to observe white-ants, and a few microscopic observations upon boots and books would probably yield results very well worthy of record.

W. F. SINCLAIR, LATE I.C.S.

LONDON, 27*th November*, 1896.

The passage referred to:—

A short time ago Mr. J. H. Hart mentioned, in the *Bulletin* of miscellaneous information published at the Royal Botanic Gardens, Trinidad, that there was evidence of the attack of fungi on timber or trees previous to the destruction of the wood by *Termitidæ*. He returns to the subject in the October *Bulletin*, wherein he states that the mycelium of a fungus could be readily traced in all parts of the tissue of a number of specimens attacked by *Termites*. That it is really a fungus which attacks the wood, the experiments at Trinidad prove conclusively, and that *Termites* follow the attack is also clearly shown. The only doubtful point is whether the wood-ants do at any time or in any case attack sound timber. So far as obervations at present go, it seems that the primary cause of the destruction of wood by *Termites* is the mycelium of some fungus. (*Nature*.)

No. II.—THE DISTRIBUTION OF THE BLACK-CAPPED PURPLE KINGFISHER (*HALCYON PILEATA*).

The Black-Capped Purple Kingfisher is so rarely found in Western India that it is well to record each locality in which it may be observed. Mr. Comber states in his note in Vol. X (p. 533): "I found it at Malvan in 1880." It had however, been previously obtained by Jerdon at Tellicherry on the Malabar Coast, and in 1883 I again discovered it at Belikeri in North Kanara, in some scrub-jungle close to the sea-shore and in the compound of the district bungalow. Very probably it has since been found by Mr. Davidson or Mr. Aitkin in other localities in North Kanara.

Its occurrence however, so far *north* and so far inland as Kalyan, is more interesting.

This handsome Kingfisher is one of the many Malayan forms which creep up the Western Coast of India. Curiously not a few of these forms of birds as well as reptiles miss Ceylon altogether in their wanderings. Some become so changed in their new *habitat* as to lose their typical coloration and be fairly separable as sub-species. *Halcyon* or *Sauropatis chloris* is an instance in point, the specimens which I obtained at Ratnagiri being far from typical as noted by Mr. Sharpe. It would be interesting to have the Kalyan specimen of *H. pileata* compared with typical skins of this species so as to ascertain if any similar changes are observable.

G. W. VIDAL.

NORWOOD, ENGLAND, *4th December*, 1896.

[Mr. Vidal's suggestion has been acted upon and the skin referred to has been sent to him for comparison. Another specimen of this bird was recently obtained by Mr. W. S. Millard at Rewa Danda in the Kolaba District, as recorded at the Society's Meeting held on 16th December, 1896. *Vide* Vol. XI, p. 142—EDITOR.]

No. III.—DEFLECTION OF BULLETS ON A TIGER'S SKULL.

The following took place about 10 miles north of the River Godavery in the Hyderabad Territory on 10th April, 1895. A tiger was beaten out, and, when first seen by me, was walking towards the tree on which my "muchan" was built. Between us, and at a distance of about 90 yards from me, was a shallow sandy nullah, some 10 yards in width, with the bank nearest to me much steeper than the other, which was merely a gentle slope. When the tiger reached this slope, which was quite bare of cover, I aimed at the point of his shoulder and fired. The bullet (a hollow pointed one) went a little high, striking the side of the neck, where it broke up without apparently doing very much damage. The tiger on being hit fell into the nullah rolling over and clawing the near bank for several seconds. Owing to his being partially concealed by the bank, it was not possible to plant a second bullet in a vital place. He then picked himself up, scrambled up the bank, and made straight for my tree, coming along at the usual close-quarter rush, head and body nearly touching the

ground, the space between being burnt and quite devoid of cover. When about 30 yards off, I aimed somewhere at the centre of the face with the left barrel (solid bullet). As soon as I could see for the smoke, the tiger had turned off at right-angles and was staggering about, apparently dazed, some 20 yards off. A bullet on the shoulder from my second rifle then dropped him. On subsequent examination it appeared that the solid bullet from my left barrel had struck exactly in the centre of the forehead and midway between two parallel lines connecting the eyes and ears ; it had then glanced to the left, not having damaged the skull in the very least degree. The skin shows a good-sized well-defined hole in the centre of the forehead, with a broad grazing cut about 1½ inches long to the left, and of course joining the hole. The rifle used was a double ·577, burning 160 grs. of powder ; bullet, Eley's, hard lead, 520 grs. As an instance of the energy and penetration of the above combination of powder and lead to show that the above was not due to want of penetration, I may mention that shortly afterwards I had a very long shot(about 200 yards) at a full-grown wild buffalo (*B. arni*) galloping away from me. The bullet (520 grs. solid) struck the root of the tail. The buffalo was found lying down in a state of collapse some 400 yards further on.

I also subsequently on several occasions with the same rifle and bullet dropped the African Buffalo (*Bos caffer*) at and over 100 yards without any difficulty.

J. H. VANDERZEE, Lieut.,
Indian Staff Corps.

Ellichpur, Berar, *January*, 1897.

No. IV.—AN INSTANCE OF THE NATURAL REPELLENT EFFECT OF "WARNING COLOURS."

The observation here recorded appears to be noteworthy as corroborative evidence in favour of the protective value of "Warning Colours."

I have in my possession a very docile young Himalayan bear, one of whose most strongly marked appetites is for grasshoppers. He seizes greedily and crunches, with every sign of relish, the common bright-green and dull brown grasshoppers found in Calcutta, and one of the few displays of real ill-temper, of which he has been guilty, was occasioned by my attempting to pick up a large grasshopper that had dropped from his mouth.

Recently I offered him a specimen of the glaring-coloured and evil-smelling *Aularches miliaris* (Linn.) which, as soon as he smelt it, he refused in a most comical way, but without any show of anger or violent distrust.

(It may be recalled to memory that, in life, *Aularches miliaris* has the abdomen broadly cross-striped in alternate black and scarlet, and the fore-wings black with large canary-yellow spots, and also that it secretes a most peculiarly pungent-smelling frothy fluid.)

A little after the first refusal I again forced the insect upon him, when he stood up on his hind legs and violently struck it out of my hand, in exactly

the same way as—after a single experience of their nature—he is accustomed to treat the offer of a burning cigar-end or a lighted match.

Whenever now I show him this grasshopper (*Aularches miliaris*), he first endeavours to move off; but if he is compelled to face it, he rises and strikes one's hand such a hearty cuff that the insect is knocked out of one's grasp.

The bear also has a certain amount of objection to a very large spiny-legged species of *Acridium* and to a species of *Euprepocnemis* nr. *robusta* Serv. with spiny legs, if these are offered to him alive and with their legs intact. In these cases the dislike is not to the insect, but only to its hard spiny legs, and it is not accompanied by any gesture of fear or apprehension, for it is these emotions, rather perhaps, than blind anger that the bear's cuff seems to be meant to express.

I may mention that the bear lives, as far as possible, in a state of nature. It is never confined, and is only chained up when nobody can be spared to watch it.

I offer this note as a simple record of fact. So far as it goes, it appears to support the almost universally-accepted, though now by no means unquestioned, beliefs (1) that when an insect has been found by experience to be unpleasant to (taste and) smell, it has only to be seen to be avoided, and (2) that any conspicuous markings that lead to the immediate recognition of such an insect by eyesight and at a distance are likely to be of such vital benefit to the insect as to be acted on by natural selection.

A. ALCOCK, M.B., C.M.Z.S.,
Superintendent of the Indian Museum.

(The above appeared in the *Journal of the Asiatic Society of Bengal.*)

No. V.—THE WHITE-FACED DUCK (*ERISMATURA LEUCOCEPHALA*).

On the 27th December, 1896, three ducks of a peculiar description were shot in the Ganges Kadar, about 20 miles south of Roorkee. Major J. C. P. Onslow, R.E., shot two, and Lieutenant H. D. B. Campbell, R.E., shot one, which, however, was not picked up. We were a party of five in camp, and in the evening the ducks were examined, but none of us had ever seen a duck of this description. It was thought, however, that there would be no difficulty in identifying the birds from Hume and Marshall's book, "The Game Birds of India." On returning to Roorkee on the 28th December, I referred to the book and found that the only bird answering at all to the description was the white-faced or stiff-tailed duck (*Erismatura leucocephala*). Unfortunately the birds had not been skinned, nor had the heads been kept. So I have to rely upon my memory for the description.

The chief points about the duck were the peculiar bill, *very broad and swollen at the base*, and the absurdly short wings giving it the appearance almost of deformity. The bill was dark-coloured as far as I can recollect.

I cannot clearly recall the markings, except that there was a good deal of white about the body and breast. Mr. Campbell says that he particularly noticed the white face. The crown was dark, and so were the wings. The bird was very little longer, if any, than a common teal, but much bigger, and presented a " stumpy " appearance, very ugly and ungainly. The wings were hardly more than six inches in length. The birds were shot in deep water in a nullah which they refused to leave after being put up, and after a short swift flight they settled again.

I have shot a good many duck during the last six years, and am familiar with most of the species which visit the North-West Provinces.

H. J. SHERWOOD, CAPT., R.E.

ROORKEE, N.-W. P., *January*, 1897.

[There appears to be little doubt that the bird described in the above note was the White faced stiff-tailed duck, and its occurrence near Roorkee is well worthy of record. We have in our collection the head of one shot at Sialkote by Lieut. C. R. Bushe in February, 1891.—EDITOR.]

No. VI.—CROCODILES.

Existing reptiles are divided by modern naturalists into four orders, of which crocodiles and alligators belong to the order *Emydosauria* of De Blainville. The greatest confusion still exists even amongst educated men as to the difference between the crocodile and the alligator and also as to their geographical distribution. In India there are no alligators, yet Europeans, as a rule, call by that name all the crocodiles there, of which there are two genera and three species. Even in Government returns these destructive reptiles are called by one or other name indifferently, and often both names will be found in the same document.

It may be as well to start with a good sweeping statement, which, so far as present knowledge goes, may be taken as correct. It is this : except in China, where, in 1869, an alligator (*A. sinensis*) was discovered, or rather discriminated, there are no alligators either in Asia, Africa, or Australia.

The differences may be described as follows :—In the first place, the horizontal contour of the head of the crocodile represents an isosceles triangle, but in no case is the muzzle wider than that of the alligator. Secondly, the crocodiles have a deep notch on each side of the upper jaw, into which the fourth lower tooth fits, whereas in the alligator the corresponding tooth fits into a sulcus or pit. Thirdly, as a rule, the digits of the hind feet of the crocodile are webbed to the nails, and there is a denticulated crest of flattened scales on the inside of the hind leg ; whilst in the alligator the web between the toes is rudimentary, and the dentionated crest is absent. There are exceptions to the latter difference in two of the crocodiles, of which one is *C. rhombifer* from Cuba, which has *not* the fringed leg, nor are the hind toes webbed; but I have not been able to trace the second species. Crocodiles

have the head at least twice as long as it is broad ; whilst the alligator's head is in length compared with width as three to two.

There are about twelve or thirteen species of crocodiles, as distinct from alligators, recognised, namely :—

1. The garial, gavial, or nakoo, *G. gangeticus*, Günther, *Gharialis gangeticus*, Theobald Catalogue; Indus, Ganges, Brahmapootra, Mahanadi in Orissa, Kaladyne river, Arrakan ?

2. Journey's false gavial, *Tomistoma schlegelii*, Gray ; Borneo.
3. *Crocodilus cataphractus*, Cuvier, snout gavial-like ; West Africa.
4. *C. johnstonii*, snout gavial-like ; North Australia.
5. *C. intermedius* ; Orinoko.
6. *C. americanus* ; Central America, West Indies, Florida.
7. *C. siamensis* ; Siam, Java.
8. *C. niloticus* ; the Nile, and Madagascar.
9. *C. porosus* ; India, Ceylon, and North-East Australia.
10. *C. palustris* ; India and Ceylon.
11. *C. robustus* ; Madagascar.
12. *C. rhombifer* ; Cuba.
13. *C. moreletti* ; Honduras.

The name crocodile was in the first instance applied by the Greeks to those they saw in Africa—κροκοδειλος being the name of a lizard they were familiar with in their own country, just as *el lagarto* (the lizard), corrupted into alligator, was applied by the Spaniards to the cayman of South America. The generic name in Egypt was champsa ; and it is still called timpsa (another form of the word) in that country.

The tongue of the crocodile is entirely attached to the floor of the mouth, and cannot therefore be protruded. The ancients consequently concluded that it had no tongue ; and it is supposed that because of this peculiarity it was chosen as a fitting emblem of the Deity, who orders all things by his will alone. Some time ago I came across a copy of "Sandys' Travels," 1670, from which the following extract will prove interesting :—

> The country people do often take them in pitfalls, and grapling their chops together with an iron, bring them alive to Cairo. They take them also with hooks baited with sheeps or goats, and tied with a rope to the trunk of a tree. The flesh of them they eat, all saving the head and tail, and sell their skins unto merchants who convey them into Christendome for the rarity. It is written in the Arabian records how Humeth Aben Thaulon (being Governor of Egypt for Gifar Matanachi, Caliph of Babylon), in the 270th year of their Hegir, caused the leaden image of a crocodile, found amongst the ruines of an ancient temple, to be molten ; since when the inhabitants have complained, and that those serpents have been more noysome unto them than before, affirming that it was made and there buried by the ancient magicians to restrain their endamagings.

Again, in Hamilton's account of the East Indies, 1688 to 1723, referring to Java, he says :—

They have many large crocodiles or alligators in their rivers and marshes, and sometimes they go a mile or two off to sea, and get foul of the fishers' nets. I was cleaning a vessel that I bought at Samarang on a bed of ooze, and had stages fitted for my people to stand on, when the water came round the vessel, and we were plagued with five or six alligators which wanted to be on the stage, and every moment disturbed our men ; so I and two of my men sat on the vessel's deck, and fired muskets at them, but our ball did them no harm because their hard scaly coat was shot proof. At last we contrived to shoot at their eyes and we shot at one so. As soon as he found himself wounded, he turned tail on us, and with great flouncings, made towards the shore about half a mile from us, and, the rest following him, we were pretty quiet after that. A day or two after, some fishers told us that they had seen a dead alligator lying on the shore, and pointed whereabout they saw him. I went in a boat ashore, and found him lying at full length. I measured his length, and found from his nose to his tail twenty-seven feet and a half, and he was about one-third part of his length in circumference about the belly.

It is curious that the old writers—and, indeed, for that matter some of those of the present day—contend that the scales of the crocodile are strong enough to deflect a bullet ; this I have never found to be the case, and have known them to be killed by the ·380 rook rifle with its "pinch" of powder. They have wonderful vitality, and, unless killed outright, succeed in getting into the water, and do not float for about twenty-four hours. The neck is undoubtedly the most vital spot, and, even if the vertebræ are not touched, the bullet paralyses them for the time. This happened to me with the last crocodile I shot, which was 8 feet long ; the bullet hit it in the neck, and we were able to lash it to a bamboo, and transport it alive over a twenty-four hours' journey to enable me to get it stuffed.

In India there are three crocodiles ; first, there is the gavial or garial (*Gavialis gangeticus*). It is called garial from the fact that the old males are distinguished by an excrescence on the end of the snout, and which resembles the earthen gara or pot used by the natives. It is supposed that the name gavial was given owing to a clerical error, the letter *r* being mistaken for a *v*. There is no mistaking the species, which has an extremely elongated snout, twenty-seven or more teeth in each side of the upper jaw, and the nuchal and dorsal scutes forming a single continuous shield composed of twenty-one or twenty-two transverse series.

In the old males, but not in the females or young, there is a large cartilaginous lump on the extremity of the snout, which is supposed to contain air to enable them to remain under water for a longer period than would otherwise be possible.

The garial does not attack human beings, but it has been found feeding on a decomposed body. Its usual diet is fish. The habitat of this crocodile is the Indus, Ganges, and Brahmapootra rivers and their large tributaries, also the Mahanadi of Orissa and the Koladyne river in Arrakan. Personally, I am not quite sure that it is the true garial which is found in Arrakan, as there

is another species, the so-called false gavial, in Borneo. The garial grows to a length of 20 feet, and has the same habit, as the other Indian and Nile species, of sleeping with its jaws open whilst basking on the sandbanks.

With regard to the other Indian crocodiles, *C. porosus* and *C. palustris*, although long ago discriminated, nothing is known as to their geographical distribution; and although when in India I again and again appealed through the newspapers for information, and worried my friends on the subject, I was unable satisfactorily to settle the question. When in Ceylon, I also appealed to sportsmen and naturalists, few of whom knew that there was more than one species. Even in the Colombo Museum I could only find one small specimen of *C. palustris*. When first I took up the subject, I was told that I could not depend on the number of cervical and nuchal plates to determine the species, as these plates varied. Thereupon, after consulting Owen and Huxley, I come to the conclusion that the teeth, being persistent, might at any age be depended upon. Alas! on consulting the British Museum authorities I found that the young of one of the species which I was working at had five teeth between the median line and the notch in the upper jaw, whilst the adult had normally only four. Here, again, the ground was cut from under my feet. It then occurred to me that at all events the premaxillary sutures might surely be depended upon as affording a constant and distinct difference, and for a while all went well.

But (though this sounds hardly credible) I have at the present time before me, as I write, a young specimen of *C. palustris*, with the premaxillary pattern which belongs to *C. porosus*.

I have finally come to the conclusion that, in order to be certain as to species, one must secure an adult skull. An adult skin will do equally well.

I will now proceed to show the difference of the two species:

I will start with *C. palustris*, Lesson, Orient. Zool. Pro., p. 305; Kelaart Prodr., p. 183; Günther Rept. Brit. Ind., p. 61, pl. viii, fig. A; Theobald Cat., p. 36; Boulenger Cat. Chel., &c., p. 285. *C. trigonops*, Gray: Cat. Tort., &c. *C. bombifrons*, Gray Cat., p. 59; Huxley, Pro. Linn. Soc., 1859, pp. 13—23. *C. bifurcatus*, Cautley, Asiatic Researches, xix. *C. vulgaris*, Cantor, Mal. Rep., p. 15. These are all the synonyms that I can find of what we may call the marsh crocodile of India. The characteristics are as follows: Snout—that is, the length taken from the eyes forward—one and three-quarters to one and a half as long as the width at the base. The width of the interorbital space is much less than the vertical diameter of the orbit. Nineteen upper teeth on each side. Head rough but without any ridges: pre-maxillo suture on the palate transverse, nearly straight or curved forward. Four large nuchal scales forming a square with a smaller one on each side; two pairs of smaller ones in a transverse series behind the occiput. Dorsal shield well separated from the nuchal; the scutæ usually in four, rarely in six longitudinal series. Scales on limbs keeled. Digits webbed at the base, outer toes extensively webbed. A

serrated fringe on the outer edge of the leg. The dorsal scales are much larger and stronger than in *C. porosus*, and it has five teeth in the upper jaw from the median line to the notch.

The marsh crocodile lays its eggs in the sand and makes no nest. The period of incubation, which differs in accordance with the temperature, is said to be about forty days. Jackals dig up and eat the eggs; but I am not aware that this has been recorded of the mungoose in India, although in Egypt there is no doubt of the fact. The length of the young one the day after it is hatched is 10½ inches. This I ascertained by actual measurement of a specimen sent to me by Mr. Phipson, Hon. Sec. of the Bombay Natural History Society. This species is found in tanks and rivers throughout India, Ceylon, Burma, and the Malay Archipelago, extending west to Sind and Beluchistan. It is the only species, Mr. Phipson informs me, that is found in Bombay, and in the Kuddlehundi (the Greek Sardis), and Beypore rivers, and the backwaters on the west coast up which the tide rises for a considerable distance. To my knowledge the natives on the banks of these backwaters are not a bit afraid of them, and may be seen in mid-stream diving for shells to make lime, where there are any number of crocodiles. The last time I stood on the Kuddlehundi railway bridge I saw four of these saurians (one of which I killed) basking on the mud which the tide had left uncovered. A friend of mine, when shooting on the Beypore river, saw some otters, evidently frightened, making for the shore; and as they reached the bank one of them was followed and seized by a crocodile, which rushed after them. My friend fired at and hit the crocodile, which he did not get, but bagged the otter, which had the marks of the saurian's teeth. A writer in the *Asian*, who gave his name, some years ago, described how one of the species seized a peacock on the bank that sprang upwards several feet to avoid him, and was carried off, leaving no sign but a few feathers floating on the water.

The crocodiles at Muggerpeer, near Kurrachi, described by the late Dr. Leith Adams in the *Field* of Jan. 9, 1875, are of the species now under consideration. The pond is literally alive with them, and the late Sir Richard Burton, in one of his books (either "Sind" or "Sind Re-visited"), tells how a foolhardy British subaltern ran across the pond, which was literally paved with crocodiles! After a man had been carried out of his own verandah by a crocodile, the Government insisted that the place should be walled in, which was done.

In many parts of India the crocodile is venerated, if not worshipped. In the Calcutta Zoological Gardens, as well as in the museum there, I noticed a variety of *C. palustris* which had a very distinct shield within which the six nuchal plates were disposed. The superintendent of the gardens, when I spoke to him about this, said he had noticed it, but could give no information on the subject.

With reference to the crocodile bird which Herodotus described as picking the teeth of the animal, a man on whose word I could depend told me that he had seen a bird do so on the Beypore river. Not being a naturalist, he did not know what the bird was, but called it a "sandpiper." In the *Field* about January or February, 1886, in an article entitled "Down the backwater at Cannanore," a correspondent described how a small bird hopped in and out of the crocodile's mouth as if it were the most natural thing in the world. Sir Samuel Baker told me that, although he had never seen a bird actually in the crocodile's mouth, he had no doubt that the tale was true.

Mr. H. H. Johnston, in his "River Congo," identifies the crocodile bird as *Lobivanellus albiceps*, which is clearly a mistake, while the species which he figures in a vignette on his title-page is *Pluvianus egyptius*, the Nile plover, one of the two species known to befriend the crocodile, the other being *Hoplopterus spinosus*, the spur-winged plover of North Africa. The last-named bird is not found in India, but a closely allied species (*H. ventralis*) is recognised. It, however, has not been recorded south of the Godavery river, and is not likely to be the bird seen by my informant nor by the author of "Down the Backwater at Cannanore." "Old Log," in his admirable articles previously referred to, mentions the spur-winged plover as being in attendance on the crocodile, but this would appear to have been in Burma, where *Hoplopterus ventralis* is known to occur.

It is quite evident, from what I have stated as to the habitat of the Indian spur-winged plover, that this could not be the bird that picks the crocodile's teeth on the western coast of India, and it is therefore probable that there are other birds besides the spur-winged plover which do this friendly office for the crocodile.

Mr. John M. Cook, in the *Ibis* for April, 1893, describes how he saw a bird enter the mouth of the crocodile, which was closed on it for a minute or two, and how he subsequently shot the bird, which was identified as the spur-winged plover of Egypt (*Horopterus spinosus*). This proves conclusively that more than one species of bird picks the crocodile's teeth.

The crocodile of the Nile (now known as *C. niloticus*) is identical with *C. palustris* in every way, including the nuchal and cervical plates, and differs only by the snout being slightly longer. *C. palustris* grows to a length of 29ft. 6in., that being the record of one killed by Mr. Brunton at Cochin on the western coast. The length of the head of this monster (which is preserved at Cochin) was no less than 2ft. 8¾in. In an ordinary way a 12ft. specimen is large and a 15ft. specimen looks enormous, so that Mr. Brunton's specimen is abnormally long for this species.

With regard to *C. porosus*, it seems a species which has been much neglected, and to the present day its distribution is unknown. Unfortunately, Dr. Günther did not figure it in his "Reptiles of British India," but substituted *C. pondicherianus* (which really came from Akyab) for it. Its synonyms are

C. porosus, Schneid., Hist. Amph. 11, p. 159 ; Günth., Rept. Brit. Ind., p. 62 ; Theobald, Cat., p. 36 ; Boulenger, Cat. Chel., &c., p. 284 ; Cantor, Mal. Rept., p. 16. *Oopholus porosus*, Gray, Ann. and Mag. Nat. Hist., 1862, vol. x, p. 267 ; *C. bifurcatus*, Cuv. Oss. Fossiles, and Schleg. Krokod. Ind. Archipel., tab. 3.

In this species, the snout (that is, the portion in front of the orbits) is from one and two-thirds to two and a quarter times as long as it is broad. There are well-marked ridges in front of the eye, which converge towards each other. The pre-maxillo maxillary suture on the palate is directed backwards, and is W-shaped as shown in the above diagram of the jaw of *C. porosus*. Post-occipital scutes usually absent, sometimes small and irregular. Four large nuchal scutes forming a square with smaller ones on each side. The dorsal shield is well separated from the nuchal, and the scutes generally are feebly keeled as compared with *C. palustris*. When adult, there are only four teeth in the upper jaw from the median line to the notch ; but in young specimens there are five.

C. porosus is said to be the species that so often carries off people from the bathing ghats on the Ganges and Hoogly ; and it is not certain that this species is found above the tidal way in rivers, but it is frequently recorded as being found some distance out at sea. It is distributed throughout the larger northern rivers in India, and in tideways in Ceylon, also in Southern China and Northern Australia. So long ago as July 27, 1872, a correspondent, "O. N. M.," described in the *Field* his shooting this species in North Queensland, and finding its nest ; and on Sept. 4, 1869, Mr. Tegetmeier communicated an account by the Rev. Mr. Boake of its nest in Ceylon, composed of weeds, the fermentation of which gives heat enough to hatch the eggs. During incubation the female lies in the vicinity of the nest, and both in Ceylon and North Queensland is recorded to have made determined attacks on anyone approaching the nest. In some cases, from the number of eggs found, it appears probable that more than one female lays in the same nest. In the Madras Presidency I have only found *C. porosus* at Cuddalore on the east coast and in North Travancore. The only specimen I got from the Godavery river was *C. palustris*.

To sum up, we find in India the garial or gavial of the Ganges with an enormously elongated snout, which cannot be mistaken. *C. porosus* with comparatively long head (the snout being from $1\frac{2}{3}$ft. to $2\frac{1}{4}$ft. in length), when compared with its breadth; two ridges in front of the eye which converge towards each other, but do not meet. Post occipital scutes usually absent, sometimes small and irregular, four large nuchal scutes forming a square with smaller ones on each side, making a group of six in all : the dorsal shield well separated from the nuchal, and the scutes generally much more feebly keeled than in *C. palustris*. In the adult there are only four teeth in the upper jaw from the median line to the notch, but in the young there are frequently, if not always, five teeth. The pre-maxillo maxillary suture on the palate in the adult is directed backwards, and is W-shaped.

In *C. palustris* the snout is blunter than in its congener, being at the base only one and one-third to one and a half as long as it is broad. At all ages there are five teeth in the upper jaw from the median line to the notch. The head has no ridges, and the pre-maxillo maxillary suture is nearly straight across. There are four post-orbital scutes and six cervical scales, lozenge-shaped, all strong and well defined, as are also the dorsal scutes when compared with *C. porosus*. It is found everywhere in India, and except in the length of the snout is identical with *C. niloticus* from Africa and Madagascar, from which it differs only by having a somewhat shorter snout. This species is found everywhere in India ; but we are in total ignorance of the distribution of *C. porosus*.

Readers of the *Field* in India might do good service to natural history by recording the species of crocodile found in different localities, particularly of *C. porosus*, about which so little is known, and I hope that the descriptions I have given will enable them to identify the two species I have written about.

SMOOTHBORE.

(The above appeared in the *Field*.)

No. VII.—LEOPARD *versus* CHITAL. PIG *versus* LEOPARD.

While on a shooting trip in Berar last Christmas, I heard one night, about 10 o'clock, a number of chital barking close to my camp ; the night was fine with nearly a full moon ; this noise continued during the night : at least I heard it on the several occasions I awoke, and it all appeared to come from the one direction. I was up very early next morning, and accompanied by a shikari went in the direction where I still heard the barks. We had not gone far when I caught sight of a very large herd of chital moving about in a restless manner. I stood still to watch ; every now and then a doe would stop, elongate her neck and bark. Among the herd were several fine stags, but these, as far as I could observe from a distance, made no noise whatever. One doe was standing by herself some twenty yards in front of the herd and kept up a constant series of loud barks. She was facing a small bush, some thirty yards in front ; behind the herd stretched a thick tree jungle ; in front the ground was fairly open, with small teak trees scattered about. I went slowly on towards the herd, which did not appear to take the least notice of my approach, but continued to walk up and down. I stopped again when some sixty yards from the deer and looked carefully about in front to try and discover what all the excitement was about. At last my eye caught sight of the head and neck of a leopard on the opposite side of the small bush, which the advanced doe was intently staring at ; the leopard was apparently standing up and must have been distinctly seen by the herd, as well as by the doe. I watched this interesting scene for a couple of minutes, and then moved to one side to try and see more of the leopard. As I did so, I noticed three pigs, some little distance behind the leopard ; two appeared to be rooting at

something, and the other was standing in advance; as I moved on a little, the leopard looked towards me, then quickly turned about moving in the direction of the pig, and was at once charged by the large one in front. As this pig came on with a rush, the leopard bounded high in the air to avoid the charge, and appeared to me to alight on a tree; the pig then returned towards its companions. I went on towards the tree, thinking I should be able to get a shot at the leopard, but on getting near could not see it; the shikari told me afterwards that the leopard merely jumped on to and down from the tree and made off through the grass. As I stood looking about, the pig trotted slowly away, and all the deer entered the wood in front of which they had been moving. I then went on a short way beyond the tree into which I saw the leopard sprung, and I noticed on the ground the body of a doe chital. I went up and examined it, and it appeared to have been killed some time previously by the leopard; there were fang wounds on the neck, part of a hind quarter and a good deal of the inside had been eaten; the pig also had evidently been feeding on it; their foot-marks were close all round, and the place I found the body was about the same spot where I had previously seen two of the pigs rooting. I am under the impression that after the leopard had killed and eaten a small portion of the chital, the three pigs had come up and that they then drove him off the kill, and in consequence of this misfortune he was trying to catch another deer, when I appeared on the scene. I covered the remains of the chital with branches to protect it from vultures, and in the evening brought my ladder and sat over it till it got quite dusk, with the hope the leopard might return, but nothing came, and as the moon did not rise till late, I returned to camp. Next morning I sent a man to the place, and he reported that the leopard had returned during the night and that nearly everything was eaten up. I expressed my surprise to the shikari at the herd of chital remaining so long near the leopard, especially after one had been caught and killed; he replied that the deer always act in this manner, and do not appear to mind if one is caught. The leopard appeared to be of the large variety, and, so far as I could see, the pig which charged was a boar.

G. S. RODON, Major.

Dharwar, 24*th February* 1897.

No. VIII.—NIDIFICATION OF THE THICK-BILLED FLOWER-PECKER (*PIPRISOMA AGILE*).

It may be of interest to ornithologists to learn that the nest and eggs of the above bird, about which not very much is known, owing to its shy and retiring habits, has been found by me at Baroda, and this is not the first instance of its occurrence, as Mr. H. Littledale has found it breeding here before. He has asked me to bring the fact to notice, so as to confirm his observations. I had noticed these little birds flitting about parasites growing on a custard-apple tree, in very close proximity to my verandah, yet it never struck

me they were building. On the 18th February I was watching the taking of the eggs of the crimson-breasted barbet (Coppersmith), when I noticed one of these little birds with something in its bill, and this drew my attention towards it. Almost immediately it disappeared into what appeared a dry leaf, but on closer inspection, it resolved itself into a nest, and this nest was built very near the extremity of the branch of a custard-apple tree, on which were numerous dead leaves of about the same colour as the nest. But for seeing the bird enter the nest, I should never have noticed it, although it was quite close to the house. It was about 9 or 10 feet from the ground, and the nest is a beautiful little structure, purse-like in shape, very soft and elastic, being composed of cobwebs and what appears like portions of a flower. I am sorry I cannot give its name, as I do not know it. The nest has an entrance at the side with a regular ledge, apparently for use when the young are hatched. Oates in his "Nests and Eggs of Indian Birds" describes the nest very well. I took two eggs to-day, 23rd February, as apparently the bird was not going to lay more and had commenced sitting. They are white, splashed and speckled with pink, the colour forming a zone round the larger end, not unlike miniatures of the common Madras bulbul. I believe Oates in his classification calls this bird "*Piprisoma squalidum*."

R. M. BETHAM, CAPTAIN,
8th Bombay Infantry.

BARODA, 23*rd February*, 1897.

No. IX.—SMALL GAME OF THE PESHAWAR DISTRICT.

The following is a list of the small game shot by the Officers of the Devonshire Regiment, near Peshawar, between 8th September, 1895, and 16th April, 1896 :—

37 mallard.	133 quail.
105 common teal.	6 blue pigeons.
4 blue-winged teal.	5 wood pigeons.
16 pochards.	2 pintail sand-grouse.
1 marbled teal.	2 large sand-grouse.
14 shovellers.	3 grey partridges.
1 smew.	1 chukore.
16 gadwall.	33 seesee.
2 tufted pochards.	5 woodcock.
1 pintail duck.	1 houbara.
2 widgeon.	3 bitterns.
2,355 snipe.	2 plovers.

Duck were numerous on the Cabul river, but very wild, as the natives, who all possess guns, were constantly after them.

Snipes were particularly plentiful from 1st February, and large bags were made, 82½, 52½ and 50 couple being the three best bags made by two guns, and 36 couple to one gun on 16th April.

Five woodcock were killed, and I heard of at least eight others having been shot, a very unusual number, as generally only two or three are obtained during the season. I have no doubt that more might have been shot if the orchards and peach gardens had been searched, but, as a rule, no one ever enters them, and the only afternoon I ever thoroughly tried them I shot two woodcock.

J. H. YULE, LIEUT.-COL.,
Devonshire Regiment.

CHERAT.

No. X.—THE BLUE ROCK THRUSH.

There is a Blue Rock Thrush that has spent the cold weather for several years past in my garden at Baroda. He is a familiar bird, and friendly unto man. He comes for crumbs every morning, and spends a good deal of his time on a corner of the roof, from whence he flies down on any insects or creeping things that he can "spot." Last year he flew down and seized a large centipede within a few feet of where I was standing; then whacked it to death on the tiles; and yesterday, while I was sitting on my verandah, talking to a friend, he flew close to us and seized a lizard's tail. The tail came off, the bird dropped it, and it wriggled about on the ground most vigorously till it finally fell down to the ground, where the thrush followed and secured it. I suppose the lizard's tail must have been sticking out, and the thrush, seeing it move, mistook it for some worm or something of that sort. This thrush turns up yearly about Christmas, and moves off in a westerly direction (as I am able to conclude, because he takes up his quarters on the College sun-dial for two days after he leaves my roof). The sun-dial is about half a mile west from my house. The bird knows me quite well and is disposed to be very friendly.

H. LITTLEDALE.

BARODA, 20*th March*, 1897.

No. XI.—THE INDIAN MONGOOSE IN JAMAICA.

The introduction of the mongoose into Jamaica, says the *Academy*, marks one of the standard instances of unexpected results following upon an attempt to artificialise the process of natural selection, and takes rank as a warning with the plague of rabbits and thistles in Australia. The mongoose was introduced from India in 1872, in order to abate the pest of rats which infested the sugarcanes, and after performing this salutary duty it increased and multiplied to such an extent that not only the rats and mice, but most of the living species of the island, were threatened with extinction. Poultry suffered first, but the depredations extended to young pigs, kids, lambs, newly-dropped calves, puppies, and kittens. Game of all kinds was attacked, both living, and in the egg. The marauder ate even fish, and made such a specialty of snakes, ground lizards, frogs, turtles, and land-crabs that many

kinds of these entirely disappeared. Finally the mongoose developed a ravenous desire for bananas, pineapples, young corn, avocado pears, cocoas, yams, and the sugarcanes which it had been called in to protect, winding up its tastes with an appetite for salt meat.

The result was a wholesale disappearance of species. A few birds, like the ground dove, had the sense to shift their breeding places to the tops of the prickly cacti, where they were safe ; but other animals, and the reptiles in particular, suffered so severely that many kinds were believed for years to be extinct. As a consequence there arose yet another plague. Insects like the ticks and "jiggers" (or chigors) which used to be kept down by the snake, increased so overpoweringly that men and cattle were grievously infested. One could not walk without being covered with them.

The victory over the island remained with the tick and the mongoose, until, within the past year or two, a fresh stage set in. The mongoose suddenly began to be less plentiful, and it was found that he had fallen a victim to the tick. The results of the diminution are shown in a gradual re-appearance of other beasts, birds and reptiles. Among the snakes there is a very marked increase, and even the ground lizard, supposed to be quite extinct, has become common again. The balance of life has begun to re-assert itself, and naturalists will watch with curiosity for a complete re-instatement of the previous fauna. The renewed depredations of rats are hailed as an advent of salvation, and odd as it may sound, the increase in numbers of the crocodile is taken as a happy omen. The Jamaicans are not likely to make further experiments in this interesting domain of natural history, but will adhere in future to such present evils as they have.

No. XII.—ON THE OCCURRENCE OF THE LESSER COUCAL (*CENTROPUS BENGALENSIS*, BLYTH) IN CEYLON.

I am sending herewith the skin (a terribly mutilated one) of a bird, which I take to be *Centropus bengalensis*, Blyth (the Lesser Coucal). I picked it out from a lot of common birds collected by a Native in the Karunegala District of the North-Western Provinces during March and April last year. I do not think there is any doubt as to the locality from which the skin came.

Please state whether my identification is correct, as, if so, this is the first occurrence of the bird in Ceylon, though Mr. Oates says it occurs sparingly in Travancore and the Wynaad, etc.

A. L. BUTLER.

CEYLON, 18*th March*, 1897.

[The skin has been carefully examined by Mr. E. Comber, and there appears to be no doubt as to the correct identification of the specimen.—ED.]

No. XIII.—SMALL GAME IN THE KHARAGHORA DISTRICT.

I do not know if any of the members of the Bombay Natural History Society send in returns of their season's shooting, but in case it may be of interest I write to send you a memo. of what I have shot, to my own gun, during the shooting season now closing. I think it *would* be interesting if members from different parts of the country kept records of their shooting and sent them to you. My shooting has extended over six months, October, 1896 to March, 1897, and with the exception of 55½ couple of quail shot at Deesa in the beginning of October, it has all been obtained just round Kharaghora.

I find I have been out on 55 occasions, and of these I was shooting with others on 16 occasions, but what they shot is not shown.

Snipe.	Duck.	Quail.	Sand Grouse.	Impl. Grouse.	Sindhi Grouse.	Kullum.	Hares.	Partridges.	Geese.	Total.
823	388	246	51	38	52	35	7	3	1	1,644

KHARAGHORA, 23*rd March*, 1897. H. BULKLEY.

[We quite agree with Mr. Bulkley that such lists are of interest, and hope next season other members will keep records of their "bags" and publish them in this Journal. The value of such lists depends, however, principally on the careful identification of the species.—ED.]

No. XIV.—ON THE OCCURRENCE OF *ASIO ACCIPITRINUS*, PALLAS, IN CEYLON.

In some previous notes (Vol. X, page 284), I mentioned that a single specimen of *Asio accipitrinus* had been killed at Jaffna in November, 1891. I find I was misinformed as to the date, which should have read November, 1893. As this is, I believe, the only recorded occurrence of the species in Ceylon until this year, a note on six specimens obtained in the island during the last monsoon may be of interest.

In November last a native taxidermist came upon *seven* short-eared owls in a morning at Jaffna, and succeeded in shooting five of them. Two of these birds were sold to the Colombo Museum; the other three are now in my possession. On the 22nd of February last a sister specimen was killed by Mr. T. Farr on the Horton Plains, at an elevation of 7,000 feet. This bird was flushed from a stunted rhododendron bush, and, once disturbed, it was too wary to allow of a second approach. The next day it rose from another bush at nearly the same spot, and Mr. Farr shot it. In both bushes the bird had made a seat like a hare's form; in each of these were one or two pellets of the fur of a field mouse.

I have seen a specimen of this owl, which, though not actually killed in the island, was captured on a steamer within a few hours' sail of Colombo in 1881.

CEYLON, *March*, 1897. A. L. BUTLER.

No. XV.—ON THE DISTRIBUTION OF *HALCYON PILEATA* (THE BLACK-CAPPED KINGFISHER).

I observe that Mr. Millard obtained that beautiful Kingfisher, *Halcyon pileata*, at Rewa Danda, and the incident is referred to in our Journal * in terms which seem to imply that such a bird had no business to be there. Mr. Barnes also, in his book, speaks of a specimen shot by Mr. Vidal as "the only recorded instance of its occurrence within our region." The fact is that, though everywhere rare, this bird occurs down the whole coast from Bombay to North Canara at least, and probably to Malabar. I repeatedly saw it in the neighbourhood of Karwar when I was there during the years 1889-95, and afterwards Mr. Davidson obtained a specimen fifteen miles further south. Then I met with it at Jaitapur in the Rutnagri district, and quite lately I saw one between Rewa Danda and Alibag, on the sea-shore. I believe I have seen it on several other occasions in different places, when I was not quite so sure of its identity. I have never seen it any distance from the sea-shore, or one of the great creeks, and always perching on high trees, from which it swoops, with the action of a hawk rather than a kingfisher, on the sand crabs, which, I believe are its chief food. I have met with it only in the cold season, so it may not be a permanent resident. It has a loud screaming cry like *H. smyrnensis*.

E. H. AITKEN.

RATNAGIRI, *April*, 1897.

No. XVI.—SAVAGERY OF THE INDIAN SLOTH-BEAR.

In the last number of our Journal Mr. Gilbert speaks of the common black bear as an animal generally inoffensive, which "occasionally takes to man-killing, or man-mauling, for no apparent reason." I should like to know if this is the general experience of shikaris. I have been among black bears only in the jungles of the Canara district, and there I can say that no wild animal has a more evil reputation. I have never had any personal attentions from them, but I have known of numerous instances in which men were mauled by them without the least provocation, and I have found the natives universally holding them in more dread than tigers. If it were not for the fact that bears always, as a rule, return to their dens before sunrise, no *kunbi* in some parts of Canara would go out alone. They have very little fear of meeting an unwounded tiger by daylight, but a bear, they say, is such a *sheitan* that if it sees a man it must fly at him and try to tear out his eyes. They all agree, however, that if two or three men are together, it will not attack; so, if they have to go out at night, they go in parties. Some of them also arm themselves with cudgels of a particular tree which has the wonderful property of warding off bears. I was once presented with a goodly bludgeon made of this precious wood and could under-

* *Vide* Proceedings of the Meeting held on 16th December 1896, published on page 142 of this number.

stand that, if a bear once attacked a vigorous man armed with it, he might not care to do so again, for the wood was very hard and heavy. This prosaic explanation of its virtue did not, however, satisfy the man who gave it to me. He thought it was something more occult than that, for he assured me that it depends very much upon the manner in which the wood was cut. It ought to be cut by moonlight, and care must be taken not to let the shadow of the axe fall upon it in the process, or else the bear-repelling efficacy will be lost. I regret that I was not able to identify the tree.

In case any one should think that perhaps what I have said about the savagery of bears rests on the same foundation as the virtues of this wood, I must explain that it is not so. Of the fact that a Canara bear meeting a single man is almost sure to attack him out of sheer "cussedness" there is unhappily too much evidence, whereas in the case of the wood, though everybody knows and is fully assured of its qualities, I have not yet met any one who had cared to test them.

E. H. AITKEN.

RATNAGIRI, *April*, 1897.

No. XVII.—THE SCALY ANT-EATER (*MANIS PENTADACTYLA*).

I dug out a family of scaly Ant-eaters yesterday and captured the old male, female, and a young one alive. The hole went in about 8 feet and 4 feet under ground, ending in a chamber some 2 feet in diameter. While we were digging down to this, which took about an hour and a half, the ground being very hard, the Ant-eater excavated a new side passage some 5 feet long, in which we caught them still burrowing away from us. I kept them during the day and released them at night.

The young one was about 18 inches long and much paler in colour than the old ones, and the female *carried him everywhere on her back*—a fact which neither Jerdon nor Sterndale seems to mention. It was very curious how quickly the young one recognised its mother. If I put it down near its father, it took no notice at all, but it knew its mother at a distance of about 3 feet, and promptly scrambled on to her back again.

The hole they were in was not covered over as Jerdon mentions, but was open and very conspicuous, with the red earth thrown outside.

A. L. BUTLER.

CEYLON, *April*, 1897.

No. XVIII.—ON *KETAPA CEYLONENSIS* (GMEL.) BREEDING IN CAPTIVITY.

A pair of Fish-owls belonging to my brother bred in captivity this season, the hen-bird laying a single egg on the bare earth floor of the aviary on the 20th of February and at once commencing to sit closely. After 35 days' incubation (on March 27th) the chick was hatched. The old cock-bird made a

capital father, invariably taking all the food given him—mice, lizards, birds, &c.—to the hen, who fed the youngster most carefully, holding its head up between her legs during the process. The chick grew rapidly, and seemed to be doing well, but on April 13th it died. The parent birds seemed quite unaware that anything was wrong, the female continuing to brood contentedly over the young one for hours after it was stiff and cold. Both birds had been very savage since the appearance of the egg, and they strongly resented my removing the dead chick, the old male swooping down on my head while I was engaged in keeping the hen-bird at a distance with a stick, giving me a smart cut on the scalp and drawing blood pretty freely. Both birds were very excited after the removal of the nestling, walking up and down the aviary for some hours growling angrily. These owls were taken from a nest early in 1893, so are just about four years old.

A. L. BUTLER.

CEYLON, *April*, 1897.

No. XIX.—ON THE INDIAN PORCUPINE.

With reference to the interesting article which appeared in the Society's Journal, No. 1, Vol. X, on the different kinds of fleas, I wonder if any of our members can give me the specific name of the giant flea which infests the body of the Indian Porcupine. It must be fully ten times as large as the ordinary flea, and so far I have not noticed it on any other animal.

I have also observed that in some localities the blood of the porcupine is highly phosphorescent, a fact which does not appear to have been recorded, but whether this is due to their food I cannot determine. On one occasion I was out on a bright moonlight night and I had placed a piece of white cloth on the barrel of my gun to act as a "Night Sight." I fired at a porcupine and immediately noticed a light in the ground, and naturally supposed that my "Night Sight" had caught fire and was smouldering, but on approaching, I found I was mistaken, and that the light came from a piece of the entrails of the animal. During the same night I killed another porcupine, and noticed a similar patch of phosphorescent light at the place where the animal was struck. I have since shot scores of porcupines, but have never noticed anything of the kind. It is well known that these animals are exceedingly fond of bones and deer's antlers, which, I suppose, they eat in order to obtain a supply of phosphate of lime for the formation of their quills, and the peculiarity I have referred to above may have been due to an unsually large supply of bones and horns in that particular neighbourhood. I shall be glad to know whether this curious phosphorescence in the porcupine's blood has been observed before.

L. MOREAU.

GWYND, *April*, 1897.

No. XX.—THE INDIAN SLOTH BEAR.

Much has from time to time been written about the Indian Sloth Bear, but perhaps the following notes on the peculiarities of the animal may be found of some interest :—

One evening there was brought into the village where I happened to be encamped a woman who had been bitten on the leg in two places by a bear. The woman at the time the accident happened was stooping in high grass which she was cutting, and her story was that three bears suddenly came on her, one of which bit her.

It seems probable that this attack was made through fright at suddenly coming on the woman, and, had the bears seen her from a little distance, they would have avoided her. On the following morning I went out to the place where the bears were said to live, and found it was a dry water-course with large rocks here and there. I was standing near the edge of a fall, some fifteen feet high, looking for some of my men who had gone in another direction, when my attention was suddenly drawn to a bear about eighty yards off quietly moving down the bed of the water-course towards me. I at once seized my rifle and fired, the result being the usual crying roar which bears generally make when struck. The animal was apparently unable to get away, or did not try to, and almost immediately another bear came up to the wounded one from what I afterwards found to be a hole under a rock in the bed of the water-course. It probably came to sympathise and see what the row was about, but was received badly, for the wounded one struck at it with its paws and made more noise. The unwounded bear then began to resent the treatment and made a great noise, whereupon I fired at it, and the tumult increased. A third bear then sprang up from the same hole and came to the two wounded ones, probably for the same reason as the second one came; another shot, and number three also began to cry aloud. They were now all together, and, as soon as they were quiet, I walked up and found two of them dead and the third dying. They were lying almost touching each other. All appeared about the same size, and were no doubt a female and two nearly full-grown cubs.

On another occasion, after stalking cheetul, I had lost my way back to my camp and only had one man with me who could not assist me. It was getting dusk and raining slightly, so, walking up a small hill, I stood on a large rock to see if I could discover my tent. I could not and was just beginning to think that I should have to sleep in the jungle, when from under the rock on which I was standing a bear got up and ran down the hill. I fired and it apparently dropped dead about thirty yards off. Almost immediately another bear got up from the same place and followed the first, and while I was aiming at it the man, who was with me on my left, touched me and pointed with his finger to my right. I turned my head and saw a third bear standing on a level with me about four or five yards off and looking at me. It had apparently come up round the corner of the rock from the same spot

as the others. I immediately fired at it, and it ran down the hill making the usual noise. I then saw about fifty yards down the hill bear No. 2, which I had not fired at, looking in the direction of bear No. 1 which was lying motionless. It quickly returned to No. 1, touched it with its paw and started off again down the hill, but stopped when it had gone a short distance and partially turned round. I then shot it. Bear No. 3, when I first saw it, seemed to be looking at me with astonishment or bewilderment. No. 2 lost its life by trying to save No. 1, which it apparently thought had sat down for some reason and could not make out why it did not run away. These were again a female and two nearly full-grown cubs. I am sorry I did not at the time think of ascertaining whether bear No. 2, which returned to try and save No. 1, was the mother or one of the cubs.

The sloth bear is a powerful animal, and this may well be observed by looking at the carcase of a full-grown specimen after the skin has been removed. It does not, however, appear to be a very dangerous beast to encounter out shooting, and the death or severe mauling of a European sportsman by one is not often reported. It is also probably not so vicious as a tiger or panther, although exceptions to this rule may occasionally be met with; nor does it appear to be in the habit of laying in wait for its assailant after being wounded. I can report two cases of cowardice: one was a big male who charged down hill from a distance of nearly one hundred yards on receiving a very slight wound, but, on being severely wounded, when about eight yards off, turned and did his utmost to crawl away. Another was a female which was induced to leave her cave where she had a small cub and was wounded while running away. The cub was caught, and the wounded mother was immediately tracked up. We came upon her frequently at distances of from twenty to forty yards, but she made no attempt to charge, although I did my utmost to incite her to do so by causing the cub, which was being carried close to me, to cry out. A female will frequently carry a young one on her back, but in this case the cub was too young to be able to cling to its mother's back.

BOMBAY, *May*, 1897. F. J. A. HILL.

No. XXI.—LATE STAY OF WILD FOWL.

It may be of interest to Naturalists to know that on the 6th instant I saw a solitary male Shoveler duck on a big tank near Bhuj, and on the same day, at Devisar, 11 miles north of this, my shikari, Ookha Bheel, saw 20 Shovelers (males and females) and seven Blue-winged teal. Is it not extraordinarily late for the northern ducks to be still with us? To-day Captain Whyte and I saw two Avocets (*Avocetta recurvirostra*) near the above-mentioned piece of water, and up to the 17th of last month the Black-tailed godwit (*Limosa ægocephala*) was here in great numbers.

C. D. LESTER, LIEUTENANT,

BHUJ, CUTCH, 9*th May*, 1897. 17th Bombay Infantry.

No. XXII.—LATE STAY OF WILD FOWL.

Having read with much interest your note in the *Pioneer* of 27th April on the abnormally late stay of migratory wild fowl this year on the Ganges near Allababad, I think that a few remarks on this head may prove interesting as showing that a similar condition has prevailed this year in Kashmir. The wild fowl here, after being scattered and driven away by the heavy snow and severe frosts of January and February, began to reappear towards the end of the latter month in daily increasing numbers, and some very good bags were made, particularly on the State preserve, Hokarsor,—always a great haunt for wild fowl. The numbers of duck increased during March, and, with the exception perhaps of mallard, large numbers of duck and a fair quantity of geese (*Anser cinereus*) remained into April. I shot one of the latter on the 5th April from a party of ten which passed me during a hurricane of cold wind and rain. On 16th April I gave up shooting and returned to Srinagar, and up to that time nearly every jheel and tract of new inundation formed by the lately-melted snow held plenty of fowl, including gadwal, pintail, shoveler, teal, garganey, wigeon and white-eyed (*Fuligula nyroca*) and red-headed (*Fuligula ferina*) pochards. This latter, generally rare in Kashmir, has been very abundant during the late winter, while his handsome relative, the red-crested pochard (*Fuligula rufina*), has only shown in comparatively small numbers. Wigeon (*Mareca penelope*) has been more numerous than usual; while some specimens of the very uncommon white-faced stiff-tailed duck (*Erismotura leucocephala*) have been secured. This latter, by no means a regular visitor here, was seen on several occasions in March last. It is by no means shy, and can be approached by a boat in perfectly open water. It is a most expert diver, a winged bird being almost impossible to secure, swims very deep in the water, and when getting on the wing "skittirs" along the surface like a coot. Since my return to Srinagar I have several times seen flights of teal and duck passing over, and only yesterday saw four greyleg geese (*A. cinereus*), and have no doubt that abnormally large numbers of wild fowl are still left in the valley. The reasons for this unusually late migration form a problem well worth discussion; it is possibly due to the stormy unsettled weather which appears to have prevailed for more than a month past throughout the Himalayan regions, and this theory is supported by the fact that wild fowl prefer fine clear moonlight nights for their migrations, but Kashmir and the hills generally have known winters more severe than, and springs as stormy as, the last, without the fowl allowing them to interfere with their regular annual dates of departure; and it is possible that if the late bad weather *has* caused the delay, it is because the duck recognise it as connected with conditions prevailing at their northern breeding grounds which render a longer stay in the sunny south desirable. It will be interesting to observe if this long delay will induce some of them to breed here.

KASHMIR, *3rd May.* W. A. UNWIN, COLONEL.

(*The above appeared in the "Pioneer" on 11th May*, 1897.)

J. G. Keulemans del. Mintern Bros. Chromo lith. London.

THE WHITE-FRONTED GOOSE

Anser albifrons.

⅙ Nat. size.

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INDIAN DUCKS AND THEIR ALLIES.

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Part II, with Plate II.

(*Continued from page* 21 *of this Vol.*)

Sub-Family Plectroptorinæ.

Key to the Genera—

a A large fleshy comb at the base of the culmen in the male... ... ... 1 Sarcidiornis.

b No comb at the base of the culmen.

a' Bill at least equal to double the depth at base.

a'' Outline of the loreal feathering at the base of the bill with the convexity anteriorly. 2 Asarcornis.

b'' Outline of loreal feathering straight and inclined backwards ... ... 3 Rhodonessa.

b' Bill not so long as double the depth at base. 4 Nettapus.

Another key is as follows, and this may prove simpler to sportsmen :—

a Wing over 10″.

a' Head principally black and white.

a'' Comb at base of bill. ... ... 1 Sarcidiornis. ♂

b'' No comb at base of bill.

*a*³ Upper back black, lower plumage nearly white ... ... Sarcidiornis. ♀

*b*³ Upper back olive-brown, lower plumage chestnut-brown ... ... 2 Asarcornis.

b' Head pink, bright in ♂ dull in ♀ ... 3 Rhodonessa.

b Wing under 7″ ... ... 4 Nettapus.

As already enumerated, the distinguishing features of this sub-family are, a rather long hind toe, *not* lobed, a neck shorter than the body and with, especially in the male, more or less glossy upper plumage combined with comparatively long tail-feathers. In India four genera are represented, although each by a single species only—indeed, two of the four genera possess but one species, and are peculiar to India and adjacent countries, these two being *Asarcornis* and *Rhodonessa*.

Genus SARCIDIORNIS.

"This genus is separated from the other Indian genera by the presence of a spur on the shoulders of the wing." This feature was formerly considered of sufficient importance to constitute as a sub-family by themselves such birds as possessed it, and the *Plectroptorinæ* are designated by Jerdon "Spurred Geese." Later systematists have, however, added others to this sub-family, which now contains eight genera, many of which are not spurred.

(6) Sarcidiornis melanonota. The Nukhta or Comb Duck

Sarcidiornis melanonotus. Jerdon, "Birds of India," III, p. 785; Hume, "Nest and Eggs," p. 636; Butler and Hume, "Str. Feath.," IV, p. 27; Hume and Davison, *ibid*, V, p. 486; Hume, *ibid*, VII, p. 507.

Sarcidiornis melanonotus. Hume, "Str. Feath.," VII, p. 491; *id. ibid*, VIII, p. 114; Hume's Cat., No. 950; Hume and Marshall, "Game Birds of India," III, p. 92; Parker, "Str. Feath.," IX, p. 486; Legge, "Birds of Ceylon," p. 1063; Oates, "Str. Feath.," X, p. 245; Hume, "Nests and Eggs," (Oates' ed.), III, p. 282; Barnes' "Birds of Bombay," p. 396.

Sarcidiornis melanonota. Oates' "Birds of British Burmah," II, p. 275; Salvadori, Cat. B. of B. Museum, XXVII, p. 54.

Description: *Adult, male.*—Head and neck white, spotted with metallic black feathers, coalescing more or less upon the crown, nape and hind neck; lower neck and whole lower plumage white, tinged sometimes with rufous-grey; lower back grey; rest of upper plumage and wings black, glossed with green and blue, except on the secondaries, which are glossed with bronze and the scapularies, on which the gloss is purple; tail brown; sides of the body tinged with grey; a black mark (almost a demi-collar) on the sides of the neck, and another black band in front of the under-tail coverts descending from the rump.

Female.—Like the male, but smaller and duller ; head and neck more spotted with black, but the black less glossy in character and the gloss on the upper parts also is much less developed. Lower back, rump and upper-tail coverts all grey.

Young.—Like the female, but still more spotted about the head with a dull blackish-brown ; the black of the back and wings, also, is replaced by brown and is without gloss.

Nestling.—" Upper parts greyish-brown ; under parts greyish-white, upper part of the head brown ; a whitish frontal band runs on each side of the head over the eyes, a white crescentic band bounds behind the brown colour of the upper part of the head ; a narrow brown band starts from the ear-coverts and reaches a brown band on the hind neck ; two white patches on the side of the back at the base of the wings, and two others on the sides of the rump ; posterior edge of the wing whitish " (Salvadori).

" The young are dull earthy-brown above and dirty white below " (Hume).

Iris dark brown, that of the young said to be even darker ; bill and comb black ; legs and feet plumbeous. The female and young have no comb.

Dimensions : *Male.*—Length, 28·5″ (Hume) to 34″ (Jerdon) ; wing, 13·37″ (Hume) to 16″ (Jerdon) ; tail, 5·25″ to 6″ ; bill from gape, 2·5″ to 2·75″ ; at front, 2·5″ (Jerdon) ; comb, 2″ to 2·5′′ in the breeding season only ; tarsus, 2·62″ (Hume) to 3″ (Salvadori).

Female.—Length about 25″ to 27″ ; wing, 11″ to 11·5″ (Salvadori) ; 12″ to 14″ (Jerdon).

The Nukhta is found throughout the Indian continent, though absent here and there where the country is unsuitable, but is certainly more abundant towards the west than in the east.

Hume says : " I do not know of its occurrence in the Punjaub, Trans-Sutlej or in Scind, except as a mere straggler to the easternmost portions. I have no record of its appearance in Sylhet, Cachar, Tipperah, Chittagong, or Arakan." Again, in another place, he adds, when enumerating the places where it is to be found " (excluding perhaps, the Sunderbuns, Jessore, and one or two others of the deltaic districts)." Of these places several have now to be erased from the list of localities not inhabited by this bird. In the Punjaub, as far as

I can ascertain, it is undoubtedly a rare visitor : still it is found there and is not as rare as Hume deemed it to be. On its occurrence in the Trans-Sutlej the following notes occur in "Stray Feathers" (Vol. X, No. 5, p. 430):—"Although it (the Comb Duck) certainly is nowhere common in this region, I know of its having been shot on more than one occasion in the Lahore district, in the Gurdaspur district, and, again, further south in the Baree Doab, but only in the rainy season and always in the immediate vicinity of the canals.

"I heard of a nest being taken as far south as the Changa Manga Plantation, but I am not sure of the fact. I have never heard of or seen the bird west of Baree, but throughout the canal-irrigated portion of the Baree Doab, the whole tract between the Beas and the Sutlej and the Baree it certainly does occur, though very sparingly, during the rainy season."

After this note, which is by G. Trevor, Hume goes on to quote the *Asian* on the subject, and part of this letter I again produce :--

"I am happy to state that it not only occurs but that it breeds in the Punjaub, Trans-Sutlej. A friend of mine, an Engineer on the Baree Doab Canal, sent me a female *Sarcidiornis* for identification from Bhambé, in the Lahore district. On opening the bird I found a perfectly-formed egg ready to be laid, and from other investigations it seemed clear that there was a nest in the vicinity. During the rains the neighbourhood of Bhambé in one direction is fairly under water, and canna brakes are very common, with patches of water between, and dotted here and there with large trees, just the place for the Nukhta. It was at one such place that my friend saw the pair often, and on the day he shot the female had fired one or two shots unsuccessfully at her or the male, but was rather surprised at the way in which both returned—wheeling round and round without going away for any distance. As soon as the female was shot, the male went further off, and did not afford another shot; but the whole circumstance goes far to prove that there must have been a nest at hand."

In Cachar it is by no means very rare. I have seen it in Sylhet and again have had notice of its occurrence sent me from the North Looshai Hills. As regards the Sunderbuns, Jessore was the district in which I first made the acquaintance of this species, a distant acquaintance only, it is true, but in the next district (Khoolna), we came into closer contact

with one another. Here a pair of Nukhtas formed part of a bag of 140 couple of duck and teal got by my father, Mr. T. Wilcox, and myself in the Moolna bhil, a vast extent of swamp and water, covering fully 20 square miles of the country. This was in the cold weather, the end of January, I think, of 1882. In Cachar, Sylhet, and Looshai the birds remain all the year round and breed, as they do in most of the other parts of their habitat, but in the Sunderbuns, I should think, they are, very probably, migrants, though I have no evidence on this point. In Burma, Oates reports them as common in Pegu, and it is almost certain that they have been, or will be, recorded throughout that Province extending through the Indo-Burmese countries.

Out of India their habitat may be described roughly as Africa south of the Sahara, and they are also found in Madagascar, though they do not seem particularly common there. Hume says that they do not ascend the hills, but here and in Looshai they are, at all events, found up to about 2,000 feet if not considerably higher. Mr. C. G. Scott, an Engineer on the Assam-Bengal Railway, told me, only a few days prior to this being written, that late in April one of these birds flew quite close to him as he was walking down one of the cuttings at an elevation close on 2,000 feet, and the bird, a drake, was then flying steadily up the valley. I have seen Nukhtas myself, a pair of them, in the Mahor Valley at heights ranging between 1,500 and 2,000 feet, and once I heard its hoarse cry in the Jiri Valley at least as high as the latter elevation. I know, for a certainty, that they breed up to at least 2,000 feet, and I am almost sure that a pair had their nest in the Mahor Valley even higher up than this. I was out after sambhur at the time they were first seen. In the centre of some heavy tree forest I came across a collection of small grassy swamps, varying from some one to two hundred yards in diameter. All round these were lofty trees, and wherever there was sufficient dry land, others were dotted about in between the pools.

On my approaching the open two Nukhtas flew from one of the trees uttering their loud calls repeatedly. Instead, however, of flying straight away, they continued to fly round and round in great excitement and refused to leave the place even after I had fired at and missed a deer.

The sort of ground they prefer has been variously described by different writers. Here they keep much to water in forest, and more especially to such as is well covered with weeds and grasses and not of the clearest

and cleanest. One or two are always to be met with near Diyangmukh on a nullah which runs through heavy forest, and in the cold weather is reduced to a series of shallow pools.

Hume says: "It much prefers well-wooded tracts, not dense forests like the White-winged Wood Duck, but well-wooded, level, well-cultivated country. It is a lake bird too, one that chiefly affects rush and reed-margined broads, not bare-edged pieces of water like the Sambhur Lake, and it is *comparatively* rarely met with on our larger rivers. I have shot them alike on the Ganges and the Jumna in the cold season, but it is far more common to find them in jhils and bhils. *I have never found it in hilly ground and very rarely in small ponds*" (the italics are mine) . . . "Just when the rains first set in, they seem to be on the wing at all hours of the day, and almost wherever you go in the North-West Provinces you see them moving about, always in pairs, the male, as a rule, in front . . . . . They never, as far as I have observed, associate in flocks. There may be half-a-dozen pairs about abroad in the rains, or half-a-dozen families, each consisting of two old and from four to ten young birds, during the early part of the cold season; but I have never seen them congregate in flocks as most geese and so many of the ducks do."

Oates (*vide* "Birds of British Burmah") seems to have found them in much the same kind of places, and also in paddy-fields; but he says that in Burma it is found "singly, in pairs, or in small flocks of twenty or thirty individuals." Jerdon, on the other hand, says that although it is generally found only in small parties of four to ten individuals, yet it is sometimes found in flocks numbering over a hundred. This, I should imagine, is most unusual, and we may take it for granted that, as a rule, they go in pairs only, except when they have a family, and that occasionally two or more families join forces; and, again, when the breeding season is over the young and the full-grown are often to be found singly, the old birds alone continuing to keep in pairs.

The general concensus of opinion appears to be that they are not very wary birds, and in consequence are not hard to bring to bag. Of course, as Hume says, you cannot walk up to them and pot them as they swim about unconcernedly on the water, but with comparatively little trouble and care one ought always to succeed in getting near enough for a shot, unless the country surrounding them is utterly bare and destitute of cover for the sportsman. Once disturbed, their flight, etc., is variously

described. Hume says their flight is powerful and fairly rapid, and that they are all round quicker, more active birds than geese both on the wing and in the water. Jerdon, however, did not think much of the bird as a "progressionist," and Legge describes their flight as heavy, and leads one generally to the belief that he deemed it rather an awkward, clumsy bird—which it certainly is not. Tickell's remarks in general on this bird vary so much from those recorded of other people that I quote them nearly in full: "I have met with these birds chiefly about west Burdwan, Bankoora, Singbloom, and Chhota Nagpur, in open, uncultivated bushy country, on a gravelly soil scattered over with small, clear ponds or tanks, where they may be found in parties of four or five, resting during the heat of the day on the clean pebbly or sandy margins, and flying off, if disturbed, to the next piece of water . . . . . Wherever found they appear to prefer clear water with a gravelly or stone bottom, and are never found in shallow, muddy jhils or marshes which attract such hosts of other kinds of Wild Fowl . . . . . They are very wary and, as they take to wing generally at a long shot distance, and have both skin and plumage exceedingly thick, it is difficult to kill them with an ordinary fowling-piece; and if winged on the water, they dive so incessantly as to require the help of several people to catch them.

"I have placed their eggs under domestic hens and ducks, and hatched and reared the young birds easily, but they never became thoroughly tame and escaped on the first opportunity they had, though they had, up to the time of their flight, fed readily with the poultry in the yard. They ran and walked freely, and could perch on anything that did not require to be grasped . . . . .

"It is an exceedingly silent bird—indeed, I have never heard it utter any sound. They repose chiefly on gravel beaches by the side of clear still water . . . . . Their flight is high and well sustained . . . . .

"At night they roam over the paddy stubble, and I have found their stomachs full of rice during the harvest."

Other people seem to have been more successful than Tickell in domesticating this fine (goose or) duck, and there are numerous instances on record in which the bird has been readily and thoroughly tamed. How a cross between this and any of the breeds of domestic duck would answer is very problematical. Of course the product would be a bird of size and

weight, but how about the flavour ? The Nuhkta is not a bird which finds much favour with most people as an article of food, though it makes very good soup and not bad curry, and the ducklings when killed, just after they have taken to the wing, are quite delicate and good.

Though Hume never found any grain except *wild* rice in the stomachs of the birds he examined, others, besides Tickell, have found that cultivated rice forms one of the articles of their diet. They eat all sorts of shoots, roots, seeds, etc., of water plants, varying this vegetarian food with a little animal stuff now and then, such as worms, spawn, water larvæ, and perhaps an occasional fish.

The voice of the Nukhta is, according to Legge, "a low guttural quack-like sound, between the voice of a duck and a goose." The few I have heard uttered loud cries which seemed to me far more like the notes of a goose than a duck. A pair whose nest I afterwards found used to herald my approach to their particular piece of water with loud trumpet calls, uttered by them, when they first saw me, from their perches high up in the tree. They roost, I believe, always in trees and not in the water or on the ground, and they are not nocturnal or even crepuscular birds in their habits, as are most of their order.

The Comb Duck is one of those which invariably resort to trees for nesting purposes, as a rule making a rough nest of grass and a few sticks in some large natural hollow of a big tree, generally at no great height from the ground. Sometimes, however, they build their nests in the forks of the larger limbs, especially when three or four such branch out together from the trunk itself. Occasionally they seem, like the Whistling Teal and the Mallard, to make use of other birds' nests, for Mr. A. Anderson found some eggs in the nest of a *Haliœtus leucoryphus* which he believed to have been laid by a Nukhta. Captain G. T. L. Marshall also found an egg of *Sarcidiornis* in a nest of *Dissura episcopa*.

The only nest I have taken myself in North Cachar was placed in a large tree standing by the edge of a small swamp, the latter completely covered with dense ekra and grass, except for a few feet all round the edge, and, even there, short weeds and water-plants almost hid the water itself from sight. The nest, which was rather a large one of sticks lined with grass roughly, was placed in a hollow between where the first large boughs sprang from the bole of the tree.

It was not ten feet from the ground, but the boughs were so massive and so well inclosed the nest that I visited the pool, stood under the tree and saw the parent birds several times before I noticed where it was. It contained three eggs, just like those described by Hume, with a beautiful texture, reminding one, when touched with the finger, of the eggs of the Barbets and Frogmouths, possessing the same satiny feeling which is so uncommon outside the families mentioned. In colour they are nearly white, and have a fine gloss when freshly laid, but they soil very quickly and are then difficult to clean again.

The number of eggs laid seems to vary very much, but, probably, a dozen or less is about the normal number, though Mr. Anderson seems to have had from fifteen to twenty brought to him not infrequently; and on one occasion found the enormous number of forty eggs, of which thirty-nine were normal and one undersized. He captured a female on this nest, and says that she was in an emaciated condition, and therefore, he believed, authoress of the whole forty eggs. Probably a wild bird, with no extraneous aid in the way of artificial food, etc., would be a good deal exhausted after such an effort, but a domestic hen would not think it anything out of the way, nor would she be any the worse for it.

Hume's forty-five eggs varied from 2·22″ to 2·58″ in length and in breadth between 1·65″ and 1·78″, averaging 2·41″×1·72″. The little clutch found by Mr. Anderson, excluding the abnormally small one, averaged $2\frac{1}{2}''\times1\frac{3}{4}''$, giving an average for the whole eighty-four of 2·45″×1·74″ almost.

Jerdon says that the Nukhtas breed in July or August "in grass by the sides of tanks, laying six to eight whitish eggs." Jerdon did not, however, know, nor did he care much about the oological part of ornithology, and I do not think much weight need be attached, as a rule, to what he says about nidification.

The breeding time nearly all over India varies from the end of June to the beginning of September, and probably depends much on when the rains commence. Here, in Assam, where the rains, like the poor, are always with us, I think the birds begin to breed in the end, or even in the beginning, of June. In Bengal they commence to breed in early July. In the North-West in late July or August, sometimes as late as September. In Burma they seem to breed in the two

first-mentioned months, and in Ceylon alone they alter their habits and are said to breed in February and March. This last, however, is no very well authenticated, and may be a mistake, for Legge says: "In Ceylon this goose breeds, *I understand*" (the italics are mine) "in February and March."

The African form alluded to by Hume as *S. africanus* is not distinct from our Indian *S. melanonota*, though it averages a little smaller, the wing being about 13″ or 14″ in the male.

Hume also refers to Sclater's plate of *Sarcidiornis*, and referring to the yellow under-tail coverts therein depicted, says, that in all the Indian specimens he has seen the tail coverts are always white. As a matter of fact, although the under-tail coverts in the plate should have been white and not yellow, the bird shown in the plate is not our Nukhta at all, but *S. carunculata*, a much smaller species found in Brazil, Paraguay, and North Argentina.

This and the other ducks belonging to this sub-family are amongst those requiring a close time, as all of them are residents or mere local migrants. This close time might extend from the 1st June to the 1st December. Tickell says that by October most of the young are on the wing, but in some parts of India this is at least a month too early; and I do not think the 1st December is too late a date for recommencing their slaughter.

Genus ASARCORNIS.

This genus is one specially created by Salvadori for the White-winged Wood Duck which previously had been placed either with *Sarcidiornis*, *Casarca*, *Anas* or *Tadorna*. It seems to be allied most nearly to the first-mentioned of these genera, differing in possessing no comb or spur, and in having a flatter and larger bill. There is no other member of the genus.

Hume in a footnote to "Game Birds," p. 147, gives his reason for rejecting the name *A. scutulata* which is that Blyth considered Müller's birds to be of a different species to the wild one found in India and Burma. Salvadori, however, who has had more material to work on than was available to Hume at the time he wrote, seems to consider that *A. scutulata* does apply to our bird, and that the domesticated, or confined bird, is inclined to albinoism. Under the circumstances, I think it is better to follow Salvadori and accept Müller's name.

(7) Asarcornis scutulata.—The White-winged Wood Duck.

Anas scutulata. Hume, "Str. Feath.," VIII, p. 158.

Casarca leucoptera. Jerdon " B. of India," III, p. 793 ; Hume and Davis, " Str. Feath.," VI, p. 489. Hume, *ibid*, p. 170.

Casarca scutulata. Hume, "Str. Feath." VIII, p. 115 ; Hume, Cat. No. 955.

Anas lucoptera, Hume and Marshall, " Game Birds," III, pp. 147 and 172; Oates, "Birds of British Burmah," II, p. 281. ; Hume, " Nests and Eggs " (Oates' ed.) III, p. 287.

Asarcornis scutulata, Salvadori, Cat. B. of B. Museum, XXVII, p. 60.

Descriptions: Adult Male.—Head and upper part of the neck white, thickly spotted with black, as in *Sarcidiornis melanonota;* the black spots more numerous on the upper part of the head and hind neck ; lower part of the neck and mantle glossy black, mixed with brown-chestnut in front, the same colour covers the breast and abdomen ; under-tail coverts brown ; back, rump, upper-tail coverts and scapularies olive-brown ; the feathers of the back, rump and upper-tail coverts glossed with bluish and green ; smaller upper-wing coverts white, the median ones bluish-grey or lead-colour, broadly tipped with black ; quills olive-brown, but secondaries with the outer webs bluish-grey, forming a distinct speculum ; tertials olive-brown, the first one white on the outer half of the outer web, margined outwardly with black, under-wing coverts and axillaries white, the former mixed with brown feathers ; tail dull olive-brown ; bill ochreous-red; feet reddish (Salvadori).

Length, from 27″ to 29″; wing about 15″ ; tail, 6·5″ ; culmen, 2·5″ ; tarsus, 2·3″.

Female.—Similar to the male, but somewhat smaller and less glossy on the edges of the feathers of the back and rump and of the upper-tail coverts. Total length about 26″; wing, 12″; tail, 6″; culmen, 2·4″; tarsus, 2·1″ (Salvadori). The only sexed female in the Museum is that which was in Hume's collections, and must be the same as that for which he gave measurements in " Game Birds." His measurements being as follows :—Length, 27″ ; wing, 12·7″ ; tail, 6·8″ ; tarsus 2·2″ ; bill from gape, 2·58″. The two measurements are instructive if only to show how widely different may be the measurements of two different men, even if they be ornithologists quite at the top of the tree. Of course

shrinkage would nearly account for the differences if Hume's skin was quite fresh when measured; and this is what may have been the case, though it is hardly likely, as the bird was, I believe, collected by Mr. Shillingford in Purneah and sent (a dry specimen) to Mr. Hume.

Colonel Graham gave the colour of the legs and feet as dirty yellowish, and the bill looked as if it had been "yellow-brownish at the tip and base."

Blyth says: "Bill yellow with some lateral black specks, the destrum darker, and the feet appear to have been orange."

Later on he figures the bird with dingy olive-yellow feet and bill, but the birds from which he copied were, I believe, domesticated ones, and the discrepancy is thus accounted for.

This is one of the most rare and little known of all our *Chenomorphæ*, and the records regarding its distribution are very limited. I do not consider that Blyth's remarks can really refer to this bird at all, and he must have made a mistake; from what he says one would imagine the White-winged Duck to be a very common species in certain parts of Burma, yet Hume says in "Stray Feathers," Vol. VI, p. 489: "Davison has examined the Valley of the Sittang, the Salween, the Attaran, the Gyn, the Haung-thaw, the Tavoy, and the Tenasserim, but he has never yet seen or heard of this species. If it does occur in Tenasserim it can only be as an extremely rare straggler."

As regards Jerdon's letter to Hume, in which he mentions this bird as congregating in large flocks, it is a pity we have not the date of it. In 1864, when he finished his third volume of the "Birds of India," he evidently looked on the bird as rare in the extreme; he talks of its *occurring* in Dacca and other parts of Eastern Bengal, but does not lead one to infer that it was anything but uncommon even there. If his letter was written prior to 1864, it may be taken for granted that Jerdon had discovered his mistake, whilst, if written after 1864, it shows that Jerdon made a mistake, which, as far as any one knows, has never been rectified. He says, "I have seen several flocks of *Casarca leucoptera* in the lower parts of the Brahmapootra, where it joins the Ganges, not far from Dacca, where, indeed, Simson had seen it." Ten years more, added to the years when Hume and his collectors knew the country above referred to, has shown that it could not have been the Wood Duck which Jerdon saw in flocks. That Simson *saw* it in Dacca certainly does not prove that it inhabits

the Megna, Brahmapootra, and Ganges in numbers. The only other notice of its occurrence that I know of in Eastern Bengal is of four birds said to have been seen in Singbhoom by Mr. W. Moylan when out shooting with two other guns, of which four birds one (a drake) was shot.

Colonel Graham seems to have found it common in the Lakhimpur district of Assam, where, however, it seems he got but one bird from Sadiya, and he notes it as rare in Darrang. Godwin Austen procured one on the River Dunsiri, saw one in the Garo Hills, and knew of one killed in Tezpur. Two were seen by myself in 1886 when shooting partridges in the Barpeta part of the Kamroop district, and were missed by me with both barrels at long ranges. The bird is known and well described by the Cacharies, but, though I once heard a pair of them on the borders of the Cachar and Maogang districts, I failed to get a sight of them. Specimens have been obtained in Tavoy and Mergui, and these end the known localities within our limits in which it has been met with. Outside it extends to the Malay Peninsula, Sumatra (?) and Java. It thus seems probable that it will be found to inhabit suitable localities in Eastern Bengal, where, however, it is of extreme rarity, that it becomes less rare higher up the Assam Valley, being most frequently met with below the hills of the extreme north-east, extends through Cachar and the Indo-Burmese countries and Burma to the Malay Peninsula.

Colonel Graham says : " They roost on trees and frequent solitary pools in deep tree jungle. They are always in pairs, and may be heard calling to one another at great distances. They are rare in Darrang, for the forest is not dense and extensive enough there as a rule, but in the vast, pathless tree jungles of Lakhimpur they are common." This agrees well with what I have heard of them and their habits in North Cachar. The only experience I have had personally with them in this district was on a rainy day in June, when out shooting I heard two birds calling to one another in loud goose-like calls. The forest was very dense and consisted almost entirely of trees, but through it there wandered a sluggish, dirty stream which here and there disappeared into small morasses dotted with tiny pools of clear water. Thinking the safest way to get a shot would be to drive them, I sent my Cachari tracker to beat down the stream towards me from a point some two hundred yards or so above where we heard them calling. The drive

proved a total failure, as though the birds flew within thirty or forty yards of me they kept inside the forest on the same side of the stream as that on which I was seated, and I hardly caught a glimpse of them much less obtained a shot. The Cachari told me that when he came on the first one it was in a tree from which it did not fly until he was underneath, and that then it made off to its mate, which was some two hundred yards higher up the stream. They then both settled in a small pool and did not again take to wing until he had sneaked to within twenty yards when they got up and flew straight away, passing, as I have already said, just out of sight of me. We heard them calling two or three days after this, but when I attempted to stalk them they made off long before I got within sight or shot of them.

When I saw the pair in Barpeta I was shooting Kya Partridge in the ekra-covered patches of swamp in the forests, and a pair got up some forty or fifty yards from me from some swamp just as I emerged from the forest. Two barrels of No. 7 pattered on their backs at once, but seemed not to have the smallest effect on them. These two birds flew just like geese, one bird (the male, I suppose, for he looked much the heavier) about ten yards in front of the other, their necks fully outstretched and squawking loudly as they flew for the first few hundred yards. Whilst in the open they flew within a few feet of the ground, but on regaining the forest mounted higher until they disappeared altogether in the distance.

Mr. Moylan in narrating to me how he met with this duck in Sini in Singbhoom, said that they were shooting in grass-covered swamps at the edge of heavy forest. They were standing at the edge of this forest when he saw four birds, which he took to be geese, coming down towards him and his companions. They were at a great height, but a charge of S. K. G. shot took effect on the foremost, and he came crash to the ground, turning out to be a fine drake. It is possible that Mr. Moylan may have been wrong in his identification, but I failed to discover any reason to make me think so, though I questioned him closely on the matter. This was the only occasion on which he ever saw the duck.

I have an egg said to be of this species. A creamy white egg, extremely smooth and glossy, with fine close grain but *not* very hard. It was taken from a deep hollow in a rotten tree, the nest consisting of a mass of grass and some feathers. It was found two or three days after

I left the place, where, with the Cachari, I had come across the pair of Wood Ducks ; the tree was on the border of the stream mentioned and not far from where we had heard the birds calling, so that I think very likely the egg is that of the White-winged Wood Duck. It measures about 2·1″ × 1·38″.

Genus RHODONESSA.

The genus *Rhodonessa*, like the former, consists of but one species, which species is confined to Indian limits. In adult or semi-adult birds the colour of the head is sufficient to define it at a glance ; should, however, the bird be in its first plumage, reference must be made to its loreal feathering, as mentioned in the key above.

(8) Rhodonessa caryophyllacea. The Pink-headed Duck.

Anas caryophyllacea. Jerdon, " Birds of India," III, p. 800; Hume, " Nests and Eggs," p. 644 ; Fairbank, " Str. Feath.," IV, p. 264; Davidson, *ibid*, VII, p. 95 ; Ball, *ibid*, p. 232 ; Hume, *ibid*, p. 492 ; *id.*, *ibid*, VIII, p. 801 ; Hume and Marsh., " Game Birds," III, pp. 174, 435 ; Barnes, " Birds of Bombay," p. 404.

Rhodonessa caryophyllacea. Ball, " Str. Feath.," II, p. 438 ; Hume, *ibid*, VIII, p. 115 ; *id.*, Cat. No. 960 ; Butler, " Str. Feath.," IX, p. 437 ; Reid, *ibid*, X, p. 81 ; Hume and Marsh., " Game Birds," III, pp. 173, 435 ; Oates," Birds of British Burmah," II, p. 284 ; A. Taylor, " Str. Feath.," X, p. 531 ; Hume, *ibid*, XI, p. 344 ; Hume, " Nests and Eggs " (Oates' *ed.*), III, p. 290 ; Salvadori, " Cat. B. of B. Museum," XXVII, p. 61.

Description : Adult Male.—Head, sides of neck and hind neck a beautiful rosy-pink, with, in the breeding season, a small tuft of still brighter rosy on the top of the head ; throat, dark brown ; rest of the plumage fine, glossy, dark chocolate-brown, paler and less glossed beneath, but under-tail coverts very dark ; mantle, scapulars, breasts and sides with very fine rosy-whitish vermiculations or points ; edge of the wing whitish ; speculum reddish-fawn or dull salmon colour, with a white band at the tip of the secondaries ; outer web and tip of the outer primaries brown ; the inner webs and inner primaries buff ; tertials glossy chocolate-brown, narrowly edged with black on the outer webs ; under-wing coverts and quills beneath a pale pink colour, with a satin lustre ; tail chocolate-brown (Salvadori).

In Jerdon and Barnes (Appendix Jerdon) in *loco citato* we find the additional " edge of wing whitish, uppermost tertiaries rich glossy green."

This is right, and it is shewn in Hume and Marshall's plate, but the average bird has not so bright or light a green and has it even more glossy.

The depth of the brown varies a good deal, and I am inclined to think that owing to age, very old birds are the darkest, nearly black. Condition of plumage in this, as in every other species of brown or black bird, has a good deal to do with the colour, and brown in old plumage is always *much* duller and paler than in the fresh. I have certain Spine-tail Swifts which shows a mixture of quite light brown feathers with new black ones glossed with blue, the former being merely old ones from which the colouring matter has been exhausted.

" Bill reddish-white, rosy at the base and bluish at the tip ; irides fine orange-red ; legs and feet blackish with a tinge of red " (Jerdon).

" Bill dirty red ; cere flesh-coloured ; irides deep orange-red ; legs and feet reddish-slate " (Shillingford). Of another he notes : " Bill light pink, assuming a purplish tint towards gonys ; cere flesh-coloured ; irides deep orange ; tarsus, web and nails dark slate, inclining to purple ; lower mandible more deeply coloured than upper.

The following note of my own may explain Shillingford's " cere." Bill dull reddish-pink, deeper on mandible and darker still on gonys, *the base of both mandibles, more especially the maxilla near the forehead, purer and brighter pink.* This note was taken from an adult male.

" Length about 24″ ; wing, 10·5″ ; tail, 4·25″ ; culmen 2·1″ ; tarsus, 1·6″ " (Salvadori).

Female.—Similar to the male, but duller and paler, and more of a smoky-brown ; the pink of the head is dingier and paler, and there is a broad brown medial band from forehead over crown, and occiput and (diminishing rapidly in width) on the back of the upper neck ; but the most conspicuous difference is that the dull pink of the face runs on unbroken over the entire chin and throat, so that there is no trace of the dark band along chin and throat so conspicuous in the male (Salvadori).

The colour of the soft parts in the female seem to differ in being all of a duller hue. There is only one sexed skin in the British Museum, which possesses only six adult skins altogether, and this is a female. The

only colours given, however, in the Catalogue are those quoted from Shillingford. I do not know the authority from which these are taken, and Shillingford himself does not seem to have sexed his specimens.

Oates says that of the birds he has examined he has found the females to be about equal to the males in size. Oates gives the wing as 11″. The only other record of female measurements is in the Appendix to "Game Birds" where a female is said to be 23″ long with a wing of 10·5′, and an expanse of 37″; strange to say also she weighed more than three out of the four males that are mentioned in the same place.

Young.—Head and neck pale rose-whitish colour, with the top of the head, nape and hind-neck brown; the whole plumage lighter brown; the underparts pale dull brown, with the edges of the feathers whitish (Salvadori).

I do not understand the young bird depicted in the plate in "Game Birds" and have never heard of any bird like it in plumage, the "rose-whitish" colour being always a distinct feature.

The head-quarters of this duck are, as Hume says, Bengal, north of the Ganges and west of the Brahmapootra rivers; above all it is most common in Maldah, Purneah, Purulia and adjoining districts, the two first-named places being especially favoured. It has also been obtained in Arrah, Mozufferpore, Chota Nagpur and Ranchi, where it is only a rare bird, and in Singhboom, where it is rather more common. It is also found sparingly through Orissa and as far south as Madras, and all through Eastern Bengal and Assam up to Manipur, where Hume obtained it. He says in Vol. XI of "Stray Feathers" about *Rhodonessa*:—"This species is very scarce in Manipur. I only saw it at the Lagtak Lake, and there I only saw one party that kept up in a weedy lagoon at the north-east corner of the lake, where it was impossible to get them. I did get a single bird, but that was only by lying upon several occasions in a thick reed bed and getting them driven. Three times they went in the wrong direction, but having at last made out their line, I laid up in the right place the fourth time and knocked down a brace, of which, however, I only recovered one; I had no dog. This species occurs in Sylhet; and has been procured in various parts of the Assam Valley right up to Sadiya, but alike in Assam and Sylhet (I seem to have no record of its occurrence in Cachar) it appears to be excessively rare, little more than an occasional straggler."

In Burma it is extremely rare; Blyth obtained it in Arakan, and says that it occurs in Independent Burma (where?), but Oates did not come across it in Pegu, and I can find no other record of it.

Hodgson obtained it more than once in Nepal, and Pemberton in Thibet. "A Member of the Society" in Vol. II of this *Journal* writes:— "In Scind . . . I have one report of the Bengali Pink-headed Duck occurring as a straggler, but it cannot yet be called a recorded species." I suppose by this he means that he does not place much faith in the report.

I see Murray does not record it as a Scind bird, although he is very generous in the number of birds he assigns to that part of India.

Mr. Moylan told me that once out shooting in Sini, in Singbhoom, with three other guns they accounted for no fewer than six of these lovely ducks. They were found in the thick, weedy, reed-covered tanks lying just outside the heavy forest. Here they were in company with vast numbers of other kinds of ducks and teal, a big bag of which was made on this occasion. He seems frequently to have met with them in various parts of Singbhoom, but, as far as I could ascertain, had not seen any others shot.

In the Punjaub its occurrences are limited to four actually recorded. Two were shot by Colonel Kinlock and another is mentioned by him, as having been shot by a friend (a brother officer), whilst the other is noticed by Hume. All four birds were obtained near Delhi. In the North-West it is equally rare, and as the authorities who would attempt to prove otherwise are anonymous, it is not worth while quoting them. In Oudh it is perhaps less rare, and a few birds are seen and either shot or netted nearly every year. Latham says that it "is common in Oudh, where it lives generally in pairs, is often kept tame, and becomes very familiar." (!)

Shillingford's note on the "Pink-headed Duck" which appeared in the *Asian* gives so much information and so little is to be obtained elsewhere that I reproduce it *in extenso*:—

"During the cold weather, November to March, the Pink-headers remain in flocks varying from 6 to 30, or even 40 birds, in the lagoons adjoining the larger rivers, and have been observed by myself in considerable numbers in the southern and western portions of the district, that portion of Eastern Bhagalpur which lies immediately to

the north of the River Ganges and south-western parts of Maldah. They come up to the central or higher parts of the Purneah district in pairs, during the month of April, begin to build in May, and their eggs may be found in June and July. The nests are well formed (made of dry grass interspersed with a few feathers), perfectly circular in shape, about 9 inches in diameter, and 4 or 5 inches deep, with 3 to 4-inch walls, and have no special lining. The nests are placed in the centre of tufts of tall grass, well hidden and difficult to find, generally not more than 500 yards from water. They lay from 5 to 10 eggs in a nest. Both the male and female have been started simultaneously from the vicinity of the nest, but whether the former assists in incubation is uncertain, though judging from the loss of weight, during the breeding season, the male must be in constant attendance at the nest. The weight of five males shot between the 13th February and 28th June, 1880, in consecutive order being—(1) 2lbs. 3oz. (13th February); (2) 1lb. 14oz.; (3) 2lbs.; (4) 1lb. 13oz.; and (5) 1lb. 12oz. (28th June). When the young are fledged in September-October the Pink-headers retire to their usual haunts, the jungly lagoons.

"The following account, as indicating their strong attachment to their young, may prove of interest. On the 17th July, 1880, whilst searching for Pink-headers' nests with F. H. at the northern extremity of Patraha Katal, where nests were reported, we flushed a female Pink-header in the grass jungle on the banks of the Patraha jhil. F. H. fired with his miniature express at a distance of about 300 yards at the bird which had settled at the other end of the jhil. The ball was seen by both of us to strike the water some distance above, and a little to the left of the bird, which did not rise. Upon going up to the spot, to our surprise she fluttered about and dragged herself along with loud quackings. Being closely pursued she flew along at an elevation of about 6 feet from the ground in a manner that led us to believe that she was badly wounded, and one of her wings damaged, and she fell rather than settled in a patch of grass on dry land. Upon approaching this a similar manœuvre was gone through, and she deposited herself some 100 yards further on. Having decoyed us thus far she flew up into the air with such facility that our old mahout could not help exclaiming, *phair jee gya* (it's come to life again), and directed her flight in a direction away from the piece of water. After describing a

considerable circuit, she came back to the jhil on the banks of which we were standing. Two more bullets were fired at her from the same gun, which only made her rise after each shot and settle down again some ten yards further on. Seeing that her tactics had failed in drawing us away from the vicinity of her young, she again took to the grass jungle, and all endeavours to flush her again proved futile, though she was observed in the same piece of water subsequently."

What a pity Shillingford has not given us some details concerning all their nests he seems to have found and also of the numerous eggs he obtained; whether they were like those he sent to Hume, or whether they were like most other ducks' eggs. He did send five eggs to Hume, one of which was, I believe, taken by himself and the others by Mr. T. Hill of Jeruneah Factory in Purneah.

Of these five eggs Hume remarks: "The eggs are quite unlike those of any other duck with which I am acquainted. In shape they are very nearly spherical—indeed, one is almost a perfect sphere.

"The shell is very close and compact, but not particularly smooth or satiny to the touch, and is entirely devoid of gloss.

"In colour it is a dull, nearly pure white, with here and there traces of an exceedingly faint yellowish motling, probably the result of dirt. Even held up against the light, the shell is white, with scarcely a perceptible ivory tinge.

"The five eggs sent me by Mr. Shillingford measure as follows: 1·82″×1·7″; 1·78″×1·68″; 1·8″×1·62″; 1·71″×1·69″; 1·81″×1·61″.

"There is no possible doubt now that these eggs, taken at two different times by two different persons, are really the eggs of the Pink-headed Duck, but at the same time it must be admitted that they are eggs which no one versed in oology could, without positive proof, have accepted as pertaining to this species."

All observers, who have recorded their observations otherwise than anonymously, concur in stating this duck to be one of enclosed waters, and it seems to prefer such as are well covered with jungle and weeds of sorts and surrounded by high grass, forest, etc. It is probably found sometimes on the open rivers, but this only in the cold weather and very rarely even then. As a rule, it collects in but small parties, and I should think, very probably, that these are only of the members of one family, though two or three of these may now and then

join together. Its flight has been described as fast and powerful, and its voice as a musical edition of that of the Mallard (*A. boscas*).

As regards its food there seems to be nothing on record beyond Mr. Shillingford's note on the gizzard of a bird he examined and found to contain "half-digested water weeds and various kinds of small shells." This is, however, important, as it shows that it is both an animal and vegetarian feeder.

Most writers call this a shy and wild bird, but my father (E. B. Baker), who knew the bird well, did not consider it to be either a particularly wary or wild bird, though of a very shy, retiring disposition. I remember when I first came out to India, some ten years or so ago, he had several of these birds' skins amongst his collection of Maldah bird skins, but all these skins have been either lost or destroyed, and it is now so long since I last saw them that I cannot speak with certainty of the variations they showed in their plumage.

Most of these ducks had been shot by him when shooting with the late W. Reilly and some of the Shillingfords in Maldah and Purneah. At the end of a day's shoot when promiscuous firing had become the order, one or two of these ducks would often be added to the bag, getting up in front of the line of elephants as they worked through country in which there were any small ponds and jhils.

Genus NETTAPUS.

Unlike the two last genera, the present one contains four species, though of these only one is found in Indian limits. The type of the genus is *Nettapus auritus*, which is found throughout a great part of South Africa and also in Madagascar. The other two forms, *N. pulchellas* and *N. albipennis*, are both Australian, the former being obtained in New Guinea and some other islands.

Nettapus can be distinguished from all other genera by the following characteristics being combined in it:

Rather long hind toe not lobed, feet palmated, neck short, wing under 7″.

(9) Nettapus coramandelianus. The Cotton Teal.

Nettapus coramandelianus.—Jerdon, "Birds of India," III, p. 786; Butler, "Str. Feath.," IV, p. 27; Hume, *ibid*; Hume and Davison, *ibid*, VI, p. 486; Oates, *ibid*, VII, p. 52; Cripps, *ibid*, p. 311;

Legge, "Birds of Ceylon," p. 1066 ; Bingham, "Str. Feath.," IX, p. 198 ; Oates, "Birds of British Burmah," II, p. 272 ; Hume, "Nests and Eggs" (Oates' ed.), III, p. 280 ; Barnes, "Birds of Bombay," p. 397.

Nettapus coramandelicus.—Hume, "Nests and Eggs," p. 638 ; Hume and Marshall, "Game Birds," III, Plate XIV.

Nettapus coramandus.—Hume, "Str. Feath.," III, p. 192.

Nettapus coramandelianus.—Hume, "Str. Feath.," VI, p. 491 ; *id.*, VIII, p. 114 ; *id.*, Cat. No. 951 ; Hume and Marshall, "Game Birds," III, p. 101 ; Oates, "Str. Feath.," X, p. 245 ; Salvadori, Cat. B. of B. Museum," XXVII, p. 68.

Description : Adult Male.—Extreme point of forehead white, remainder and crown brown, the lateral edges much darker, almost black ; a complete broad collar round the base of the neck black, a little glossed with green ; remainder of head, neck, lower plumage, and a collar behind the black collar white ; flanks most minutely stippled and more or less barred with light brown, sometimes almost absent ; under-tail coverts broadly barred and tipped or sub-tipped brown ; scapulars and back dark brown, completely overlaid with dark green gloss slightly mixed with purple ; upper-tail coverts dirty white, freckled with brown. Innermost secondaries brown glossed with purple ; remaining secondaries glossed green and tipped with white ; primaries glossy green tipped brown, and with a broad white band continuing the bar made by the white tips of the secondaries ; tail brown.

Bill, legs and feet black, the two latter more or less tinged with slatey-yellow ; irides bright crimson-red.

"Sides of tarsus and toes dusty yellow ; claws horny brown." (Oates).

Length, 12·5″ to 13·5″ ; wing, 6″ to 7″, rarely over 6·6″ or under 6·3″ ; tail about 3″ ; culmen about ·9″ to ·95″ ; tarsus, 1″.

Weight between 9 and 12 oz.

Female.—Cap as in the male but uniform brown ; forehead more broadly white speckled with brown ; a deep brown line running through the eye ; remainder of lower plumage and head white, the breast and lower neck with narrow bars of dark brown, taking the place of the collar in the male ; face and neck much vermiculated with brown ; and the flanks both barred and speckled with the

same ; in old females the abdomen and centre of the breast are pure white, in younger birds more or less marked with brown ; outer secondaries broadly and inner primaries very narrowly tipped with white ; remainder of wings, upper plumage and tail brown, the scapulars and back being occasionally faintly glossed, upper-tail coverts finely stippled with white.

Bill brown, dark olive, paler and yellowish on mandible, commissure and gape ; iris red-brown ; legs and feet dull slate-yellow, more or less smudged with blackish-green ; claws light yellow-brown.

Length about 12″ ; wing 6″ or a trifle over ; tail about 2·75″ ; culmen about 0·9″ ; tarsus nearly 1″.

Male in Winter.—Similar to the female, but always retains the conspicuous white patch on the primaries (Salvadori).

Does this little duck always assume a winter plumage when fully adult? I doubt it, for I have males shot in winter just as glossy and fully plumaged as any to be obtained during the breeding season and hot weather.

Young.—Like the female, but even more stippled about the head with brown, and also more banded with light brown on the flanks.

Young in down.—"Upper parts, flanks and under-tail coverts blackish broad brown ; a broad superciliary stripe, cheeks, throat, front neck and breast white ; a brown line through the eyes ; two broad white spots on each side of the back—one near the base of the wings, and the other much larger on the side of the rump ; feathers of the tail blackish, very long and stiff."

The Cotton Teal is found almost throughout India, Burma and Ceylon, and extends also to China and the Phillipines, Sunda Islands, and the Celebes.

In India proper it may be said to have its stronghold in Eastern Bengal, is still very common in Western Bengal and Assam, less so in the Eastern Punjab and Rajputana, epecially so in the cold weather, and actually rare towards the west of the Empire. Barnes says that it is not found either in Guzerat or Scind, but it has been recorded from both places since his book was written. In Orissa they are common enough, and in parts of Madras fairly so ; from Malabar I can find no record of its occurrence, though I believe there is one somewhere, could I only remember it. In Ceylon it appears to be more or less confined

to the north and east of the Island. Legge writes ("Birds of Ceylon," p. 1067) : "This pretty little bird is common in the tanks of the northern and eastern parts of the Island, building in many secluded spots, and moving about considerably during the rainy weather. To the western province and south-west of the Island it is apparently chiefly a north-east monsoon migrant, as about Christmas it is met with on the Kotti and Kaesbawa lakes and other similar sheets of water."

In Burma it appears to be found everywhere as far south of Tenasserim as Tavoy.

In certain of the drier portions of its habitat this bird is semi-migratory in its habits, only visiting them in the rains, and leaving again for some more suitable place, as the haunts in the former begin to dry up. Hume, talking of the vast numbers seen every day during the cold weather in the Calcutta market, says that it a mystery to him where they come from. Having myself shot over some of the vast bhils and back-waters of the Ganges and Brahmapootra, I think it would take a very large number indeed to surprise me. In the places mentioned they simply swarm in thousands, and are only out-numbered by the Whistling Teals. I suppose every one knows how the fishermen of the Sunderbuns and other parts net the vast numbers of duck that are daily sent in to the Calcutta market, but in case there are some who do not, the following may explain. Over a great stretch of shallow bhil they erect nets some fifteen or twenty feet high, usually selecting the end of a large patch of water where it narrows off either into dry land or again widens out into yet another bhil. Then, by night, they pole silently up the lake towards the nets, driving the flock of duck and teal silently before them, nor is any noise made until an approach has been made to within some 200 yards, or even less of the nets. Thus, when the shouts are raised, many of the flocks have not time to rise high enough to evade the nets, into which they fly and are entangled. Cotton Teal, of course, fly low along the surface of the water and hence fall victims to the nets more easily than such ducks as get quickly into the air and fly high. On the Moolna bhil, I am sure, forty or fifty couple might be shot in a day by a single gun without any very great trouble or luck ; but in Bengal very few sportsmen, except such as shoot for quantity alone, consider them game, and Cotton Teal are left alone unless when required as food for servants, boatmen, or

coolies, who like their flesh and eat it greedily, preferring them to more delicately flavoured ducks. They breed in great numbers in these vast sheets of water on the little islands which are dotted about in all directions, and which contain from three or four up to a hundred trees or so. Nor are they much molested when breeding, though now and then the miserable fishermen, who are the only inhabitants of these watery, fever-stricken parts, may take a clutch or two of eggs as food. In different parts of India their habits also vary much. Hume writes: "Tame and familiar little birds, village ponds, at any rate where singhara are grown, seem to be just as much affected as more secluded pieces of water. You may often see half-a-dozen dabbling about in the water and weeds within ten yards of the spot where the village washerman is noisily thrashing the clothes of the community; *more suo* on large stones or ribbed slabs of wood, as if his one object in life was to knock everything into rags at the earliest possible moment. Even the loud half grunt, half groan, with which he relieves his feelings after each mighty thwack has no terror for these little birds."

The habitat of these remarkably domesticated Cotton Teal is not mentioned by Hume, but in Rungpore, though not quite so tame as the above description shows them to be in some places, they take little notice of passers-by, unless very closely approached. They squat in the roadside ditches and tanks, and when finally leaving them, scuttle away, chattering and clucking for all they are worth, as if trying whether they could vociferate harder than fly, or *vice versâ*, often only to return to some spot within fifty or sixty yards of that just left. Their flight is decidedly *quick* as well as fast, and they dodge round corners and avoid stumps and other obstructions which come in their way, as they fly down the wayside drains and ditches, with an activity quite wonderful. In addition to their speed of flight they are very densely plumaged and tough, and carry off a wonderful lot of shot for so small a bird. In the Sunderbuns they are found alike in the very biggest and broadest stretches of water as in the smallest; only in the former they keep much to weedy places with thick cover adjacent. In Rungpore, Furreedpore, Barisal, and adjoining districts they keep more to small tanks, ditches and enclosed bhils than to the larger, more open pieces of water, and this is said to be their practise in most of the other parts of their habitat. Legge says that they frequent sometimes the flooded lands close to the sea-shore.

I have generally observed them in rather small flocks—seldom more than about twenty, and more often under than over a dozen—that is to say, in family parties only: other observers, however, speak of finding them in far larger flocks, so I suppose that often the families collect together.

The only district in which I have *personally* found and taken their nests in any numbers is Rungpore. I was there once for three or four months in the rains, and I am sure that at that time a short walk of two or three miles in any direction along any road would have been productive of three or four nests of the Cotton Teal, as well perhaps of one or two of the Whistling Teal. The District and Station Roads are well off for fine large trees, forming complete avenues on many of them, and most of them have large drains on either side, or else a succession of borrow pits take their place. These, long disused, have naturally become well covered with weeds and grass, and form grand hunting grounds for this little duck, whilst the numerous hollows in the old trees, which overhang them, afford them sites for building in. I think they generally select hollows of some size in the trunk of the tree itself and at about six to twelve feet from the ground, and this hollow they line well and abundantly with twigs, grass, and feathers. I have twice known as many as 22 eggs laid, once 18 and once 16, but normally, I should say they lay any number from 8 to 14, 10 being perhaps the number more often laid than any other. I have never known them make any other sort of nest than this already described, but others have recorded quite different stories regarding their nidification. Blewitt, writing from Jhansi, says: "It breeds in July and August. Just above the village of Borogaon is a large lake from which several eggs of this goslet were brought. The eggs were collected in the two months on different occasions. It makes a semi-floating nest on the water, among the rushes or lotus weeds, of weeds, grass, etc., all together, filled up several inches above the water-level.

"The many boatmen of this lake stated that this goslet breeds there every year, and at the Salbuhat Lake also the boatmen affirmed the same."

I have found nests quite low down, in trees only just above water-level in fact, but have never taken them from a hole at any height from the ground, and cannot now recall to mind any which were over

15 or 16 feet from it. They do, however, sometimes select very lofty situations, for Oates took one nest containing 10 eggs from a mango tree about 30 feet above the ground. They are said also to breed sometimes in old ruins, broken-down walls, etc. Cripps says, "They even lay their eggs in the factory chimney holes." They do not always make use of places quite close to water, as a pair of these birds laid their eggs in a gigantic tree standing in the Magistrate's compound in Rungpore. At the back of the house there was a good-sized tank, frequented by a pair of these birds, and as they were so constantly present, I hunted all round the tank, in every tree, for the nest. However, it was not to be found, though holes and hollows which looked suitable for nesting purposes were common enough. Eventually I found the nest by accident in a tree in front of the house, and full two hundred yards from the tank. This was one of the nests, already mentioned, which contained 22 eggs. I watched this nest very carefully, and on the sixteenth day after it was found the chicks were hatched, and I then waited anxiously to see how they would get to the water. They remained in the nest that day, but the following morning, though I was out very soon after daybreak, they were all in the tank, 15 out of the 22, 7 eggs being addled, which I took. It was a great disappointment not seeing the goslings taken from the nest to the water, and I have never yet seen it done. A very intelligent native once told me that very early one morning before it was light, he was fishing in a tank, or rather looking to his nets which had been put down overnight, when he saw something flutter heavily into the water from a tree in front of him and some twenty paces distant. The bird returned to the tree, and again with much beating of wings fluttered down to the surface of the tank, and this performance was repeated again and again at intervals of some few minutes. At first he could only make out that the cause of the commotion was a bird of some kind, but after a few minutes he, remaining crouched amongst the reeds and bushes, saw distinctly that it was a Cotton Teal, and that each time it flopped into the water and rose again it left a gosling behind it. These, he said, he could see were carried somehow in the feet, but the parent bird seemed to find the carriage of its young no easy matter, flew with difficulty, and fell into the water with some force. I do not vouch for this man's story being true, but give it for what it is worth, and believe it myself.

They breed in Bengal in late June, July, and August, the end of July principally. In Ceylon they are said to breed much earlier, but there, of course, their weather arrangements are different, and the birds of all kinds have to make their nesting time suit accordingly.

The eggs are true duck eggs, though more spherical than most, much like those of *Dendrocygna* in shape, texture, and polish. Oates calls them miniatures of those of the Comb Duck, but says they are less glossy.

They vary in length between 1·5″ and 1·8″ and in breadth between 1·17″ and 1·41″. The average of 40 eggs, including the 26 mentioned in Hume's "Nests and Eggs," is exactly 1·7″ × 1·3″.

Cripps, in blowing an egg of this bird, noticed that the drops as they fell on to a pucca floor, appeared phosphorescent. He could give no reason for this, but the fact that they did so certainly deserves mention in any article on the Cotton Teal.

The Cotton Teal has often been unjustly accused of being unable to progress on land. I do not know how this idea was started, but it is quite without reason. Mr. Finn, of the Indian Museum, Calcutta, states that his birds, which he had in captivity, walked perfectly well, and suggests that the idea arose from people seeing wounded birds shuffling along. I think there may be, however, another explanation. I had once a pair of Cotton Teal tame, and these birds were allowed to wander about where they liked though I had to keep one wing clipped or they might have wandered too far and got shot. Now, under ordinary circumstances, the two little birds waddled about in complete comfort though without any undue speed. Under the effects of excitement, however, whether pleasurable or frightened, they attempted to hurry themselves and at once flopped about in the most ludicrous fashion, tumbling over every little obstruction they met with and appearing as if their hindquarters were going too fast for their heads and breasts to keep in front.

(*To be continued.*)

BIRDS COLLECTED DURING FIVE YEARS' RESIDENCE IN THE HYLAKANDY DISTRICT, CACHAR.

Part IV.

By C. M. Inglis.

(*Continued from page 87 of this Vol.*)

Order *Eurylæmi.*

Family *Eurylæmidæ.*

Genus *Psarisomus Blanf; No.* 944.

Hume, No. 138. Psarisomus dalhousiæ (Jaur.).—The Long-tailed Broad Bill.

126. This is a very rare bird here. For three years I did not get a single specimen, then two were shot on some bamboos close to my bungalow.

Genus *Serilophus Blanf; No.* 943.

Hume, No. 139. Serilophus rubripyguis, Hodgson's Broad Bill.

127. This species is fairly common. It frequents the jungle. I found a nest of this bird on the 2nd September. The nest was hanging from the end of the branch of a sapling near a stream; it was about $4\frac{1}{2}$ feet from the level of the water, and was composed of moss and fibres. It was lined with dry bamboo leaves and fibres. Length of nest 12″, breadth 5″ and egg cavity $4\frac{1}{2}$″ deep. The mouth of nest opened from the side and measured $3'' \times 2\frac{1}{4}''$. It contained four highly incubated eggs, which were of a white ground spotted with dark red at the thick end, the number of spots diminishing towards the narrow end. The eggs are elongated ovals, and measure on an average $\frac{7}{8}'' \times \frac{5}{8}''$.

Order *Scansores.*

Family *Picidæ.*

Sub-Family *Picinæ.*

Genus *Gecinus Blanf; No.* 950.

Hume, No. 172. Gecinus occipitalis (Vigors).—The Black-naped Green Woodpecker.

128. This is a fairly common Woodpecker here. I have found it in the open on solitary trees as well as in thin jungle.

Native Name—Harria Kat-tokrā or Kāt-Khoda.

Blanf; No. 955.

Hume, No. 173. CHRYCOPHLEGMA FLAVINUCHA.—The Larger Yellow-naped Woodpecker.

Native Name—Burra huldi matha Kāt-Khoda or Kāt-tokrā.

129. This species is rather rare and is only to be found in the dense jungle often associating with *Dissemusus paradiseus, Gampsorhynchus rufulus,* &c.

Blanf; No. 951.

Hume, No. 173. GECINUS CHLOROLOPHUS (Vicill).—The Lesser Yellow-naped Woodpecker.

Native Name—Chota huldi matha Kāt-Khoda or Kāt-tokrā.

130. This is a much commoner species than *C. flavinucha.* It also keeps more to wooded parts than the open, though not so strictly as the former species.

Genus *Dendrocopus Blanf; No.* 967.

Hume, No. 157. DENDROCOPUS MACII (Vicill).—The Fulvous-breasted Pied Woodpecker.

Native Name—Kālā Sādhā Kāt-tokrā.

131. This is the commonest Woodpecker we have. It comes into gardens and everywhere in the open where there are trees. They generally go about in pairs, as do most of the Woodpeckers.

Genus *Iyngipicus Blanf; No.* 975.

Hume, No. 163 *bis.* IYNGIPICUS CANICAPILLUS.—The Burmese Grey-headed Pied Woodpecker.

Native Name—Chota Kālā Sadha Kāt-tokrā.

132. This Woodpecker is very rare here. I have only managed to secure a pair since I have been collecting. They were both shot on the same tree and were male and female.

Genus *Micropternus Blanf; No.* 983.

Hume, No. 178. MICROPTERNUS PHAEOCEPS (Blyth.)—The Rufous Woodpecker.

133. This Woodpecker is fairly common here. It seems to affect thin jungle and also trees in the cultivation. The tail of this species is always very sticky.

Genus *Gecinulus Blanf; No.* 958.

Hume, No. 177. GECINULUS GRANTIA.—The Pale-headed Woodpecker.

134. This bird, I think, may be put down as one of the rarest Woodpeckers we have, though some seasons they are fairly numerous.

Genus *Chrysocolaptes Blanf; No.* 992.

Hume, No. 166. CHRYSOCOLAPTES SULTANEUS (Hodgs.)—The Golden-backed Woodpecker.

135. This species is extremely common, frequenting gardens and thin jungle, &c. I once shot a male that could scarcely fly ; it was feeding on the ground. The whole of the rump feathers were stuck together and formed a hard lump.

Native Name—Burra Lall Māthā Kăttokrā.

Genus *Hemicercus Blanf ; No.* 995.

Hume, No. 165 *bis.* HEMICERCUS CANENTE (Less.)—The Burmese Heart-Spotted Woodpecker.

136. This species is far from common, being a rather shy and very active little bird. It could not, however, be put down as a rare bird.

Genus *Hemilophus Blanf; No.* 996.

Hume, No. 168. HEMILOPHUS PULVERULENTUS (Temm.)—The Great Slatey Woodpecker.

137. This is the rarest Woodpecker we have. I have only one specimen which was shot by my head shikari as it was flying across a clearance. On a visit to Roopacherra I saw several more, but they were out of shooting range.

Native Name—Buna Kăttokrā.

Genus *Venilia Blanf; No.* 978.

Hume, No. 176. LEPOCESTES PYRRHOTIS.—The Crimson-necked Bay Woodpecker.

138. This species is also very rare here and only to be met with in dense jungle. I once or twice came across a paradise of Woodpeckers where I found *G. flavinucha*, *G. chlorolophus*, *G. grantia* and the present species ; there were besides some *Cissa chinensis*, *Garrulax mondiger* and *Dissemurus paradiseus*.

My attention was first drawn to them by the loud harsh screeching of *C. chinensis*, and wanting a specimen, I followed it up ; in going through the brushwood a pair of *V.* or *L. pyrrhotis* rose from near my feet and flew

on to a tree. With a right and left I managed to get both of them, which happened to be a male and female. This is the only pair that I have ever shot.

Sub-Family *Lynginæ.*

Genus *Picumnus Blanf; No.* 1001.

Hume, No. 186. PICUMNUS INNOMINATUS (Burt.)—The Speckled Piculet.

139. This is rather a rare bird here. It frequents bamboo jungle and taps like a Woodpecker, making a great noise for so small a bird. I have only shot four specimens, and seen another three or four since I have been collecting.

Genus *Sasia Blanf; No.* 1002.

Hume, No. 187. SASIA OCHRACEA (Hodgs.)—The Rufous Piculet.

140. This species is much commoner than *Picumnus innominatus*, but still may be called rare. It also frequents bamboo jungle, and I have also found it several times in nuli and ekra.

Genus *Iynx Blanf; No.* 1003.

Hume, No. 188. IYNX TORQUILLA (Linn.)—The Wryneck.

141. This bird is exceedingly rare. I have only shot and seen two specimens. It is very quiet and shy, and frequents thin jungle and bushes, keeping near the ground.

Family *Capitonidæ.*

Genus *Cyanops Blanf; No.* 1012.

Hume, No. 195. CYANOPS ASIATICA (Lath.)—The Blue-faced Barbet.

Native Name—Lil Bossonto.

142. This species is common in the jungle here, they may be heard calling all round you. They also come into the cultivation where any *Ficus* berries are ripe; but they are more jungle-loving birds than the other Barbets.

Blanf; No. 1009.

Hume, No. 192. CYANOPS LINEATA (Vicill.)—The Lineated Barbet.

Native Name—Burra Bossonto.

143. This is a very common Barbet, being found on any tree where the berries are ripe. They are very bold birds, neither fearing the approach of man nor that of other birds. I have often seen them

driving away *Osmotreron phayrei*, that had come to feed on the berries of the Joki tree, and the smaller birds seemed to keep their distance from them for fear of being driven off. They have a very loud note. A friend of mine nicknamed them "gobblers," on account of the rapidity with which they swallowed incredible numbers of large berries.

Genus *Mezobucco Blanf; No.* 1016.

Hume, No. bis 198. MEZOBUCCO CYANOTIS (Blyth.)—The Blue-eared Barbet.

144. A few years ago this was one of the commonest Barbets here, but latterly I found it very scarce. It seems to prefer the evergreen forests to the open, though I have sometimes found it on trees in the cultivation.

Native Name—Chota Bussonto.

Genus *Xantholæma Blanf; No.* 1019.

Hume, No. 197. XANTHOLÆMA HÆMACEPHALA (Müll.)—The Crimson-breasted Barbet.

145. This Barbet is very common. It is generally known as the "Coppersmith," on account of its call which resembles too, too, too. They keep up this note *ad infinitum*. They excavate holes in trees in which they breed. I once saw one making a hole for its nest in the rotten branch of a small tree; unfortunately the branch got broken off in a storm, so I was unable to get the eggs.

Native Name—Lall matha Bussonto.

Order *Upupæ*.

Family *Upupidæ*.

Genus *Upupa Blanf;* 1066.

Hume, No. 254. UPUPA EPOPS (Linn.)—The European Hoopoe.

146. This is a fairly common Hoopoe, but not as common as the next. They are cold weather visitants.

Blanf; 1067

Hume, No. 254 *bis*. UPUPA INDICA.—The Indian Hoopoe.

147. This is the common Hoopoe found here. It frequents gardens, fields, &c. They feed on the ground as a rule, though I have seen them flying at insects on the wing.

Native Name—Doob Chootā.

Order *Trogones.*

Family *Trogonidæ.*

Genus *Harpactes.*

Blanf ; No. 1101.

Hume, No. 116. HARPACTES ERYTHROCEPHALUS (Gould.)—The Red-headed Trogon.

Native Name—Lall Pakee.

148. This bird is common in the dense jungle, and is generally found in pairs. They have a very soft call, composed of two notes, the second one being lower than the first. After shooting the male, I have often imitated the call, which, if the female hears, she will answer; if you continue to call for a short time, she will gradually come within range. They are insectivorous and I think strictly arboreal. I found a nest of this bird on the 24th April, in a hole in the trunk of a dead tree, about ten feet from the ground. There was no lining except a few chips which had probably fallen in from the side of the hole, which was a natural cavity. I sent a man up the tree and he managed to capture the female. The eggs were three in number and perfectly fresh. They were nearly spherical, glossy, and nearly a pure white colour. They measured 1·1″×1″, 1·1″×9″ and 1·1″×1-01″.

The red of the breast in most of my female specimens has faded tremendously, becoming nearly white.

On 5th August, 1893, I shot a young male. The whole plumage was of a golden brown; lesser wing-coverts and tettiaries paler, undulated with black; tail, similar to adult; lower plumage, pale golden brown, abdomen whitish. It measured:—

L. 9·4″, w. 4·9″, t. 4·4″, tar. ·8″, bf. ·7″; bg. 1″, and e x p. 15″.

(*To be continued.*)

A LIST OF THE BUTTERFLIES OF MUSSOORIE IN THE WESTERN HIMALAYAS AND NEIGHBOURING REGIONS.

By Philip W. Mackinnon, F.E.S., and Lionel de Nicéville, C.M.Z.S., F.E.S., etc.

(*With Plates U, V, and W.*)

(*Read before the Bombay Natural History Society on* 16*th April*, 1896.)

Mussoorie (Másuri, Massuri or Mussooree), with its suburb containing the military cantonment of Landour, is a hill station in the Dehra Dun district of the North-Western Provinces. Unlike other hill stations or towns of the Himalayas, such as Darjiling, Naini Tal, Simla, and Murree, Mussoorie is on the outer range of the hills, with only the valley of the Dehra Dun (which is itself bounded on the south by the low Siwalik hills) between it and the plains of India. Generally speaking, the station is about 6,000 feet above sea-level, although in parts it is 7,400 feet high. Mussoorie being one of the—if not the—oldest hill station in India, the forests which originally luxuriantly clothed nearly all the hill-sides have ceased to exist, except in the western parts, and as a natural result very few butterflies are to be seen in the central portions. The aurelian or butterfly-hunter will still, however, find almost all the ravines, especially those which carry perennial streams, very rich in insects at any time from the middle of March to the end of June, *i.e.*, in the spring and dry (or hot) seasons, during which the rainfall is scanty. After June these ravines do not contain many butterflies, being drenched by the heavy monsoon rainfall, which averages nearly 100 inches during the year, most of which falls from July to September. Practically collecting ends in and near Mussoorie in October, but there is not a month in the year when a few species of butterflies may not be seen on sunny days. In the winter Mussoorie is often covered with snow, and the annual temperature ranges between 27° and 80° Farh. at 6,000 feet elevation. To the north of Mussoorie, running parallel to the range of hills on which the station is built, is the valley of the Aglar, which is about 2,000 to 3,000 feet elevation only, and in which butterflies are very numerous. To the north of this valley, again, at about ten miles in a direct line from Mussoorie, is the Nag Tiba range, the highest point of which is close on 10,000 feet. On

these hills, which are richly forest-clad on their northern slopes, many rare species not obtained elsewhere in our area are found. The valleys leading into the Ganges river on the east and the Jumna river on the west are also excellent hunting-grounds. We have included in our paper all the butterflies brought in by the native collectors sent by us to the highest valleys and hills right up to the frontier of Hundes or Thibet, where the butterfly season is very short, extending at the most from the middle of June to the middle of August. These elevated regions (the Nilung Pass is well over 18,000 feet elevation) are often above the forest line, so that the butterflies found in them all live in the larva state on grasses and low herbaceous plants, for instance the three species of *Parnassius* enumerated below feed on *Sedum* and allied moss-like plants. To the south of Mussoorie lies the large triangular-shaped Dehra Dun Valley with an area of 1,193 square miles, and an average elevation of about 2,000 feet. The valley still contains much forest, especially of the valuable sâl-tree (*Shorea robusta*, Gærtn., Natural Order *Dipterocarpeæ*), and is watered by numerous perennial streams, which become raging torrents in the rains. The valley is bounded on the north by the Himalayas, on the south by the Siwaliks, on the east by the Ganges, and on the west by the Jumna. As will be seen from the list below, many species of butterflies are found in the Dun which do not occur at all in the hills to the north, these species being mainly peculiar to the plains of India. In the Dun the best time for collecting is from July to October, the spring and early summer being far less rich. Even in the winter months, from November to February, a few more or less worn and faded butterflies are on the wing.

No list has as yet appeared of the butterflies of Mussoorie and neighbouring regions, though many papers have been written on the butterflies of other portions of the Western Himalayas. The principal of these are :—

I. "Kaschmir, und das reich der siek." Von Carl Freiherrn von Hügel. Vol. IV, Part V. * *Lepidoptera*, pp. 397 and 403-496,

* In Mr. W. F. Kirby's "A Synonymic Catalogue of Diurnal Lepidoptera" (1871) this part is referred to as the second, but it really is the fifth. Part I is the "Register und Glossarium;" Part II "Astrologie der Hindu;" Part III "Sammlung baktrischer Münzen;" Part IV "Fische Kaschmir's;" Part V "Insecten" by Vincenz Kollar und Dr. Ludwig Redtenbacher. Two other parts devoted to "Säugthier-Fauna von Kaschmir," and "Höchsten Macht des Sick-Reiches" complete the volume.

West, Newman chromo.

WESTERN HIMALAYAN BUTTERFLIES.

Plates I—XXIII (1844), by Vincenz Kollar und Dr. Ludwig Redtenbacher. One hundred and ten butterflies are enumerated, of which the following are given from or near Mussoorie in our area :—

Papilio sarpedon, Linnæus.
„ *cloanthus*, Westwood.
„ *machaon*, Linnæus.
„ *agestor*, Gray [= *P. agestor govindra*, Moore].
„ *panope*, Linnæus [= *P. clytia*, Linnæus].

Parnassius jacquemontii, Boisduval [recorded by Kollar from "near Massuri," but only found far in the interior at high elevations].

Pieris valeria, Cramer [= *Nepheronia hippia*, Fabricius].
„ *horsfieldii*, Gray [= *Delias belladonna*, Fabricius].
„ *epicharis*, Godart [= *Delias eucharis*, Drury].
„ *gliciria*, Cramer [= *Pieris canidia*, Sparrman].

Thestias marianne, Cramer [= *Ixias marianne*, Cramer].

Rhodocera rhamni, Linnæus [*Gonepteryx rhamni*, Linnæus].

Callidryas pyranthe, Linnæus [= *Catopsilia pyranthe*, Linnæus].
„ *minna*, Hübner[= *Catopsilia pyranthe*, Linnæus].
„ *hilaria*, Cramer [= *Catopsilia crocale*, Cramer].
„ *alcmeone*, Fabricius [= *Catopsilia crocale*, Cramer].

Colias myrmidone, Esper [= *Colias fieldii*, Ménétriès].
„ *hyale*, Linnæus [= *Colias erate*, Esper].

Laxura atymnus, Boisduval [= *Loxura atymnus*, Cramer].

Thecla rama, Kollar [= *Arrhopala rama*, Kollar].
„ *nissa*, Kollar [= *Rapala nissa*, Kollar].
„ *nila*, Kollar [= *Iraota timoleon*, Stoll].

Polyommatus sena, Kollar[= *Ilerda sena*, Kollar].
„ *pavana*, Kollar [= *Chrysophanus pavana*, Kollar].
„ *tamu*, Kollar [= *Ilerda tamu*, Kollar].

Polyommatus phlœas, Linnæus [= *Chrysophanus phlœas*, Linnæus].

Lycœna bœtica, Linnæus [= *Polyommatus bœticus*, Linnæus].
„ *pandia*, Kollar [= *Catochrysops cnejus*, Fabricius].
„ *asoka*, Kollar [= *Catochrysops strabo*, Fabricius].
„ *patala*, Kollar [= *Catochrysops cnejus*, Fabricius].
„ *didda*, Kollar [= *Catochrysops strabo*, Fabricius].
„ *nara*, Kollar [*Tarucus theophrastus*, Fabricius].
„ *amyntas*, Fabricius [= *Everes argiades*, Pallas].

Lycœna putli, Kollar [=*Chilades trochilus*, Freyer].
„ *maha*, Kollar [=*Zizera maha*, Kollar].
Danais sita, Kollar.
„ *similis*, Linnæus [=probably *D. septentrionis*, Butler, the true *D. similis* being confined to China].
„ *limniace*, Cramer.
Euplœa coreta, Godart [=*E. core*, Cramer, the true *E. coreta*, Godart, standing for the *E. coreoides* of Moore].
Acrœa anomala, Kollar [=*Pareba vesta*, Fabricius].
Limenitis selenophora, Kollar [=*Athyma selenophora*, Kollar].
„ *opalina*, Kollar [=*Athyma opalina*, Kollar].
„ *sankara*, Kollar [=*Neptis sankara*, Kollar].
„ *strophia*, Godart [=*Athyma sulpitia*, Cramer, found only as far as present knowledge goes in Upper Burma and China].
„ *dichroa*, Kollar [=*Sephisa dichroa*, Kollar].
Amathusia ganescha, Kollar [=*Cyrestis thyodamas*, Boisduval].
Apatura ambica, Kollar.
Paphia hügelii, Kollar [=*Kallima huegelii*, Kollar].
Charaxes bernardus, Fabricius [=*Charaxes hemana*, Butler].
Adolias patala, Kollar [=*Euthalia patala*, Kollar].
„ *derma*, Kollar [=*Euthalia derma*, Kollar, unknown from the Himalayas].
„ *aconthea*, Cramer [=*Euthalia aconthea*, Cramer, confined to Java. Kollar probably wrongly identified under this name the common *E. garuda*, Moore].
Terinos sinha, Kollar [=*Atella sinha*, Kollar].
Argynnis sakontala, Kollar [=*Argynnis childreni*, Gray].
„ *niphe*, Linnæus.
„ *phalanta*, Drury [=*Atella phalantha*, Drury].
„ *latonia*, Linnæus.
Melitœa durga, Kollar [=*Dodona durga*, Kollar].
Vanessa caschmirensis, Kollar.
„ *charonia*, Fabricius [=*Vanessa canace*, Linnæus].
„ *vulcania*, Godart [=*Pyrameis indica*, Herbst].
Cethosia cyane, Drury.
Satyrus swaha, Kollar [=*Aulocera swaha*, Kollar].

Satyrus saraswati, Kollar [=*Aulocera saraswati*, Kollar].
„ *padma*, Kollar [=*Aulocera padma*, Kollar].
„ *isana*, Kollar [=*Lethe isana*, Kollar].
„ *europa*, Fabricius [=*Lethe europa*, Fabricius].
„ *banksia*, Fabricius [=*Melanitis ismene*, Cramer].
Erebia scanda, Kollar [=*Callerebia scanda*, Kollar].

It may be here noted that Kollar's and Redtenbacher's preface to the Part V of Von Hügel's "Kaschmir" is dated on page 402, March, 1844, while the whole volume bears the date of 1848. We have taken the former date to be correct for the lepidopterous portion. *Danais sita*, Kollar, is an older name than *D. tytia*, Gray, and *Apatura ambica*, Kollar, is an older name than *A. namouna*, Doubleday; also that *Satyrus isana* Kollar, has priority over *Satyrus, hyrania*, Kollar, the former name having been applied to the female, and the latter to the male, of one and the same species, but the name *S. isana* appears on an earlier page.

II. "Notes on Indian [Mussoorie] *Lepidoptera*," by Captain Thomas Hutton. Trans. Ent. Soc. Lond., first series, Vol. V, pp. 43-51 (1846). Enumerates 13 species of the genus *Papilio*, including doubtfully *P. podalirius*, Linnæus, a species which is confined to Northern Africa, Europe, Asia Minor, and Western China. He also keeps distinct *P. demoleus*, Linnæus, and *P. epius*, Fabricius, which together equal one species, *P. demoleus*; also *P. dissimilis*, Linnæus, and *P. panope*, Linnæus, which together equal one species, *P. clytia*, Linnæus; and lastly *P. polytes*, Linnæus, and *P. pammon*, Linnæus, which together equal one species, *P. polytes*. He incidentally mentions without naming them two other species, which almost certainly represent *P. arcturus*, Westwood, and *P. polyctor*, Boisduval.

III. "List of Diurnal *Lepidoptera* collected by Capt. A. M. Lang in the N. W. Himalayas." By Frederic Moore. Proc. Zool. Soc. Lond., 1865, pp. 486-509, pls. xxx, xxxi. Enumerate 119 species.

IV. "Notes on *Lepidoptera* from 'Goolmurg,' in Cashmere." By Captain A. M. Lang. Ent. Month. Mag., Vol. V, pp. 33-37 (1868). Enumerates 23 species.

V. "List of Diurnal *Lepidoptera* collected in Cashmere Territory by Capt. R. B. Reed, 12th Regt., with description of new species." By Frederic Moore. Proc. Zool. Soc. Lond., 1874, pp. 264-274, pl. xiii. Enumerates 103 species.

VI. "Himalayan *Lepidoptera.*" By Lionel de Nicéville. The *Indian Agriculturist*, January 1st and February 2nd, 1880. Enumerates 91 species from Kotgarh, 50 miles north of Simla in the Western Himalayas.

VII. "A List of the Diurnal *Lepidoptera* (Butterflies) occurring in Simla and within 50 miles, with remarks on their time of appearance and localities where met with." By Lionel de Nicéville. Being Appendix A of Towell's "Hand Book and Guide to Simla and the Interior." (Second Edition.) 1880. Enumerates 146 species.

VIII. "On a Collection of *Lepidoptera* from Western India, Beloochistan, and Afghanistan." By Arthur G. Butler. Proc. Zool. Soc. Lond., 1881, pp. 602-624. Only one species is enumerated from Mussoorie in our area :—*Euplœa vermiculata*, Butler [=*Euplœa core*, Cramer].

IX. "List of the *Lepidoptera* collected by the Rev. J. H. Hocking chiefly in the Kangra District, N. W. Himalaya; with descriptions of new Genera and Species." Part I. By Frederic Moore, F. Z. S. Proc. Zool. Soc. Lond., 1882, pp. 234-263, pls. xi, xii. Enumerates 236 species.

In this paper Mr. Moore records *Callerebia cashapa*, Moore, from "Masuri." In "Lepidoptera Indica" Mr. Moore sinks this species as a "variety" of *C. nirmala*, Moore. Also *Cyaniris huegelii*, Moore, from Masuri, *Horaga onyx*, Moore, from "Deyra Doon," *Ilerda tamu*, Kollar, from Masuri, and *Chapra prominens*, Moore [=*Baoris sinensis*, Mabille], from "the Tonse Valley, 6,000 feet, Gurwhal."

X. "A List of Butterflies taken in Kumaon." By William Doherty. Journ. Asiatic Society of Bengal, Vol. LV, Part II, pp. 103-140 (1886). Enumerates 271 species.

XI. "On *Lepidoptera* collected by Major Yerbury in Western India." By Arthur G. Butler, F.L.S., F.Z.S., &c. Proc. Zool. Soc. Lond., 1886, pp. 355-395, pl. xxxv. Enumerates 89 species of butterflies.

XII. "An Account of three Series of *Lepidoptera* collected in North-West India by Major Yerbury." By Arthur G. Butler, F.L.S., F.Z.S., &c. Ann. and Mag. of Nat. Hist., sixth series, Vol. I, pp. 132-151, 196-209 (1888). Enumerates 107 species.

It will be noted that the present paper, containing as it does the names of 323 species, is much larger than any that has previously appeared dealing with the butterflies of the Western Himalayas. The paper is mainly based on the collection made during the last eleven years by Mr. P. W. Mackinnon; but that made by Colonel A. M. Lang, R.E., in Mussoorie many years ago, has also been studied. To Mr. Mackinnon is due the discovery of the transformations of most of the species described in this paper: and it is only those who have lived in tropical and sub-tropical countries who can fully realise how extremely difficult it is to find the larvæ and pupæ of any but the very commonest butterflies, and even they in many cases elude discovery for years. Those species which have been reported from our area, and which probably occur within its boundaries, but have not been seen by us from thence, have an asterisk* prefixed to the names. A few species obviously erroneously recorded by Kollar from Mussoorie have been omitted altogether from the list.

We are greatly indebted to Mr. J. F. Duthie, Director, Botanical Department, Northern India, for the identification of most of the plants enumerated below on which the larvæ of our butterflies feed.

We have also to thank Major Malcolm Fawcett, of the 5th Lancers, for the drawings here reproduced of the larvæ and pupæ of *Lethe isana*, Kollar; fig. 3*b* of the larva of *Lethe vaivarta*, Doherty; of the larva and pupa of *Patala yama*, Moore; of the pupa of *Sephisa dichroa*, Kollar; figs. 9*a*, larva, and 9*f*, pupa of *Pseudergolis wedah*, Kollar; the pupa of *Dodona eugenes*, Bates; the larva of *Papilio protenor*, Cramer; the larva and pupa of *Papilio polyctor*, Boisduval; the pupa of *Papilio sarpedon*, Linnæus; the larva of *Papilio cloanthus*, Westwood; the larva of *Notocrypta feisthamelii*, Boisduval; and the larva and pupa of *Rhopalocampta benjaminii*, Guérin.

Mr. Mackinnon has drawn the pupa of *Euthalia patala*, Kollar; and fig. 24*c* the pupa of *Papilio polyctor*, Boisduval.

All the other drawings have been executed in Calcutta by native artists under Mr. de Nicéville's direction from larval specimens sent by post in either glycerine or spirits of wine; the pupæ were sent alive. Many of the drawings of larvæ are not very satisfactory, as the colours had faded on arrival, and many of the bodies also had shrunk.

Family NYMPHALIDÆ.

Sub-Family DANAINÆ.

1. DANAIS (*Tirumala*) LIMNIACE, Cramer.

Very common in the valleys below Mussoorie and in Dehra Dun from April to October. Females have been observed ovipositing in April in the Dun on *Marsdenia tenacissima*, Wight et Arn., Natural Order *Asclepiadeæ*.

2. DANAIS (*Tirumala*) SEPTENTRIONIS, Butler.

Rare in Mussoorie itself, but occurs in great numbers in the low valleys about Mussoorie and in the Dun. It is most numerous in the spring and summer, but like *D. limniace*, Cramer, is to be seen almost all the year round in the Dun. The larva in the Dun feeds on *Vallaris dichotoma*, Wall., Natural Order *Asclepiadeæ*.

3. DANAIS (*Limnas*) CHRYSIPPUS, Linnæus.

Very common in Mussoorie and in Dehra Dun almost all the year round. As the species of *Asclepiadeæ* which are the food-plants of the larva grows only in the lowest valleys not above 2,500 feet elevation above the sea, all the butterflies seen at greater elevations and in the station of Mussoorie must emigrate into these regions from below. The albinic aberration of *D. chrysippus*, the *D. alcippus* of Cramer = *D. alcippoides* of Moore, has not been met with in our area.

4. DANAIS (*Salatura*) PLEXIPPUS, Linnæus.

We have followed Professor P. O. Chr. Aurivillius, who has made a special study of the *Lepidoptera* described by Linnæus, and has written an admirable paper in 1882 on the subject, in restoring the name *plexippus* to the Asiatic butterfly which has, since Mr. S. H. Scudder in 1878 reversed the names and applied *plexippus* to the American species, been usually referred to the "*Papilio*" *genutia* of Cramer, the latter being a more recent name for the same species according to Aurivillius. The American butterfly will stand as *Danais* (*Anosia*) *erippus*, Cramer, from South America, with a local race in North America, *D. erippus menippe*, Hübner. Mr. W. F. Kirby in "The Entomologist," vol. xxix, p. 188 (1896), well sums up the evidence on the subject thus:—"Under these circumstances, I am still of opinion that it is better to regard the eastern *Danaus*, figured by Cramer as *Papilio genutia*, as the true *Papilio plexippus*, of Linné, on the strength of his comparing it with *D. chrysippus*; and having regard

to Clerck's figure, and the ostensible types; and to call the common American species, now becoming naturalised among us, by the name of *Anosia menippe*, Hübner."

D. plexippus is quite as common both in Mussoorie and Dehra Dun as the preceding species. The female has been observed ovipositing in Mussoorie on *Cynanchum Dalhousiæ*, Wight, Natural Order *Asclepideæ*. Mr. Angus Campbell informs us that on 10th April, 1888, at Nalapani, in the Dun, he captured a male *D. plexippus* in coition with a female *D. chrysippus*, Linnæus.

5. DANAIS (*Parantica*) MELANOIDES, Moore.

Not common either in Mussoorie or in Dehra Dun. A few are on the wing in May and August, but it is more numerous in September and October.

6. DANAIS (*Caduga*) SITA, Kollar. Plate U, Figs. 1*a*, 1*b*, *larva*; 1*c*, 1*d*, *pupa*.

This butterfly, better known under the name of *D. tytia*, Gray, is fairly numerous in September and October in Mussoorie and Dehra Dun, and a few appear in April and May in Mussoorie. It is found also in the Upper Ganges Valley before that great river breaks through the hills on to the plains at Hardwar; also in the Native State of Tehri Garhwal to the north and east of Mussoorie in May and July. The eggs are white, longitudinally ribbed, and about three times as long as they are broad; they are laid singly on the young leaves of *Marsdenia Roylei*, Wight, Natural Order *Asclepiadeæ*, the food-plant of the larva. The larva on emergence is of a dirty white colour, with transverse lines on each segment, and has two somewhat long and thin tentacles or processes on the third and two shorter ones on the twelfth segment as in the allied sub-genus *Parantica* (*D. aglea*, Cramer, from South India and Ceylon). When full-fed, the larva is about an inch-and-a-half long, the ground-colour is of a pale yellowish-green, with two rows of dorsal and a row on each side of lateral yellow spots; the head is black with grey spots on the face; the legs black. Pupa pale emerald-green with golden-yellow spots. From eggs laid in September the imago emerged in the following April. The transformations of this species do not appear to have been previously observed. The butterfly is the model for the mimicking *Hestina nama*, Doubleday, and *Papilio govindra*, Moore.

7. Euplœa (*Crastia*) core, Cramer.

Very common in the low valleys about Mussoorie and in Dehra Dun in the autumn. In the latter valley the larva has been noticed feeding on *Ficus glomerata*, Roxb., Natural Order *Urticaceæ*. Mr. Moore (*vide* Lep. Ind., vol. i, p. 82) appears to be under the impression that *E. core* is not found in the Himalayas, but only to the south of the hills, in the hills themselves being replaced by *E. vermiculata*, Butler. This is certainly not the fact. Close to Mussoorie and in the Dun in October, 1895, collectors brought in daily scores of typical *E. core* and *E. vermiculata* and every intergrade between the extremes of both forms. There is not the smallest doubt that these two species, which are given as distinct by Mr. Moore, are really one and the same. It appears probable that *E. core* is the prevailing form in the rains, but at the end of the rains both *E. core* and *E. vermiculata* appear in about equal numbers and every variety connecting the two, while later on, when the rains have wholly ceased, *E. vermiculata* alone appears. A precisely parallel instance is found in *Melanitis ismene*, Cramer, and other satyrine butterflies. At the end of the wet-season from one batch of eggs laid by *M. ismene*, in captivity, de Nicéville has bred the ocellated and non-ocellated forms, and all intermediates.

8. Euplœa (*Trepsichrois*) linnæi, Moore.

Rare in Mussoorie, where it has been caught sparingly from May to September. It does not appear to occur in the Dun.

Sub-Family Satyrinæ.

9. Mycalesis (*Orsotriœna*) medus, Fabricius.

The dry-season form of this species, *M. runeka*, Moore, has been recorded from the Dehra Dun in Butt. India, vol. i, p. 112, n. 93, but we have not met with it in our area. The wet-season form, true *M. medus*, has been recorded in Lep. Ind., vol. i, p. 169, by Moore, from Umballa.

10. Mycalesis (*Calysisme*) perseus, Fabricius.

The dry-season form, true *M. perseus*, is not very common in the Dun and the low valleys near Mussoorie in the spring and autumn up to December. The wet-season form, *M. blasius*, Fabricius, is rare, and we have only obtained it at Dehra Dun in August.

11. Mycalesis (*Calysisme*) mineus, Linnæus.

The dry-season form, *M. otrea*, Cramer, is very common in the Dun in the spring and autumn, rare in Mussoorie in May. The wet-season

form, true *M. mineus*, is comparatively rare, and occurs in the same places from July to September.

12. MYCALESIS (*Samanta*) LEPCHA, Moore.

The name which stands for this species is an unfortunate one, as the butterfly does not occur in the Lepcha country (Sikkim). It is found in our area only in Mussoorie from 3,000 to 7,000 feet elevation, the dry-season form, true *M. lepcha*, from March to May, the wet-season form (which has escaped being named) from July to September.

13. MYCALESIS (*Samanta*) NICOTIA, Doubleday and Hewitson.

The dry-season form, the *M. langi* of de Nicéville, occurs in our area rarely in and below Mussoorie down to 3,000 feet elevation from April to June. The wet-season form, true *M. nicotia*, is still rarer, and is found during the rains in the same localities as the dry-season form.

14. LETHE EUROPA, Fabricius.

In our area is found in the Dun only, commonly from April to June.

15. LETHE DYRTA, Felder.

Very common in Mussoorie all through the spring and summer; a few have been taken in the Dun in September and October.

16. LETHE ROHRIA, Fabricius.

Double-brooded in Mussoorie, found commonly in April and May, and again from August to October.

17. LETHE ISANA, Kollar. Plate U, Figs. 2*a*, *larva*; 2*b*, 2*c*, *pupa*.

Double-brooded in Mussoorie, found rarely from April to June, and again in October. The larva feeds on the leaves of the hill bamboo ("ringhal" in the vernacular), *Arundinaria falcata*, Nees, Natural Order *Gramineæ*. It is green, with a yellow patch on the back, the head ending in a point. The pupa is sometimes brown, sometimes green. The name "*Satyrus*" *isana* has priority over "*Satyrus*" *hyrania*, Kollar having described both sexes of the same species as distinct species.

18. LETHE (*Tansima*) VERMA, Kollar.

Very common in Mussoorie in April, May, August and September.

19. LETHE (*Sinchula*) VAIVARTA, Doherty. Plate U, Figs. 3*a*, 3*b*, *larva*; 3*c*, *front view of head of larva*; 3*d*, 3*e*, *pupa*.

Common at Mussoorie and in the interior in May and June, and again in September and October. The larva feeds on the leaves of the

hill bamboo, *Arundinaria falcata*, Nees, Natural Order *Gramineæ*, and is of a light green colour with two conical-shaped processes on the head. The pupa is pale green, sometimes reddish-brown.

20. LETHE (*Sinchula*) NICETAS, Hewitson.

Rare, a few specimens have been obtained from Tehri Garhwal, north-east of Mussoorie, at 5,000 feet elevation. In Mussoorie itself it does not appear to occur.

21. LETHE (*Putlia*) BALADEVA, Moore.

Very rare, two specimens only obtained in Tehri Garhwal in May.

22. LETHE (*Zophoessa*) JALAURIDA, de Nicéville.

Rare, taken only in the Baspa Valley in July and August.

23. BLANAIDA PULAHA, Moore.

Not common in Mussoorie from 6,000 to 7,000 feet elevation in March and April, more common in the Ganges Valley at about 8,000 feet in July.

24. PATALA YAMA, Moore. Plate U, Figs. 4*a*, *larva* ; 4*b*, *pupa*.

Occurs at Mussoorie and in the interior from 5,000 to 7,000 feet elevation in June and July, but is not common anywhere. The larvæ feed on the leaves of the hill bamboo, *Arundinaria falcata*, Nees, Natural Order *Gramineæ*, and are to a certain extent gregarious, as from three to seven have been found enclosed in a sort of nest or shelter made by joining three or four leaves together. The eggs are laid early in July on the underside of a wide leaf in lines, as many as 34 have been counted on one leaf. The larva is straw-coloured, with a dark head, till nearly full-grown, when it becomes of a light ochreous colour with a dorsal brown stripe, and a subdorsal yellowish stripe ; between these lines is a series of dark brown spots. Head reddish. Anal segment with two yellowish points or processes. The pupa is short and stout and of a very dark colour, and is placed in a sort of nest in moss in September, the imago emerging the following June.

25. RHAPHICERA MOOREI, Butler.

Brought down by native collectors from the higher valleys of the River Ganges in August and September. Major M. Fawcett has taken it at Landour which adjoins Mussoorie, in August at 7,000 feet. Found also at Nag Tiba, north of Mussoorie. It appears to be everywhere somewhat rare.

26. LASIOMMATA SCHAKRA, Kollar.

Very common in Mussoorie and in the Upper Ganges Valley from 3,000 to about 6,000 feet elevation from March to October.

27. LASIOMMATA MÆRULA, Felder.

L. laurion, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. x, p. 15, n. 3, pl. B, figs. 5, *male*; 6, *female* (1895).

Found rarely in the interior in the higher valleys and on the Gonas Pass. Dr. K. Jordan has very kindly, since my description of *L. laurion* appeared, examined the type specimens of *L. mœrula* in the Felderian collection now in Dr. Jordan's custody. He writes to me under date 26th June, 1896, that there are ten male specimens of *L. mœrula*, some of which are labelled Pangi, but which have the label *schakra* Kollar, beneath them. They "are *without* male-mark; the forewing is strongly hairy; they agree with Felder's description of *L. mœrula* (and also with Kollar's figure of *Satyrus schakra* on the whole). These specimens have apparently first been identified by Felder as *L. schakra*, afterwards he found out that they did not quite agree with *L. schakra* (figure), being different in the extent of ochreous on the underside of the forewing for example, and gave the name *mœrula* to them." From this it is evident that *L. laurion*, de Nicéville, is the same species as *L. mœrula*, and the former name must be sunk as a synonym. The confusion caused in the identification of this species would not have arisen had Felder put type tickets *on* the specimens he described, or even put the correct labels beneath them.

28. HIPPARCHIA (*Nytha*) PARYSATIS, Kollar.

Very rare in Mussoorie, where a single specimen has been obtained in July; a few others have been brought in from the Upper Ganges Valley in the same month.

29. AULOCERA BRAHMINUS, Blanchard.

Found at high elevations in the interior near the snows in the Nila and other valleys in July and August.

30. AULOCERA PADMA, Kollar.

Found early in the season, in April, at Mussoorie, and a second brood occurs in September and October. Very numerous in May at Nag Tiba, 9,000 feet elevation. In the rains it is replaced by the two species which follow.

31. AULOCERA SWAHA, Kollar.

This is the commonest species of the genus found in Mussoorie and in the interior, making its appearance in great numbers at the end of July or the beginning of August, while a few ragged specimens are still to be seen at the end of October. The larva feeds on different grasses, Natural Order *Gramineæ*. It is brown, with a rough hairless skin. Mr. A. Grahame Young's observations on the transformations of this species in the Kulu Valley do not agree at all with ours, and the food-plant he gives for it, wild blue *Iris*, is almost certainly incorrect.

32. AULOCERA SARASWATI, Kollar.

Is nearly as numerous in and about Mussoorie as *A. swaha*, Kollar, but emerges a little later in the season.

33. EPINEPHELE (*Maniola*) CHEENA, Moore.

Found only in our area by native collectors in the Baspa Valley, an affluent of the Sutlej River, in July and August, at an elevation of about 11,000 or 12,000 feet.

34. EPINEPHELE (*Chortobius*) NEOZA, Lang.

It is more than doubtful if *E. neoza*, Lang, and *E. pulchra*, Felder, (which latter name is the older) can be maintained as distinct species, but we have followed Mr. Moore's distinctions as given in his Lep. Ind., vol. ii, p. 53, in keeping *E. neoza* for our specimens. It is very common in the higher valleys (especially the Nila Valley) leading into the Upper Ganges and Sutlej valleys, from July to September.

35. YPTHIMA BALDUS, Fabricius.

Mr. Moore notes in Lep. Ind., vol. ii, p. 62, that he has "Not seen any specimens of true *Y. baldus* from either the Western or Eastern Himalayas." It undoubtedly occurs all along the Himalayas. In Mussoorie and Dehra Dun the dry-season form, *Y. marshallii*, Butler, is very common in March and April, the wet-season form, true *Y. baldus*, being found from July to October less commonly.

36. YPTHIMA INDECORA, Moore.

We have specimens of the dry-season brood, true *Y. indecora*, taken in Mussoorie in March and April, and of the wet-season brood, which has not been separately named, from August to October. It is not very common.

37. YPTHIMA SAKRA, Moore.

Very common at Mussoorie in ravines in June and July only. Mr. Moore keeps *Y. nikœa*, Moore, from the Western Himalayas, distinct from *Y. sakra* from the Eastern Himalayas, but we agree with Messrs. Elwes and Edwards in uniting them under the older name.

38. YPTHIMA AVANTA, Moore.

The dry-season form, true *Y. avanta*, is found in Mussoorie in April; the wet-season form, *Y. ordinata*, Butler, flies in the rains. It is not common, and is not found in Dehra Dun.

39. YPTHIMA HUEBNERI, Kirby.

Mr. Moore has described an *Y. apicalis* from a single male from "Deyra Dhoon." We have specimens taken in the Dun in March which agree with the description and figure of that species, but they certainly represent the dry-season form only of *Y. huebneri*, which has been named *Y. howra* by Moore. The wet-season form, true *Y. huebneri*, occurs in the Dun in the rains. It is not found in Mussoorie at all.

40. YPTHIMA NARED, Kollar.

Common in Mussoorie only, where it flies from April to October. It has no dry-season non-ocellated form.

41. YPTHIMA ASTEROPE, Klug.

Mr. Moore in Lep. Ind., vol. ii, p. 91, says that *Y. mahratta*, Moore, "Is allied to the North-East African (Aden) species, *P. asterope* of Klug." My Lahej (Aden) specimens of *Y. asterope* agree exactly with the supposed distinct *Y. mahratta*, so I have no hesitation in uniting them. It is common in the Dun in March and August, and has both an ocellated and a non-ocellated form, the former being true *Y. asterope*=*Y. mahratta*, and the latter *Y. alemola*, Swinhoe. It does not appear to occur in Mussoorie itself, but native collectors have brought it into the station from the neighbouring low valleys.

42. YPTHIMA INICA, Hewitson.

We have only obtained the dry-season form of this species, the true *Y. inica*, in the Dun in March, but the wet-season form, *Y. ariaspa*, Moore, will certainly be found on the same ground during the rains.

43. DALLACHA HYAGRIVA, Moore.

Very common in Mussoorie only in August and September on grassy hill sides.

44. CALLEREBIA ANNADA, Moore.

This species, the largest of our *Callerebias*, is very common in the spring and autumn in Mussoorie and the interior. Mr. Mackinnon has bred it from the egg, and notes that the larva and pupa do not differ perceptibly from the larva and pupa of *C. nirmala*, Moore, as described by Mrs. Robson.

45. CALLEREBIA HYBRIDA, Butler.

Occurs at Mussoorie in the early part of the rainy season (July), and again in September.

46. CALLEREBIA NIRMALA, Moore. Plate U, Figs. 5*a*, 5*b*, *larva* ; 5*c*, *front view of head of larva* ; 5*d*, 5*e*, *pupa*.

The rarest of the *Callerebias* occurring in Mussoorie, where it flies in May and June. It is very common in the interior. Mrs. Robson has described the transformations of this species in the Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 551 (1894), and the figures here reproduced have been drawn from some of these specimens. The larva feeds on grass, Natural Order *Gramineæ*.

47. CALLEREBIA SCANDA, Kollar.

Very common in the rains in Mussoorie (July to September).

48. PARALASA KALINDA, Moore.

A small species, with the ferruginous patches on the upperside of both wings large and including the ocellus of the forewing, the ocellus with a distinct fulvous iris. We have obtained this species only from the north side of the Nilang Pass at 16,000 feet elevation in July.

49. PARALASA SHALLADA, Lang.

A larger species than *P. kalinda*, Moore, the ground-colour of a less deep black, the ferruginous patches on the upperside of both wings smaller and deeper ferruginous, well removed from the ocellus of the forewing, the ocellus with the iris obsolete or indistinct. We have specimens from Nag Tiba, 8,000 to 9,000 feet elevation, and from the Upper Ganges Valley at a similar elevation taken in May, June and July. We believe these two species to be distinct, but the points of difference are not well brought forward in Mr. Moore's description and figures of them in Lep. Ind., vol. ii, pp. 104-105.

50. MELANITIS ISMENE, Cramer.

The dry-season form, true *M. ismene*, is very common in Mussoorie in the early summer and autumn ; the wet season form, *M. deter-*

minata, Butler, is very rare, a few specimens only taken in August and September. Both forms occur very numerously in the Dun, and one or other of them is to be found almost throughout the year.

51. MELANITIS BELA, Moore.

The dry-season form, true *M. bela*, is found in the low valley below Mussoorie in April and October, and the wet-season form *M. aswa*, Moore, in the same places in August and September.

Sub-Family ELYMNIINÆ.

52. ELYMNIAS UNDULARIS, Drury.

Occurs in the low valleys below Mussoorie not higher than 3,000 feet elevation, and in Dehra Dun, but is not common, flying in March, April, July, September and October. The female mimics *Danais plexippus*, Linnæus.

Sub-Family ACRÆINÆ.

53. PAREBA VESTA, Fabricius.

Fairly common at Mussoorie in May, June and October, and found in the Dun in August. The food-plant of the larva in the hills is *Debregeasia bicolor*, Wedd., Natural Order *Urticaceæ*. The caterpillars are gregarious, and until about half an inch in length feed on the upper and lower surfaces of the leaves only, leaving the veins; when nearly full-grown they eat the entire leaf except the mid-rib.

(*To be continued.*)

THE BIRDS OF NORTH CACHAR.

Part VIII.

By E. C. Stuart Baker, F.Z.S., M.B.O.U.

(*Continued from Vol. X., page* 567),

Order—STRIGES.

Family *Strigidæ*.

(483) Strix flammea.—The Barn Owl.

Hume Cat., No. 60, 60 *Bis. Blanford, No.* 1152.

A fairly common bird where there are suitable buildings in which it can breed. They commence laying in October, though I have taken eggs as late as January.

The depth of colouring of the under parts varies considerably, as do the spots in number.

One bird in my collection has the breast and abdomen a very dark tawny, seeming in this respect to approach in description the Andaman bird named *S. deroepstorffi* by Hume.

(484) Strix candida.—The Grass Owl.

Hume, No. 61. *Blanford, No.* 1153.

Common in the extensive grass plains of Cachar. I once flushed an owl from long grass in the north-west of the Cachar Hills, which I think was of this species, and another was caught on its nest one dark night as I was returning from shooting. One of my gun-bearers put his foot on it and grasped it with his hand before it could get away. The nest was a rough mat of grass placed by a rock which slightly overhung it and situated half way up a steep, lofty cliff down the sides of which we had to climb to get to our camp. These are the only two occasions on which I have seen *S. candida* in the hills. *S. flammea* I have never seen out of the plains.

Family *Asionidæ*.

Sub-Family *Photodilinæ*.

(485) Photodilus badius.—The Bay Owl.

Hume, No. 62. *Blanford, No.* 1154.

Hardly ever met with, but not probably as rare as it seems. In 1888 I was fortunate enough to obtain a nest and eggs of this bird. Not far from where I lived in Gungong there is a nullah with steep banks of considerable height which are densely clothed with the small,

solitary bamboo, amongst which are also a few trees, nearly all very old and rotten and full of hollows. Passing one of these trees I heard a loud hissing, but so well screened was the tree by the surrounding jungle that it was some time before I could make out the bright chestnut head of a small owl peering out of a large hollow only just above my head. I, of course, sent a man up to find out whether there were eggs, and on his reporting that there were three of them, went after the bird and shot it. The eggs, spherical as usual, are rather large for the bird, measuring 1·35″×1·23″; 1·35″×1·16″, and 1·34″×1·12″. They were hard set and extremely stained and dirty, no amount of washing reduced them to anything approaching whiteness. They were taken on the 18th of April.

I was much surprised to find this bird breeding in a bamboo jungle, as they keep so much to heavy tree forest, outside of which they are but rarely met with. From the cast up pellets I have examined, *Photodilus badius* seems to feed almost entirely on small mammals, birds, and reptiles, and I have seen hardly any remains of insects.

Beyond the hissing of the bird I heard on the nest, and a low chuckle given by it when alighting on a tree close by, and which I again heard when going after another specimen, I have not heard them utter any sound; but the natives assure me that it gives vent to the most awful shrieks and screams on dark nights, keeping, generally, more quiet on moonlight ones. A noise I heard one night which sounded like a number of cats, with unusually powerful voices, fighting amongst one another, was said to have been caused by a pair of these owls, but I failed in my attempt to get a shot, so I cannot be certain about the matter.

(486) Asio accipitrinus.—The Short-eared Owl.

Hume, No. 68. *Blanford, No.* 1157.

I have not yet seen a specimen of this owl from Cachar, but one was obtained from North-East Cachar by Inglis (*vide* "Stray Feathers," Vol. XI).

(487) Syrnium indrani.—The Brown Wood Owl.

Hume, Nos. 63, 64. *Blanford, No.* 1160.

A rare bird in Cachar of which I know little. I should think it probable that the shrieks attributed by Layard and others to the Brown Wood Owl may be made by birds of the genus *Photodilus*.

Sub-Family *Buboninæ*.

(488) KETUPA ZELONENSIS.—The Brown Fish Owl.

Hume, No. 72. *Blanford, No.* 1164.

Fairly common on all the larger streams which are well wooded, more particularly on the Diyung river, where a few birds may always be met with.

(489) KETUPA FLAVIPES.—The Tawny Fish Owl.

Hume, No. 73. *Blanford, No.* 1165.

Less common than the last, and though frequenting the same kind of places, not, I think, extending to the plains. Its cries are exactly the same as those of *K. zelonensis*.

An egg I obtained of this species measured 2·19″×1·81.″ It was taken from a huge nest of sticks and miscellaneous *débris* built in the fork of a magnificent wild mango tree growing on the banks of the Diyung. The parent birds refused to go away whilst the nest was being rifled, and one which I eventually shot and winged, threw itself on its back and fought desperately against the Cacharies who attempted to seize it.

On this occasion the single egg which the nest contained was hard set, but I have seen two young ones twice and three once, so that probably two or three eggs is the number usually laid.

Ketupa seems to be the most diurnal of all owls, and I have often seen birds, either singly or in family parties, fishing on the banks of the rivers late on into the day. They may be seen at any time, even in the hot weather, seated on large branches low down in big trees which are almost in the open.

(490) BUBO CORAMANDUS.—The Dusky-horned Owl.

Hume, No. 70. *Blanford, No.* 1169.

Not rare either in Cachar or Manipur, where, however, Hume did not meet with it. It is not often met with at any great elevation.

(491) HUHUA NIPALENSIS.—The Forest Eagle Owl.

Hume, No. 71. *Blanford, No.* 1170.

Not a rare bird, though its deep "whoo-hoo-hoo" may be heard more often than the bird itself is seen.

A female which had been caught on its nest was brought to me with a single egg. The nest was said to have been a broad roughly-made platform of sticks and grass placed in a large *Ficus* about six

feet from the ground. The tree grew in a deep, rocky ravine, gloomy on the brightest day and where the sun could never penetrate. The egg measures 2·21″ by 1·87″ and is of the usual shape and character. It was taken on the 20th of June.

(492) NYCTEA SCANDIACA.—The Snowy Owl.

Hume, No. 68 *Bis. Blanford, No.* 1172.

In the station of Silchar two owls built a nest in the roof of the office of the Forest Officer and laid three eggs which were duly hatched. Unfortunately I could not pay a visit to Silchar at this time, and before I could do so the Forest Officer, unable to endure the noise and inconvenience of the birds, had the young ones destroyed ; he however, noted the description of the birds and told me about them very shortly afterwards, and incredible though it seems, I can come to no other conclusion than that they were a pair of Snowy Owls. The description of the birds and their size, both young and old, would apply to no other owl but *N. scandiaca*, and I feel sure I am correct in recording this species as one of the birds of Cachar. I owe Mr. Barrett, the Forest Officer, thanks for much trouble he has taken in collecting owls, eggs, and skins for me, and had he known the value of the birds he was destroying they would have been suffered to remain until I could personally inspect them ; at the same time I think his description of them was sufficiently close to warrant my taking it as that of the Snowy Owl to the exclusion of all other species.

(493) SCOPS GIU.—The Scops Owl.

Hume, Nos. 74 *to* 74 *sex.* (*not* 74 *quint*). *Blanford, No.* 1173.

The only specimen I have of this species is a fine female caught on its nest on the 14th June, 1895. The wing of this bird is of the largest size ; measuring no less than 5·95″, far longer than the average of Himalayan birds ; in coloration, however, the bird most nearly approaches the Malayan form, to which Hume gave the name of *Scops malayanus*. A careful examination of the collection of *Scops* in the British Museum shows no example of a bird so brightly coloured until one examines the most southern specimens, and even then I could find none with quite such brilliant tints as are displayed in my bird from North Cachar. The white markings on the scapulars, wings, and lower surface of the body are very clearly defined, as, indeed, are all

the contrasting vermiculations on every part of the body. In my specimen the maxilla and commissure are black, the rest of the mandible yellow.

It must be a rare bird in Cachar, as the only other local specimen I have seen was a bird in the grey phase caught near Silchar.

(494) Scops spilocephalus.—The Spotted Himalayan Scops Owl.

Hume, No. 74 *Ter. Blanford, No.* 1175.

Another rare owl of which I have seen but little. A young one, caught in company with an adult female, is coloured as follows :—

Plumage generally of a light—rather bright, rufous, all the feathers of the head above back, rump and upper-tail coverts very finely banded with dull black; wings and tail as in the adult, but paler ; lower surface still paler rufous, the feathers tipped with a yet paler tinge and indistinctly barred darker.

Irides golden yellow ; legs dull fleshy, claws about the same ; bill yellowish-white, the cere rather darker ; eyelids reddish-orange.

The bird, which is, I think, a young female, has the wing about 5·6″. It was caught on the 9th of July.

(495) Scops bakhamœna.—The collared Scops Owl.

Hume, No. 75 *Ter., quat., quint. Blanford, No.* 1178.

The form found here in North Cachar is, of course, that which has been separated as *lettia*. All the specimens I have seen have been very typical specimens of this form, but, at the same time, have varied very much *inter se*. I have now before me two birds—a male and a female—taken at no great distance from one another and in much the same kind of country, yet differing so much in coloration about the head that a casual observer would at once jump to the conclusion that they belonged to different species. The female has the whole anterior crown and forehead as well very broad supercilia a pearly white, more or less freckled and tipped with rufous and brown ; the male has no white on the forehead, also the whole crown, nape and back are far more richly coloured, although the black stipplings on the head are not so distinct nor yet so black as are those on the female.

I think the coloration of the iris depends a good deal on age. I notice that nearly all young birds have the irides yellow or golden-yellow, whilst most old birds (old, not merely adult) have them a deep,

bright brown. It is curious that this is also the case with certain of the diurnal birds of prey.

This Scops Owl is very fairly common all over North Cachar, but I have not noticed it, or heard its call, above some three thousand feet.

The common phase in North Cachar is the rufous plumage; in the plains the grey is perhaps the more common.

(496) ATHENE BRAMA.—The Spotted Owlet.

Hume, Nos. 76 *and* 76 *quat.; Blanford, No.* 1180.

Common enough in the plains, but never I believe met with in the hills.

These owls are great bat-eaters, and the latter are not caught on the wing, but are hauled out of crevices and holes by the owls.

(497) GLAUCIDIUM CUCULOIDES.—The Large Barred Owlet.

Hume, No. 79; *Blanford, No.* 1183.

The depth of the general colouring of this bird varies very greatly, and the general tint ranges from a grey-brown tinged with rufous to a dark rufescent-brown. A purely grey phase does not appear to exist, in North Cachar at all events, as amongst the very great numbers I have seen no specimen has approached this form. It has also been ascertained that the seven bars on the tail are not invariably present in birds from other parts, but I have never seen any here that had not *originally* seven bars though the terminal one may be so abraded that a casual observer would probably put the bird down as only possessing six.

As a nesting place this bird usually selects a rather large hollow in the trunk or one of the main branches of some big tree. Generally this hollow is at some height from the ground, but I have known them breed in hollows not six feet from it. Certain places seem to possess a perfect fascination for this bird, and one such place in particular I know of. The tree in which this is is a very large one standing in the outskirts of a forest of mixed bamboo and trees close to a large stream. This nest I first found in 1889. In that year I took four eggs which, however, proved to be too far set to be blowable. On this occasion I shot the hen bird. In 1891 the hole was again occupied, but the birds were not molested and I believe reared their young in safety. In 1892 I shot the male, but could get no one to climb the tree, a very difficult one, having no branches for some forty feet and the hole being situated just below the bifurcation of the two first great

limbs. In 1893 the hole had again found a tenant, and the female was observed to keep so continually inside the nest that I felt sure the eggs were laid and that the bird had begun to sit.

Thinking thus I shot the male and female, and after some time induced a Naga to climb up the tree and inspect the nest and bring down the contents. My disappointment was natural when there was found to be but one egg which was carefully brought by the Naga to within a few feet of the ground and then just as carefully dropped.

The first nest I ever took of this bird was found in a hollow of a dead stump standing in some bamboo jungle close by a road from which the hole was easily visible, and from which the bird could be seen quite distinctly whenever it put its head close to the entrance. In spite of this the nest was not discovered until the eggs were so far incubated as to render the cleaning of them a long and difficult task.

The number of eggs laid seems to be always four. I have twice seen four hard set eggs and twice four young ones. As I have never seen a whole fresh egg I can only judge from the hard set ones that their surface is rather more porous and the texture softer than in the eggs of *Athene brama*, allowing of course for their becoming softer as incubation advances. Both clutches were also much discoloured, and even after long washing and brushing still presented a very yellow appearance. The fragments of the broken egg were white and very glossy, but even that egg had begun to get soiled in places, though the dirt had not had time to penetrate the shell.

The only clutch of eggs I have been able to measure were 1·35 inches by 1·2 inches and are very large in proportion to the size of the bird, even more so than are most owls' eggs.

The great discoloration of the eggs appears to be caused by the chronically filthy state of the bird's feet. All those I have shot have been more or less dirty, and some are simply coated with mud and evil smelling remnants of former meals.

This bird is the most common of all the family in North Cachar, nearly every hundred yards of jungle which contains a few big trees holding one or more pairs of this owlet. Their ordinary cry—and I have frequently watched them in the very act of uttering it—is a long drawn rippling whistle, highest and loudest at the commencement

and gradually dropping and dying away. It is a melancholy sound, but by no means either unmusical or unpleasant. This cry has been attributed by various writers to *G. radiatum*, *G. brodei*, or some other owlets, but I am absolutely certain that it is the common note of the barred owlet, though I cannot be as sure that it is not also uttered by any other owl. It has also a note sounding something like ku-u-hoot; it is very low and deep and could not I think be heard a hundred yards distant from where the bird is sitting. This species seems to live very largely on field mice and small rats, most of the birds I have examined containing remains of such inside them. They also devour a good many insects and small lizards, worms and frogs. I saw one, once, when some grass jungle was on fire, catch a large toad which was hastening away from the danger across a path. I believe that, unlike most of the owlets, this one does not always take his prey to a tree or similar perch before eating it, but commences and very frequently finishes his meal on the ground at the place where caught.

It seems to be less affected by daylight than any other owl except *Ketupa*, and though not as lively or active in the daytime as in the dusk, it may very often be seen during broad daylight in shady forest either perched on some bare or dead tree or flying from one place to another, seldom keeping so exclusively to trees with dense foliage as do the others of its race. On one occasion I saw two of these birds feeding on a rat on the ground in the middle of a large *jhum* (rice clearing) when it was fully 9-30 a.m. When I got to within some sixty yards they flew into a dead tree stump and did not take to the forest until I got within about thirty paces of them.

It is not at all a shy bird and allows of a very close approach, taking but little notice of it; nor is this merely due to its faculties being confused by daylight, for I have noticed that it is quite as confiding in the dusk of the evening. I have often seen it taking white ants on the wing, and, when thus employed, its feet seem to be the main, if not the sole, instrument in catching the insects which are then conveyed to the mouth by the same action that everyone has seen performed by a kite when engaged in the like pursuit. They seem to content themselves with catching one or two white ants, or at the outside three, each sally, then returning to rest for a few minutes on any convenient perch.

Their cry is very difficult to imitate, but I have known one Cachari sufficiently expert at it to obtain answers. The bird is, as might be supposed, most noisy up to about 10 a.m. and after 5 p.m., but during the breeding season it calls every now and then throughout the day, and all the year round it is to be heard as night comes on, and again in the early morning up to about an hour after sunrise.

498. GLAUCIDIUM RADIATUM.—The Jungle Owlet.

Hume, Nos. 77 & 78 ; *Blanford, No.* 1184.

A rare bird, but to be met with in small numbers everywhere. Blanford says, "Like other species of *Glaucidium*, this is more often seen and heard in daylight." It is of course, as are all owls, sometimes met with in the day-time, but I have found it decidedly more crepuscular in its habits than either *G. cuculoides* or *G. brodiei*, with both of which species I am very well acquainted indeed.

499. GLAUCIDIUM BRODIEI.—The Collared Pigmy Owlet.

Hume No. 80 ; *Blanford, No.* 1187.

The general dimensions given by Davidson in "Stray Feathers," Vol. VI, agree with those of the birds obtained here with the exception of the tail. Davidson gives the length of this as 2·15″, whereas the tails of the birds I have measured in North Cachar were none under 2·3″, and most exceeded 2·4″.

This little owl seems to care little in what kind of hollow it deposits its eggs. I have taken them from hollows with small entrances low down in big trees, at about 10 feet up in stumps, and again in the topmost boughs of lofty trees. Another hollow from which I secured four eggs would have furnished nesting room to 8 or 10 pairs of owls, and the entrance to this was about 24″ high by about 18″ wide. This hole was in a large, semi-rotten stump of a cotton tree, and was about 15 feet from the ground. As a rule, however, I think that the Pigmy Owlet, though not at all particular as to the style of hole in which to bring up its young, prefers that the hole should be at a considerable height from the ground, and also, if possible, in one of the smaller branches, and not in the trunk itself or one of the main boughs. In the nest-holes I have seen there has been no artificial lining beyond the scraps of touchwood and chips of bark, etc., which have fallen into it naturally. Of course, when once the young are hatched, a very

miscellaneous collection of odds and ends soon accumulates at the bottom of the hole, of which pellets thrown up the birds themselves form the greater part.

Occasionally the deserted nest-hole of a wood-pecker or barbet is made use of for nesting purposes, for on one occasion, when visiting a tree in which I had found a pair of blue-faced Barbets (*Cyanops asiatica*) breeding, I discovered that a pair of owls had taken possession of the hole, and a few days later a Naga brought me an egg which he had obtained there.

The full number of eggs laid appears to be four, very rarely five. I have seen five young ones twice and five eggs once, but I have never seen less than four young or less than four eggs when the latter showed any signs of incubation. In texture the eggs are, I think, somewhat finer and smoother than in those of most birds of this family. Freshly-laid eggs show a fine gloss. They are rather large in proportion to the size of the bird laying them, and in shape are very broad, very regular ovals. Three clutches, each of four, measure, on an average, 1·13″ × 0·97″, 1·26″ × 1·03″ and 1·24″ × 1·18″. The longest and shortest eggs measure 1·27″ and 1·11″ respectively, and the broadest and narrowest 1·13″ and 0·95″ respectively. They are early breeders, and I think the majority of birds commence their breeding operations about the middle of March, a few as late as April. I have taken eggs as late July, but the probability was that these were eggs of a second brood.

This is a common little bird in North Cachar, and its clear musical whistling call may be heard any day during the breeding season either in the early morning or just before dusk. Its ordinary call consists of four notes, the first the loudest, then two quicker, and then the fourth lower and fainter, often inaudible at a distance, and sometimes omitted altogether. It is a very easy note to imitate, and the bird may often be induced to answer an imitation of its cry, thereby revealing its position to the collector. I believe this bird to be capable of considerable ventriloquism, for I have stood under a tall tree into which I have seen this bird fly and have heard the notes uttered, at first very faintly and as if far away in the distance, and then louder and louder as if the bird was gradually approaching.

During the day-time it generally perches very high up in lofty trees which are well covered by foliage, and under these circumstances

it is almost impossible to see one, although the would-be observer may know it to be in a certain part of the tree. Occasionally, however, it may be seen seated on the top of some small dead tree in the forest; its shoulders humped up and feathers puffed out looking like a queer excrescence at the end of the bough until it shows itself to be something alive by twisting its head about. When thus seated, it is very easy of approach and does not fly away, even though the person approaching does not do so at all quietly, most likely owing to the daylight interfering with its sight. Under no circumstances, though, is it at all shy, and in the early morning I have several times wandered round and round some big tree talking to my attendant who with me was attempting to discover the whereabouts of a bird, we have seen fly into it, whistling to and being regularly replied to by the owl.

Its food consists principally of insects, and I once saw one hanging head downwards from a branch, working away at the loose pieces of bark and evidently extracting insects of some kind, though what they were I did not find out, as, though I shot at and dropped the bird, I failed to find it in the dense scrub and grass into which it fell.

Besides insects it devours mice, small rats and many birds, more especially young ones from the nest. Davidson saw it in the act of devouring a young Barbet, and I have seen unmistakable remnants of various kinds of birds in the nest holes. This owl also must sometimes eat carrion, for I once found the fur of a bamboo rat in the pellets thrown up by one, and it seems incredible that so small a bird should be able to overpower so large and powerful an animal, and one is therefore forced to the conclusion that the bird finding the rat dead made a meal of it. That it has great pluck is shewn by the size of the birds it kills and eats. I have seen feathers from the Blue-eared Barbet (*Cyanopis cyanotis*), the Coral-billed Scimitar Babbler (*Pomatorhinus phayrii*), *Hypsipetes psaroides*, and other birds as large, amongst the articles with which the bottom of their nest-holes are strewn.

It seems quite impartial as to the elevation at which it breeds or stays all the year round, and I have found it from the level of the plains up to the summits of the highest peaks, though, perhaps, it is less common above 4,000 feet than at and below that height.

(500) MINOX SCUTULATA.—The Brown Hawk Owl.

Hume, *No.* 81, 81 *bis*, 81 *ter.*, 81 *quat.*; *Blanford*, *No.* 1187.

A common enough bird in many portions of the plains, but very locally distributed in the more mountainous parts of the district. The variation in size in this bird is very remarkable, and no species of owl, with which I am acquainted, shews such variations in the measurements of birds collected in one locality, as does this. I have but a small series yet; their wing measurements include the extremes of 7·13″ and 8·65″.

Several people have mentioned to me the hawk-like character of this owl's flight. They hunt about for insects and small animals of sorts in many of the tea garden clearings and their actions can then be easily watched; moreover, in such places they appear to be much more fearless than they are in more wooded parts. In North Cachar they haunt stretches of grass mixed with bamboos and small clumps of trees, and in such places I have found them difficult to approach and hard to observe.

(*To be continued.*)

NEW SPECIES OF WESTERN PENINSULAR PLANTS FROM NORTH KANARA AND MYSORE.

By W. A. Talbot, F.L.S., Deputy Conservator of Forests.

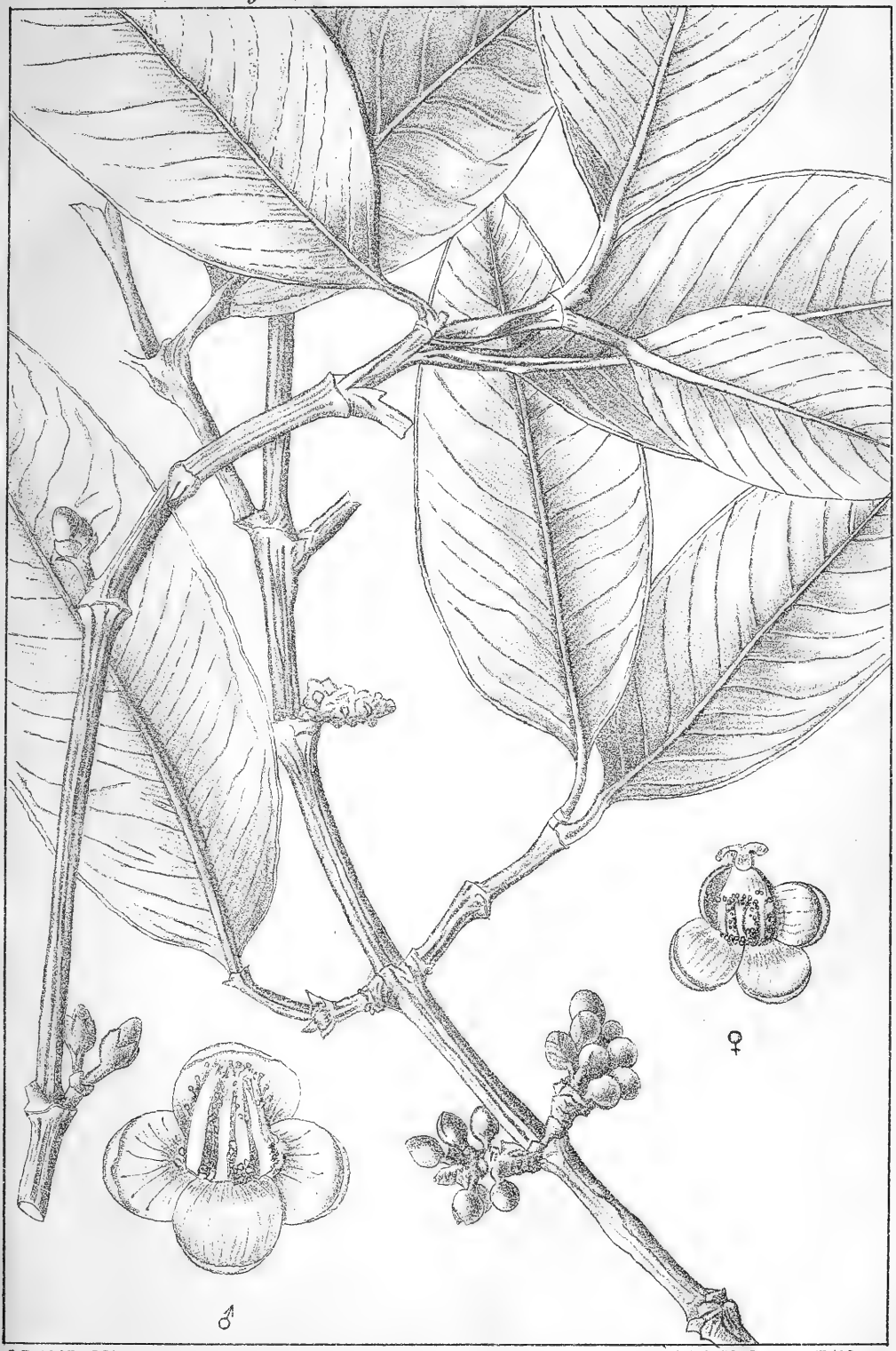
(*With Plates* 1 *to* 10.)

(*Read before the Bombay Natural History Society on* 30*th Sept.* 1897.)

Guttiferæ.

G. malabarica, Talb., sp. nov. *G. ovalifolius*, Hook., f. var. *macrantha* ? Fl. Br. I. 1·269, *G. spicata*, Kz. MSS. in Herb. Cal. Herb. No. 3713.

A small or medium-sized tree with sulcate, angular branchlets. Leaves coriaceous, ovate or oblong lanceolate, acute or obtuse, glabrous, shining above and beneath; nerves numerous, anastomosing, distinct, midrib prominent beneath; blade 6-3 by 2·5-1 in.; petiole ·5-·75 in. long, rugose, dilated at the base, so that the two opposite petioles clasp the branchlets. Flowers dicœcious. Male flowers white, ·5-·75 in. across, numerous, sessile or shortly pedicelled, fascicled on short, axillary, thick peduncles; pedicels bracteolate at the base. Sepals 4-5, orbicular, $\frac{1}{3}$ the orbicular white, concave petals. Staminal phalanges 5, thick, equalling the petals, surrounded at the base or springing from a lobed mamillated disk; anthers 12 on each phalange, didymous, free part of filament short, stout. Female fl.: Sepals and petals of male. Staminodes in 5, thin, flattened phalanges surrounding the ovary and springing from a disk similar to that of the male flower, effete anthers 4-5 on each phalange, flat, didymous and on longer free filaments than those of the male flower. Ovary 3-celled, crowned with the 3-lobed, spreading stigma. Dr. Prain remarks as follows about this species. "I can't tell whether this be *G. ovalifolia*, var. *macrantha* or not. But it is exactly the same as a solitary sheet collected by Col. Beddome which Mr. Kurz called *G. spicata*, and on which, at a later time, Mr. Brace has written: 'Can this be var. *macrantha*?' Dr. King has left it where Mr. Brace put it. But, if it is var. *macrantha*, the sooner a new species is made of it the better. It is certainly distinct from *G. ovalifolia*, Hook. f." On the Western Ghâts from North Kanara southwards, common on the Gairsoppah Ghât in evergreen forests. Flowers cold season. Fruit (not seen) rainy season.



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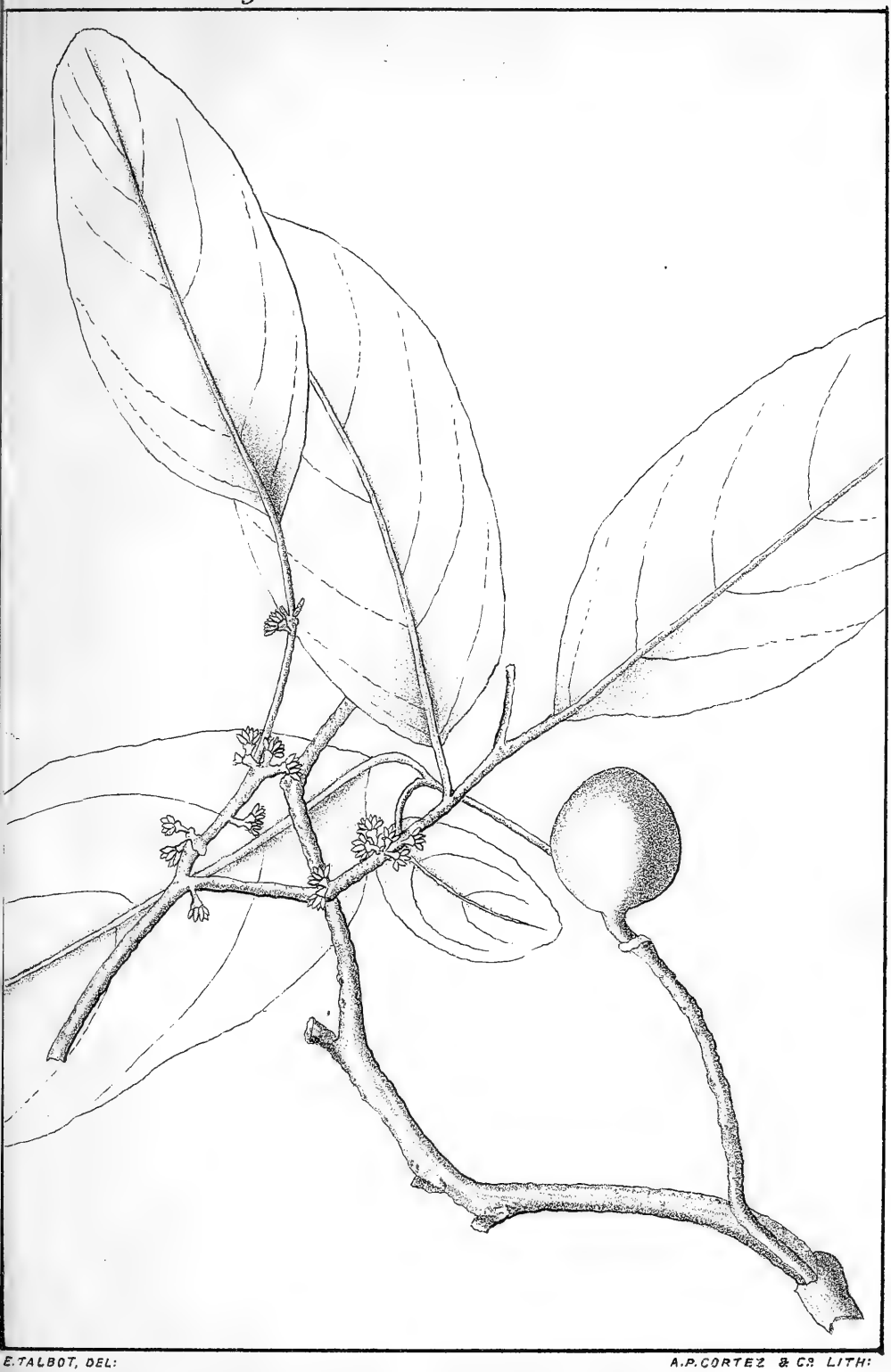
GARCINIA MALABARICA TALB: SP: NOV:



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STROMBOSIA LEPROSA, TALB: SP. NOV.

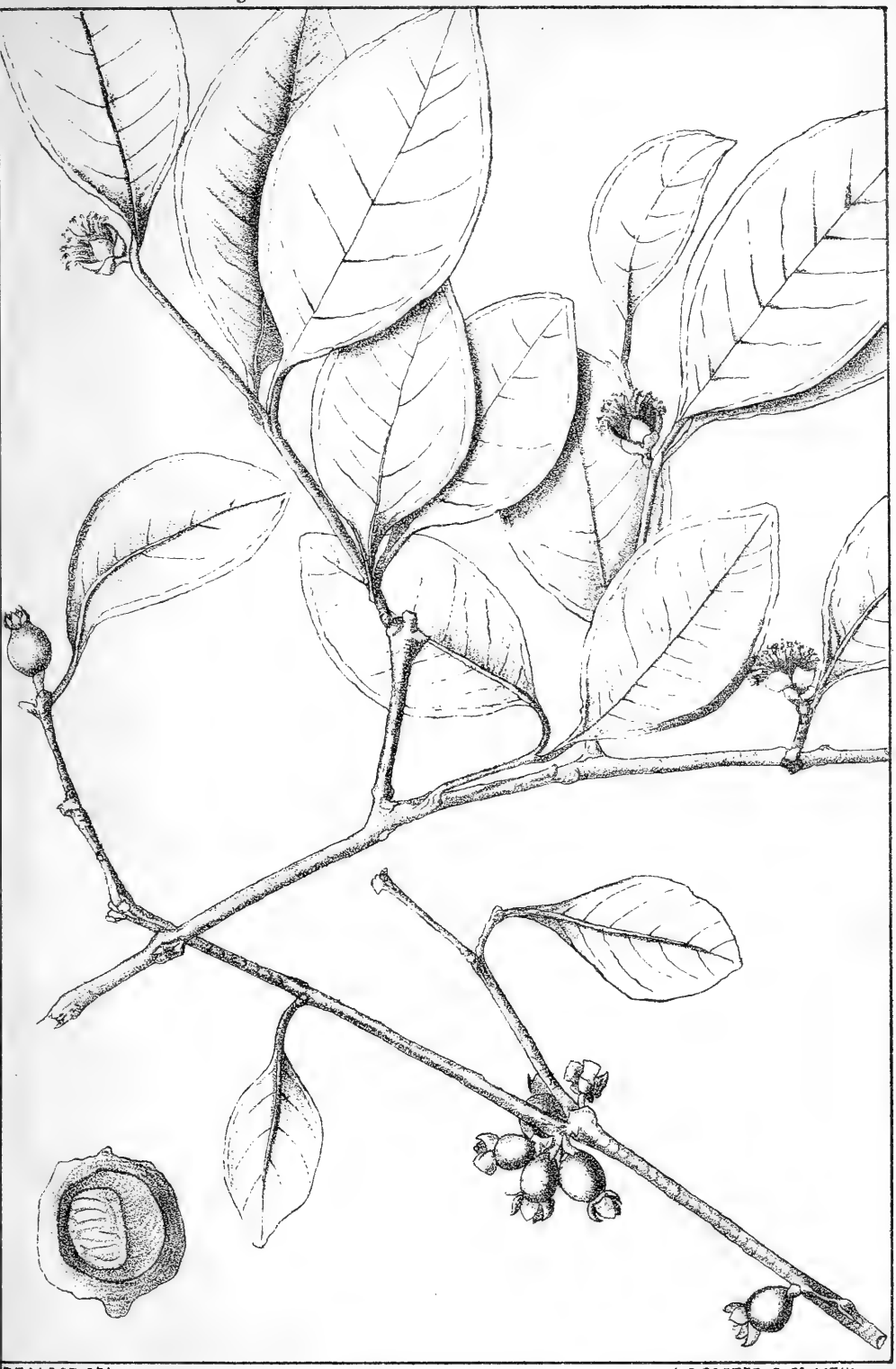
E.TALBOT, DEL. A.P.CORTEZ & Co., LITH:

EUGENIA UTILIS, TALB. SP. NOV.

E. TALBOT, DEL.

A.M. CORTEZ & Co. LITH.

EUGENIA KANARENSIS, TALB. SP. NOV.



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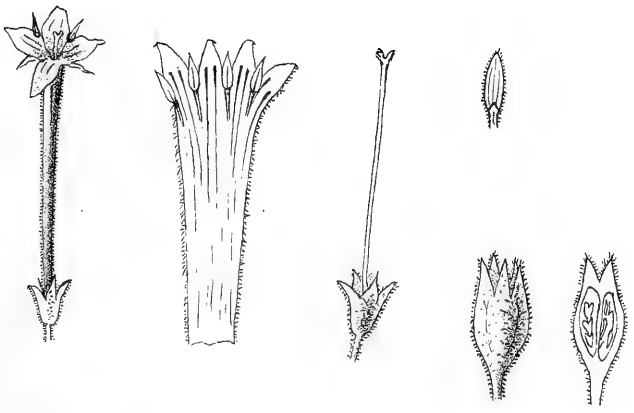
EUGENIA MEMECYLIFOLIA, TALB: SP: NOV:.



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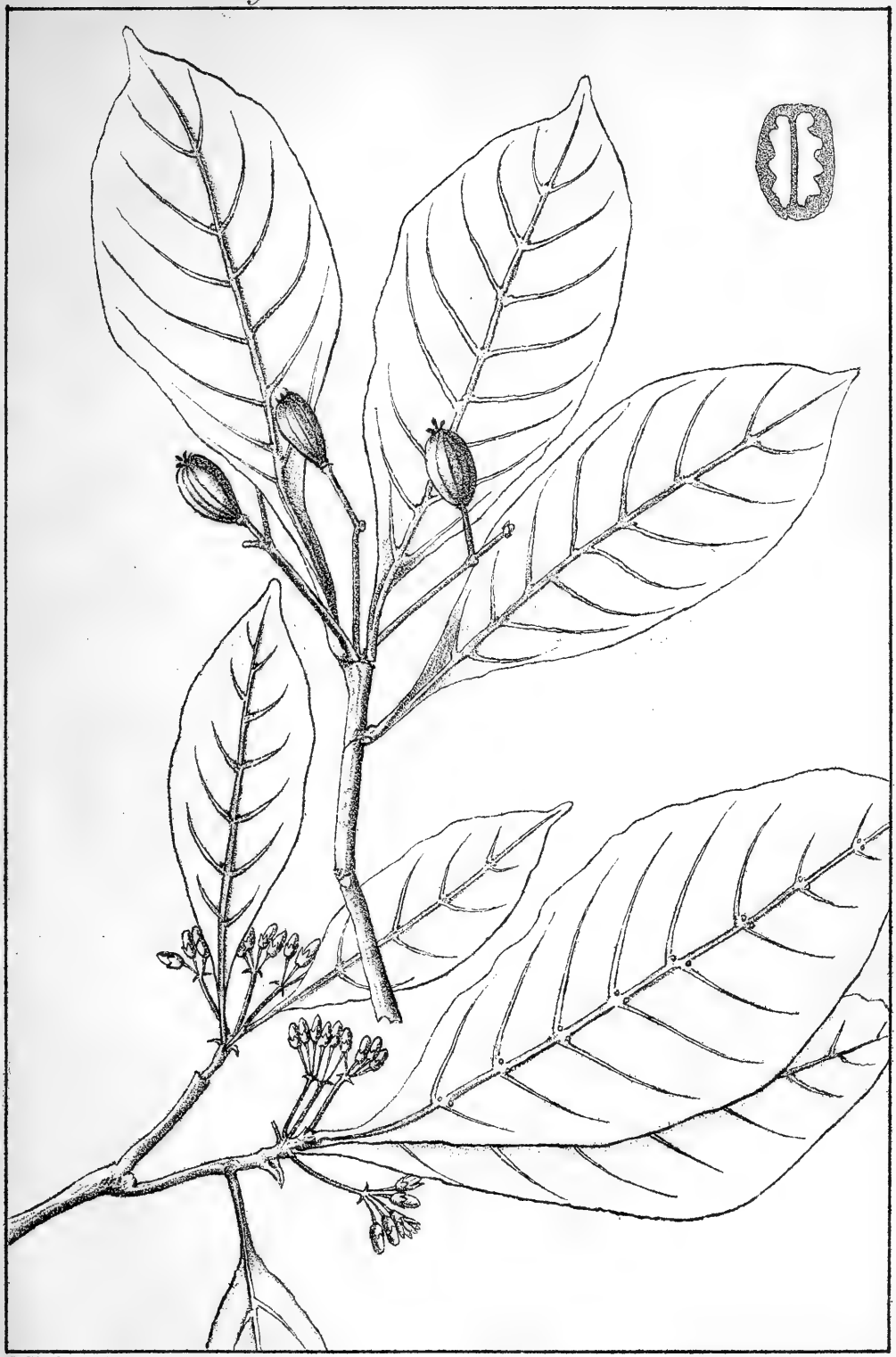
ANOTIS PRAINIANA, TALB. SP: NOV:



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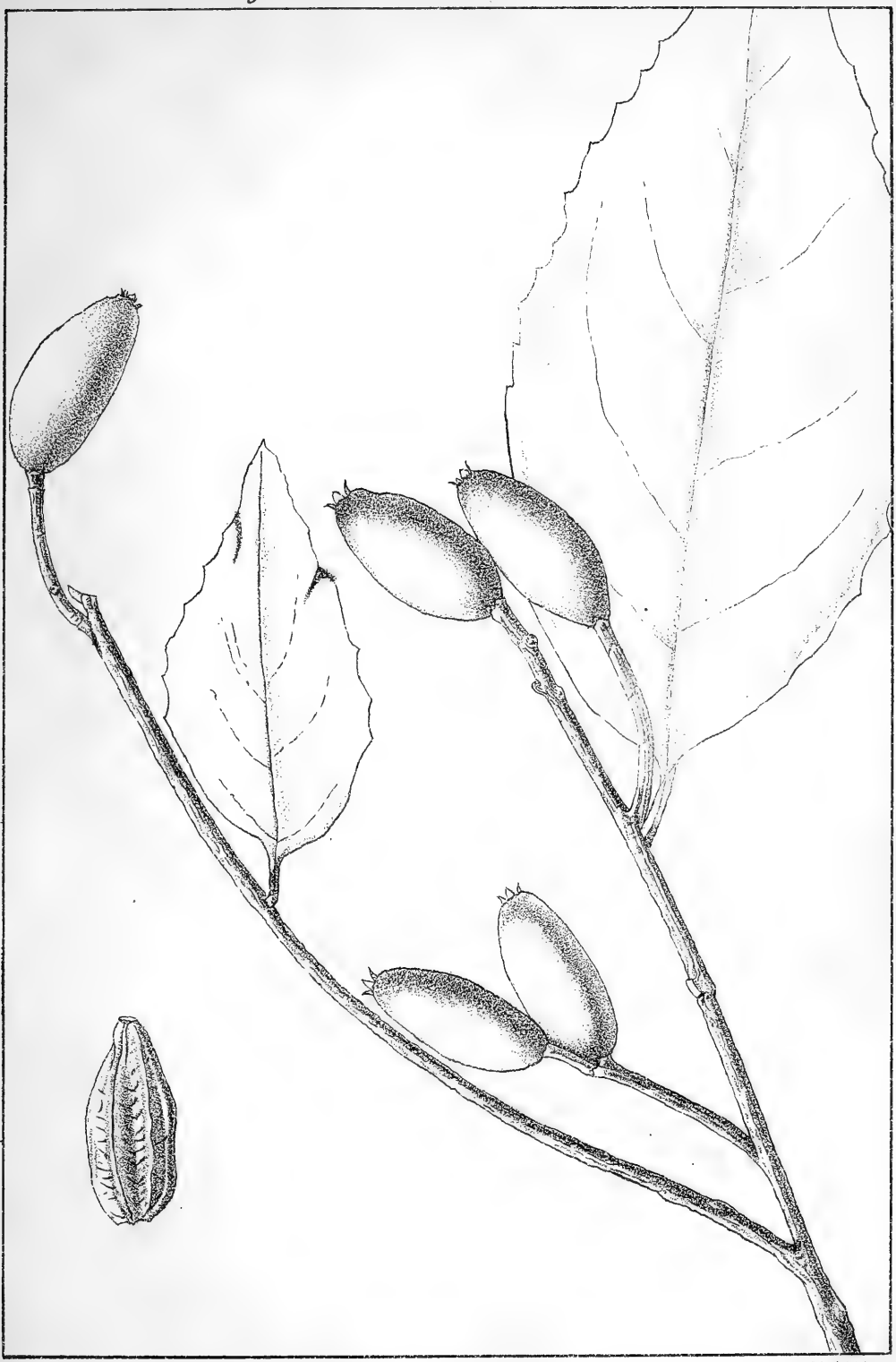
PSYCHOTRIA OCTOSULCATA, TALB, SP. NOV:

E. TALBOT, DEL. A.P. CORTE & Co. LITH:

VERNONIA BABABUDENSIS, TALB. SP. NOV.



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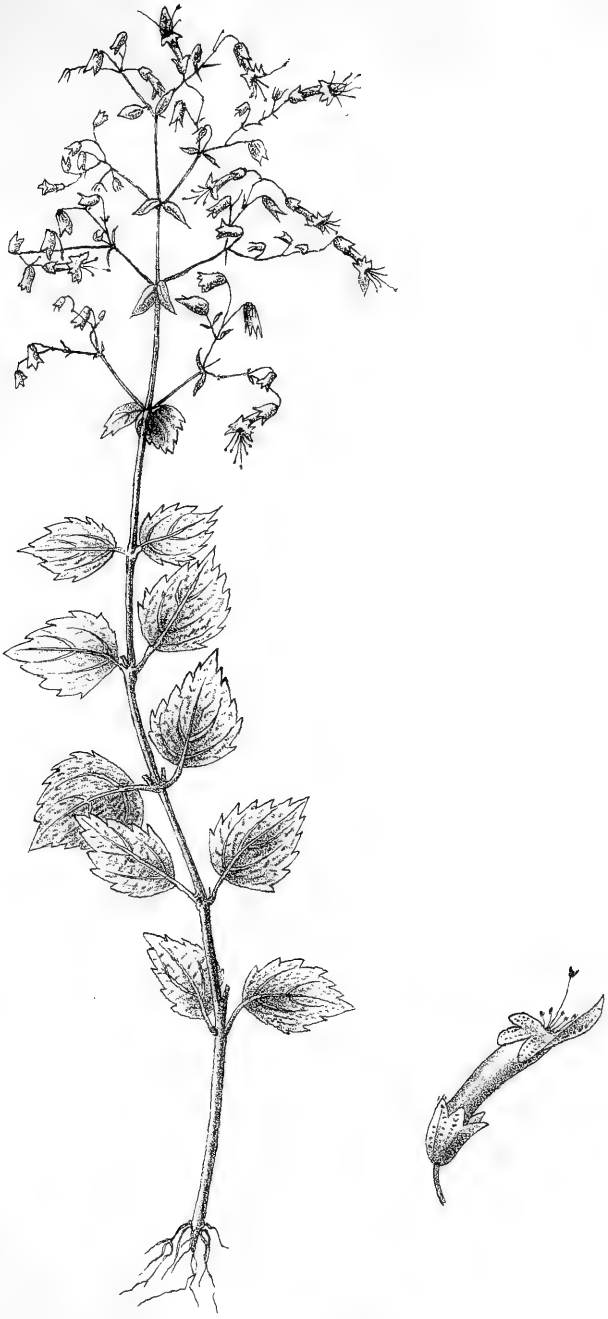
SYMPLOCOS KANARANA, TALB: SP. NOV:.



E. TALBOT DEL: A.P. CORTEZ & Co LITH:

PLECTRANTHUS PARVIFOLIUS, TALB. SP: NOV.

OLACINEÆ.

Strombosia leprosa, Talb., sp. nov. *S. ceylanica,* Gardn. Fl. Br. I. 1·579 in part. *Sphærocarya leprosa,* Dalz. and Gibs., Bomb., Fl. 223, Herb. No. 3641.

A small or large evergreen tree with white, scaly bark. Leaves glabrous, shining, thinly coriaceous, pale beneath, ovate, rounded at the tip, sometimes oblique at the base; blade 3-6 by 1·5-3 in.; petiole ·5-·75 in. long; lateral nerves 4-6 pairs, distinct beneath. Flowers small, white, pentamerous, in axillary fascicles or on woody tubercles; buds globose. Calyx lobes more or less indistinct, ciliate. Petals valvate, hairy within at the tips, ·12 in. Stamens adnate to the petals, Disk epigynous, red. Ovary 5-celled; style short. Fruit globose. green, glabrous or scaly, ·75 in. in diameter. Seed globose, ·5 in., finely rugose; albumen firm.

This tree sometimes attains a considerable size. I have measured some near Sonda (North Kanara), which were 100 ft. high by 3-4 ft. in diameter near the base, and possessing a straight cylindrical trunk.

Branches pendulous. Bark smooth, white or grey, scaly; inner bark brown, fibrous. Distinct from *S. ceylanica,* Gardn. to which species it is united in the Fl. Br. I. on the authority of Beddome, (Fl. Syl. t. 137), who states that he has only poor specimens of the Kanara plant. Ripe fruits of *S. ceylanica* are about ½ as large as those of the Kanara tree, which has also shining leaves. The leaves of *S. ceylanica,* Gardn., are dull like those of *Lepionurus.*

MYRTACEÆ.

Eugenia utilis, Talb., sp. nov. Herb. No. 3644. Hennerl, Kan.

A large, quite glabrous tree, branches terete. Leaves coriaceous, elliptic, abruptly and shortly acuminate, acute at the base, conspicuously gland-dotted; blade 3-2 by 1·5-1 in.; petiole ·3 in. long; lateral nerves close, rather inconspicuous. Flowers small in axillary or terminal corymbose, panicled cymes which are shorter than the leaves, flowers sessile, usually fascicled in 3s on the cyme branches; buds globose or pear-shaped ·1 in. in diameter. Calyx shortly turbinate, scarcely lobed or truncate. Petals separate or slightly cohering. Fruit small, black, succulent.

A fine large tree with a straight, cylindrical trunk, and grey, scaly bark. Wood moderately heavy and tough, of a reddish-brown colour,

greatly in demand throughout the Sirey subdivision of North Kanara for building purposes. This tree is pretty common in evergreen or on the borders of evergreen forests in the southern parts of North Kanara, it comes near *E. lissophylla*, Thw., and could not be matched at Kew.

Eugenia kanarensis, Talb., sp. nov. Herb. No. 3552.

A very large, glabrous, evergreen tree with smooth, white, terete branchlets. Leaves ovate, long or shortly acuminate, acute at the base, thin, shining, minutely gland-dotted ; blade 4-2 by ·75—1·5 in.; petiole ·5 in. long, nerves numerous, fine, distinct, anastomosing just within the margin in a fine line. Flowers small, in open, spreading, axillary or terminal corymbs, shorter than the leaves, cyme branches slender. Buds small, ·09 in. in diameter, globose. Calyx elongate, turbinate, broad at the top, narrowed at the base into a short pedicel, scarcely 4-5-lobed or truncate. Petals free or slightly cohering, orbicular. Fruit not seen.

A large smooth-barked tree, found on the Gairsoppah Ghât above Mulamune at an elevation of about 2,000 ft. The following note about this tree was received from Kew. "This is not *E. cymosa*, Lam., but is probably identical with a specimen collected by Bourdillon in Travancore and named *Eugenia* sp. near *E. Gardneri*."

Eugenia memecylifolia, Talb., sp. nov. Herb. No. 3127.

A small, evergreen tree, leaves ovate, bluntly acuminate, coriaceous, glandular dotted, shortly petioled ; blade 1·5 ·2 by 1-1·5 in. ; petiole ·25-·4 in. long. Flowers white, sessile or subsessile, ·5 in. across, solitary or 2-several fascicled in the leaf axils. Bracts 2, broad-ovate, small, thick, leathery, tomentose when young. Calyx lobes 4, ovate, imbricate, tomentose, ciliate on the margins, glandular dotted. Petals 4 spreading. Staminal disk broad, enlarged. Style simple. Fruit white, succulent, irregularly globose, ·75-1 in. in diameter. Seeds 1-2, globose, flattened on one side, ·5 in. in diameter, glabrous ; episperm crustaceous, mottled. In quite ripe fruits the seeds lie loose in the swollen, succulent, white pericarp.

A small tree or large shrub with smooth bark and leaves like those of some forms of *Memecylon edule*, gregarious in the sholas of the higher Supa Ghâts of North Kanara at an elevation of about 3,400 feet. This species is allied to *E. Mooniana*, Wgt., but differs in habit, larger flowers, and the quite distinct fruit.

RUBIACEÆ.

Anotis Prainiana, Talb., sp. nov. Herb. No. 2995.

A densely-branched pilose herb, branches filiform, interlaced, hairs flat, silvery, shining. Leaves small, membranous, petioled, rhomboidal-ovate, acute; blade ·25 in.; petiole flat, nearly as long as the blade. Stipules inconspicuous. Flowers solitary, terminal, rosy-white, nearly ·5 in. long. Calyx short, hairy, tube flattened, limb with 4 erect lobes. Corolla with a long slender tube, glabrous at the mouth, limb 4-lobed, lobes each with two parallel pink lines. Anthers dorsally affixed, included; filaments short. Ovary 2-locular; style filiform, 2-branched; ovules 3-4 in. each cell, affixed near the base of the ovary. Capsule hairy, didymous, crustaceous, laterally compressed, loculicidally 2-valved, seeds 7-8, angled, with a very minutely granulate testa.

This pretty ornamental plant grows in cushion-like masses in quite dry places, under overhanging rocks but in a very moist atmosphere, on the Bababuden hills of Mysore at about 5,000 feet elevation, it belonged to the section *Euanotis*, and comes nearest to *A. Leschenaultiana*, W. & A.

Psychotria octosulcata, Talb., sp. nov. Herb. No. 3556.

An erect, stout, smooth-barked shrub with green, glabrous branches. Leaves obovate or oblanceolate, abruptly acuminate, shining above, pale beneath, thin; blade 3-6 by 1-2 in.; petiole ·2—·5 in. long; lateral nerves 7-10 pairs, prominent, parallel, usually with small, saccate glands in the axils. Stipules connate at the base, long or shortly acuminate, deciduous. Flowers white in short terminal corymbose cymes 1-2 in. long, branches opposite. Calyx minute, cup-shaped, 5-toothed. Corolla ·1 in., tube hairy at the mouth. Fruit obovoid, straight or slightly curved, 8-ridged, black and succulent when ripe, but soon drying and becoming regularly ridged with a flattened top. Seeds 2, black, rough, dorsally 4-ridged, ventrally flat, ·5 in. long; albumen equable, horny.

A large shrub 10-20 feet high with a stem 1-2 in. in diameter at the base. Common in some of the evergreen forests of the Siddapore and Sircy sub-divisions of North Kanara.

COMPOSITÆ.

Vernonia bababudensis, Talb. sp. nov. Herb. No. 3189.

A low shrub with stout, spreading, tomentose branches. Leaves ovate acute, sharply serrate, scabrid above, rough hairy beneath, blade 3·5-2 by

1·75-1 in.; petiole very short or 0; lateral nerves about 7 pairs, strong beneath. Heads ·5 in. in diameter, in broad, terminal, corymbs; peduncles, short or long up to 1 in., tomentose with several short, spreading, linear, bracts. Inner involucral bracts acute, hairy, and reddish at the back and tips, outer short, linear, hairy, acute. Corolla red, pubescent outside. Akene ·2 in. long, striate on the margins and tip; inner pappus hairs ·3 in., white, barbellate, outer hairs very short.

Closely allied to *V. pectiniformis*, DC., common above Santaveri, on the Bababuden Hills of Mysore at about 6,000 feet elevation.

STYRACEÆ.

Symplocos kanarana, Talb., sp. nov. Herb. No. 3673.

A small tree, leaves ovate, long acuminate, crenate-serrate, chartaceous, glabrous, shining above, blade 3·6 by 1-2·5 in.; petiole ·3 in. long; lateral nerves 5 pairs. Flowers in short axillary spikes. Fruit ovoid, smooth, yellow, ridged, 1·25 in. long by ·5 in. broad; stone 1 in. long with 6 very deep longitudinal furrows and sharp narrow ridges between, rough, surrounded by a copious olive-green pulp, when dry the fruit turns yellow and becomes obtusely angled.

This species, of which I have only found the fruit during May, is closely allied to *S. macrocarpa*, Wgt. Ms. It grows in the evergreen forests of the Sircy taluka of North Kanara. Dr. Prain says this is exactly the same as an unnamed species collected in Travancore by the late Mr. Lawson, and communicated by him to the Calcutta Herbarium.

LABIATÆ.

Plectranthus parvifolius, Talb., sp. nov. Herb. No. 3276.

A glandular, villous herb, 8 in. to 1 foot high. Leaves broadly ovate, acuminate, thick, crenate, pubescent with thick glandular hairs above, paler beneath, and densely covered with minute, reddish, shining, waxy glands, blade ·6 by ·5 in.; petiole of lower leaves ·4 in., upper leaves sessile; lateral nerves 3-4 pairs, strong beneath. Cymes in short, open panicles. Corolla tubular, ·25 in. twice the calyx, lips subequal. Fruiting calyx ·1 in., teeth acute. Nutlets ovoid, yellowish, flattened.

A small species which comes nearest *P. nepetæfolius*, Bth., found in open situations above Santaveri on the Bababuden Hills of Mysore a about 6,000 feet elevation.

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F.E.S.

With Notes by H. J. Elwes, F.Z.S., F.E.S., &c.,

and

Additions By Sir George F. Hampson, Bart., B.A., F.E.S., &c.,

(*With a Map.*)

(*Read before the Bombay Natural History Society on 15th July*, 1897).

The production of Sir George Hampson's work on the "Moths of India" in the "Fauna of British India" (Blanford), has now rendered it possible for entomologists who have not access to the types or original literature on the subject, to identify and systematically arrange all the hitherto known species belonging to the more important groups of Indian *Heterocera*. Without the help of the foregoing valuable work, I could not have attempted to compile the present catalogue, which comprises all those species which have been found within the limits of the Sikhim-Bhutan Himalayas, as defined hereafter. This district, although a small one, is so rich in species that, as far as is at present known, it probably heads the list among Indian localities. The idea of the formation of a catalogue of the *Heterocera* of Sikhim has for years been entertained by Mr. H. J. Elwes to follow his paper on the *Rhopalocera* of the same district, read in 1888, before the Entomological Society of London, and I must here tender my thanks to him for his kind offer to add his notes on the habits, &c., of those species with which he is personally acquainted. I have also to acknowledge the kindness of Sir George Hampson in consenting to correct and add to my manuscript; also for many valuable hints as to the formation of the same.

Sikhim.—As geographically understood, this represents the territory bounded on the north by Thibet, on the south by the Darjeeling district, on the east by Thibet (the Amo Chu or Chumbi Valley) and Independent Bhutan, and on the west by Nepal. For purposes of convenience, however, and with reference to climatic effects, I prefer to include under the name the whole territory which, immediately previous to 1835, constituted the State of Sikhim. This, besides the country already defined, included the whole of the

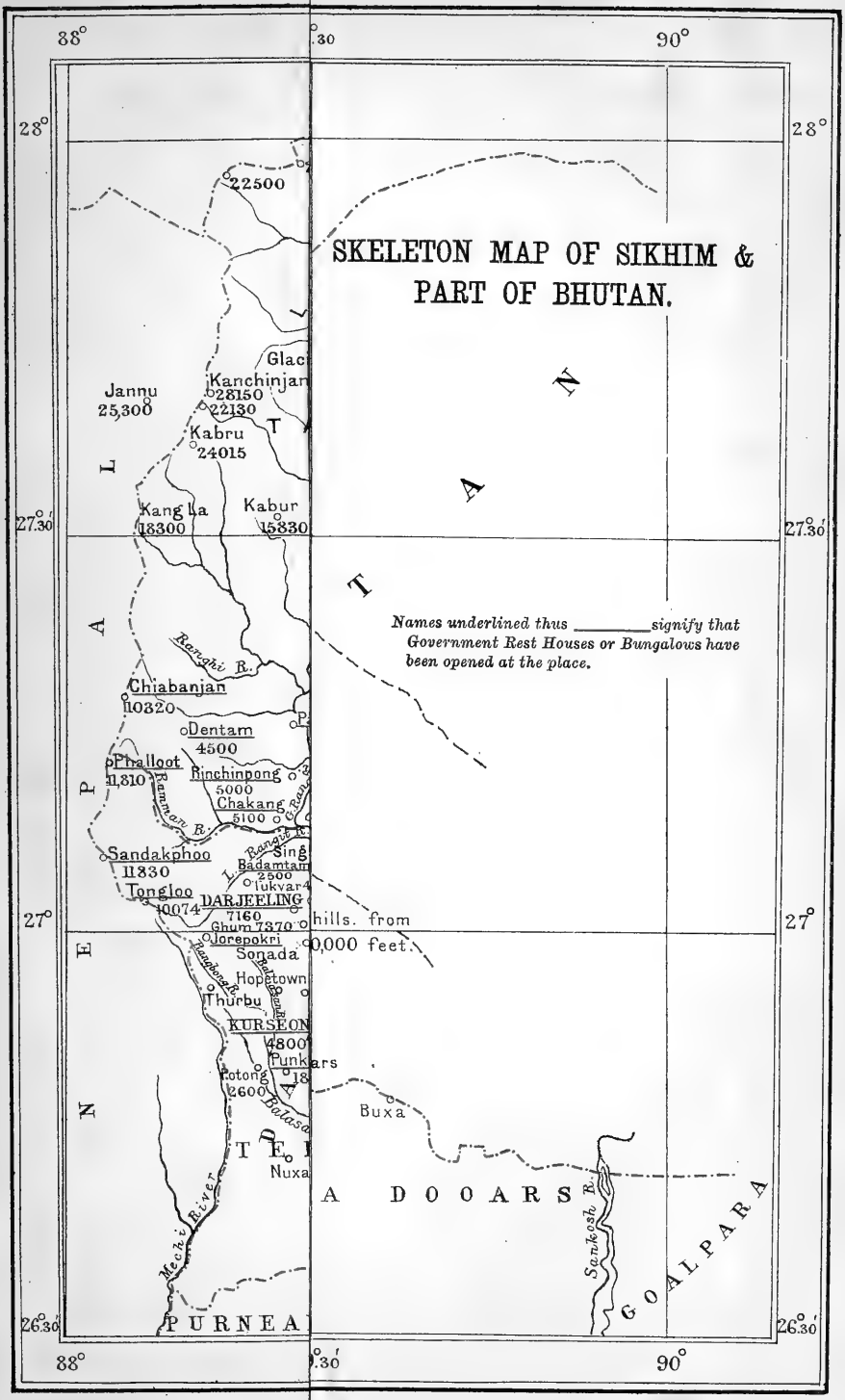
Darjeeling district west of the Teesta river. The late Mr. Otto Möller observed these same limits for the zoological definition of the country.

Bhutan.—This country is less known and more inaccessible than Sikhim; its fauna has, in consequence, not been worked at to the same extent. It is bounded on the north by Thibet, on the south by the Bengal and Assam Duars, on the east by an undefined line separating it from the independent tribes of the northern Assam Himalayas, and on the west by Thibet (Amo Chu or Chumbi Valley), the spur from Gipmochi to Richi-la, thence along the Darjeeling boundary as far as the junction of the Sip Chu with the Jaldacca river. Again, by reason of the climatic similarity of the adjoining portion of the Darjeeling district, known as the Daling Division, I include the same under the name of Bhutan, of which, previous to 1866, it formed a part.

The physical features of Bhutan are widely different from those of Sikhim; the hills rise more abruptly from the plains, a chain of hills between 6,000 and 10,000 feet being situated less than ten miles from the same, whereas over 15 miles of lower hills intervene in Sikhim between the first ridge of the same height and the plains. The rainfall on the outer spurs of Bhutan is far greater than on those of Sikhim. Roughly speaking, the annual average from the Sikhim Terai to the Ghoom-Darjeeling ridge is from 120 to 200 inches, and from the Bhutan-Duars to the Richi-la spur it ranges from 200 to 300 inches. In the inner valleys the rainfall is much smaller: that for example of the Rungeet Valley at certain places averages only about 60 inches annually. Among *Rhopalocera* many species which are found rarely in Sikhim may be met with quite commonly in Bhutan, and in the *Heterocera* Bhutan seems to surpass Sikhim in quantity of species, although, of the independent territory, as yet only the outer spurs have been worked.

Dr. Waddell, in his "Birds of Sikhim" ("Gazetteer of Sikhim," Risley), divides the country into five zones, which might be found applicable to the *Heterocera* of Sikhim and Bhutan also. His divisions are:—

I. Tropical	125— 2,000	feet above sea-level.
II. Subtropical	2,000— 5,000	,, ,, ,, ,,
III. Temperate	5,000— 9,000	,, ,, ,, ,,
IV. Subalpine	9,000—13,000	,, ,, ,, ,,
V. Alpine	13,000—17,000	,, ,, ,, ,,



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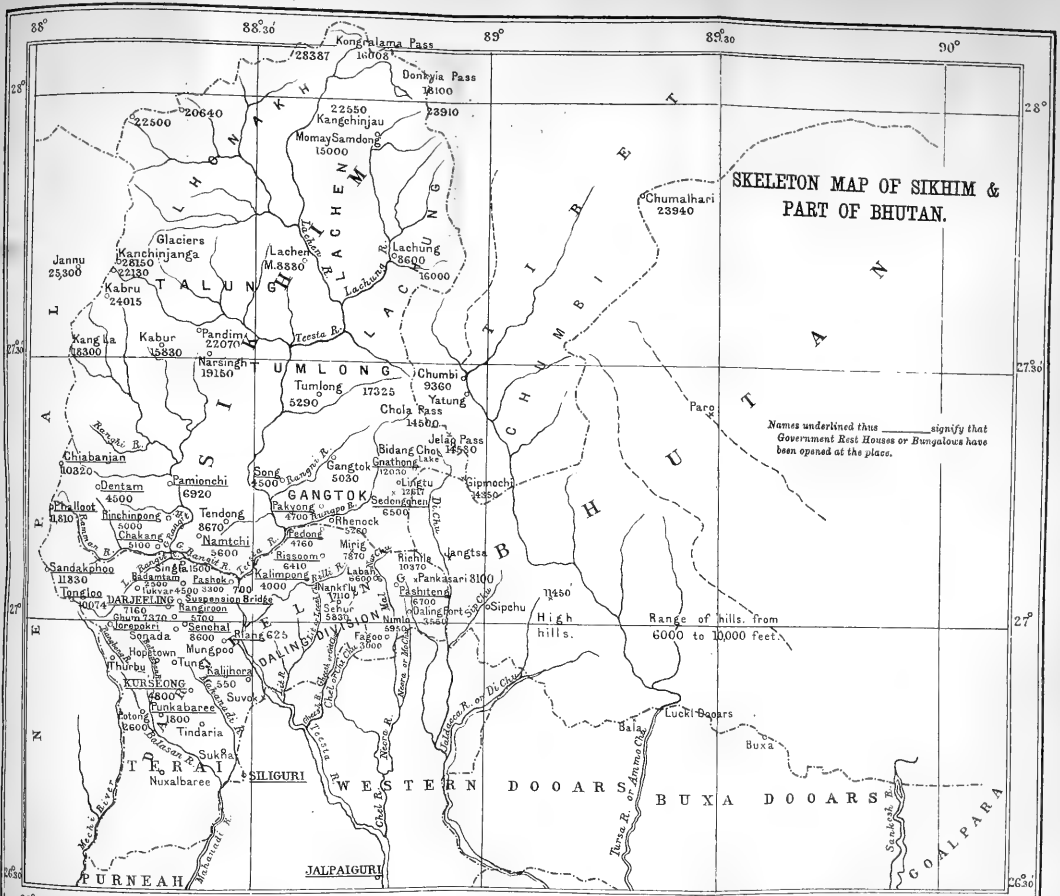
Litho., S. I. O., Calcutta.



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Litho., S. I. O., Calcutta

In the first zone, those forms which are met with in the plains abound together with a few endemic species; in the second, the forest trees become covered with lichens and mosses, and those species which feed in the larva stage on them, are found here; the third zone, which is enveloped for nearly six months in mist and clouds, seems particularly favourable to *Heterocera*; the fourth has but a short season suited to insect life; and, the fifth, which ranges from above the tree limit to the limit of perpetual snow, has not been worked at to a great extent: it however can scarcely be expected to yield many species. The following table will show, as nearly as may be, where the different families or subfamilies of the *Heterocera* may be met with, although a few of nearly all may be found outside the limits given. In the case of any family not being mentioned, it must be understood that it is not confined to any particular zone.

Tropical.—*Quadrifinæ*, *Deltoidinæ*, *Focillinæ*, *Hypsidæ*, *Agaristidæ*, *Thyrididæ*, *Pyralidæ*.

Tropical and Subtropical.—*Epiplemidæ*, *Uraniidæ*, *Acontiinæ*, *Drepanulidæ*, *Lymantriidæ*, *Limacodidæ*, *Psychidæ*, *Epicopiidæ*, *Eupterotidæ*, *Sesiidæ*, *Zygænidæ*, *Nolinæ*.

Subtropical and Temperate.—*Lithosiinæ*, *Trifinæ*, *Notodontidæ*.

Temperate and Subalpine.—*Arctiidæ*, *Cymatophoridæ*, *Geometridæ*.

In the accompanying map the names of the chief places in Sikhim and Bhutan, also the courses of the chief rivers, are shown.

It is impossible to give the names of any places within Independent Bhutan to which native collectors have penetrated, as the inhabitants being very disinclined to allow intrusion, the collectors employed have given them a wide berth, so as to avoid being interfered with, and consequently have not heard the names of the localities they have visited. By far the greater proportion of moths recorded from Bhutan in this catalogue have been obtained in the Daling Division of Darjeeling, or as it is sometimes called, British Bhutan.

The numbers given to the species are taken from Sir George Hampson's work, so that they may be referred to without difficulty.

Family SATURNIIDÆ.

Genus ACTIAS, Leach.

1. *A. selene*, Hübn.

Sikhim and Bhutan ; occurs as high as 6,000 feet. My specimens were obtained in March and April. The larva is yellowish-green, with paired dorsal and lateral tubercles, except on the first and last somites ; each tubercle bearing a few long hairs and several short ones ; anal claspers with a rufous triangular patch on the outside. Its food-plant is the wild cherry. The cocoon is brownish and inconspicuous, being generally enveloped in a leaf.

2. *A. mœnas*, Doubl.

Sikhim and Bhutan ; occurs up to 4,000 feet in March, April, and May. The larva, when first hatched, is orange-coloured, covered with rather long hairs, and with the medial segments black. I have no record of the full-grown larva. Its food-plant is *Schima wallichii*. The cocoon is less closely woven than that of *A. selene*.

Genus ATTACUS, Linn.

4. *A. atlas*, Linn.

Sikhim and Bhutan, up to 3,000 feet in May. The cocoons are found commonly on the leaves of different trees, especially in the forests around Badamtam and Singla in the Rungeet Valley.

5. *A. edwardsi*, White.

Sikhim and Bhutan ; 6,000 to 7,000 feet in June. I took a full-grown larva below Darjeeling in 1889 feeding on *Leucosceptrum canum*. It was apple-green, with a subdorsal row of long pale blue tubercles ; those on the second and third somites speckled with black ; two lateral rows of short blue tubercles ; claspers with a reddish patch on the side. This larva, as well as that of *A. atlas* and *A. cynthia*, is covered with a chalky secretion, which is easily removeable. Cocoon is formed in a leaf, and the silk is much darker than that of *A. atlas*.

6. *A. cynthia*, Drury.

Sikhim and Bhutan up to 6,000 feet. This is a very common species throughout the year, especially at from about 3,000 to 4,000 feet. The larvæ I have often taken at Badamtam (Rungeet Valley) ; they are green, covered thickly with the chalky secretion which makes them appear almost pure white ; there are dorsal, subdorsal, and lateral rows of rather short spines tipped with blue and orange. The cocoon is formed in a leaf.

7. *A. ricini*, Boisd.

Sikhim, 5,500 feet, September. I have only obtained one specimen of this species, and have never seen another from the locality. The larva is reared for its silk by the Mechi and Garo tribes of the Terai and Duars.

Genus ANTHEREA, Hübn.

8. *A. roylei*, Moore.

Sikhim, 2,000 to 3,000 feet, September. (May to September. According to Knyvett feeds on oak at 3,000 to 4,000 feet.—*H. J. E.*)

9. *A. paphia*, Linn.

Sikhim (*Otto Möller*), April. The only specimens I have are a pair given to me by Mr. Möller and labelled "Sikhim, April, 1888." (According to Knyvett occurs in the Terai only, where it feeds on "Ber."—*H. J. E.*)

10. *A knyvetti*, Hampson.

Sikhim, April. One specimen only. (Occurs at higher elevations than the other species. Feeds on wild cherry, according to Knyvett. Though Mr. Knyvett, who had bred this species, considered that it could certainly be distinguished from *A. roylei* by the larva and cocoon, and though some specimens given me by him as typical do shew the differences indicated by Hampson, yet there are intermediate forms, which I cannot certainly identify with either species.—*H. J. E.*)

11. *A. helferi*, Moore.

Sikhim, March. The cocoons have been brought to me in some quantities from "Sàl" forest at low elevations.

12. *A. assama*, Westw.

Himalayas from Kangra to Assam (*Hampson*). I have never received this species from this locality. (I have two specimens from Sikhim which agree with *A. assama* as described by Hampson, but have the marginal lines of the hindwing nearly straight, not as in Westwood's figure. I distinguish this species by the ocellus of the forewing being almost, in some cases quite, without a pupil. Khasia specimens are of a dark purplish-crimson colour.—*H. J. E.*)

14. *A. frithi*, Moore.

Sikhim and Bhutan, 2,000 feet, March. As far as my experience goes, this is by far the commonest *Antherea* found in Sikhim. The larva feeds on "Sàl," and wherever the tree occurs in forests, the

cocoons of *A. frithi* are almost sure to be found. I have taken them myself in the Rungeet Valley.

Genus SATURNIA, Schrank.

15. *S. zuleika*, Hope.

Sikhim, 5,000 to 7,000 feet, April. (Sometimes very common in the station at Darjeeling in July. Larva feeds on birch, is green with very long curved white hairs *fide* Knyvett.—*H. J. E.*)

16. *S. thibeta*, Westw.

Sikhim, 7,000 feet (*Hampson*). I have never seen this species. (Taken by me in the interior of Sikhim on Christmas day, 1880, at 7,000 feet. I have a ♀ taken on the 25th November in the station at Darjeeling, where it is, however, a very rare species; this agrees with a ♀ from Kumaon taken in September. I do not believe that the insect occurs in Thibet.—*H. J. E.*)

17. *S. anna*, Moore.

Sikhim, 5,500 feet, June. I took the only specimen I have at Tukvar in 1888. (Occurs rarely at Darjeeling in June.—*H. J. E.*)

18. *S. grotei*, Moore.

Sikhim, 7,000 feet. Not as rare as the last. (Taken by me at Darjeeling in June.—*H. J. E.*)

19. *S. lindia*, Moore.

Yatung, 10,000 feet. One female was brought to me from Yatung (Chumbi Valley, Thibet), but it probably also occurs on this side of the passes. My specimen corresponds with Butler's figure (*Saturnia hockingii*) with the exception of the ocellus of the forewing being slightly marked with reddish on the inner side.

20. *S. pyretorum*, Westw.

Sikhim (*Hampson*). I have never seen a specimen from this locality. (A single specimen from Mandelli's collection dated 29th April, 1873, is much smaller than Chinese examples.—*H. J. E.*)

Genus LOEPA, Moore.

25. *L. katinka*, Westw.

Sikhim and Bhutan, 3,000 feet. I have the form *miranda* taken in May and *sikhima* taken in July and August. I am of opinion that all the specimens I possess (5 males and 3 females) belong to the same species. (*L. sikhima*. Mr. Knyvett agrees with me that this species is distinct from *L. katinka*. He has bred *sikhima* from larvæ taken in low

valleys in British Bhutan. I have taken *miranda*, Moore, at Darjeeling in August and up to 10,000 feet on Tongloo in July. This form, which agrees with *miranda*, is larger and with much less distinct markings than the Khasia insect figured as *katinka* by Westwood. There are, however, intermediate specimens, and the females do not seem so distinct as the males.—*H. J. E.*)

26. *L. newara*, Moore.

Sikhim, 4,000 to 5,000 feet, November. I have reared this species from the egg and the description I took at the time is as follows:—

Eggs hatched April, 1887, having been laid in December.

Larvæ, when first hatched, are yellow with a black dorsal line and two black tufts of hair on each somite, on the edge of the black line, and near the divisions of the somites ; each somite marked with a black line as far as half-way to the legs, each of these lines terminating in a tuft of black hairs. Anterior legs and head black, undersurface yellow.—(15-4-87.)

1*st moult.*—Yellow with black lateral lines ; a subdorsal row of black tubercles tipped with blue, each bearing a tuft of black hairs ; two lateral rows of yellow tubercles on each somite, except the 1st, 3rd, and 11th, on which only one of the yellow tubercles and no subdorsal black tubercles, but dorsal blue ones, are present, all bearing tufts of black hair. There is a small black patch on the anal segment, and a larger one on each of the anal legs. Head and forelegs black.—(23-4-87.) (At this period the larvæ are very variable, chiefly in the extent of the black markings, and some have the black tubercles replaced by yellow ones and *vice versa*.)

2*nd moult.*—Same, but with the black markings less prominent. Two more blue tubercles on the last somite, lateral tubercles blue-tipped.—(1 & 2-5-87.)

3*rd moult.*—Colour greenish-yellow ; skin rough ; tubercles, except the blue lateral ones, almost entirely disappeared, the remaining ones more resembling warts tipped slightly with blue. No hairs from the subdorsal warts, and only two or three from the lateral tubercles. Three small blue warts just above the prolegs, which are hairy.—(13-5-87.)

4*th moult.*—Blue lateral specks just apparent. Head grooved in front. Much greener.—(1—5-6-87.)

5th moult.—Green thoracial somites hunched, blue specks absent. The larva is full-grown in July, and has a subdorsal row of minute warts. It utters a sharp squeak when disturbed. Food-plant *Salix babylonica*. The pupa is formed in a green cocoon of a close texture and ribbed down the outside. This cocoon is left open at the top, the lips of it closing together except when pressed; the lower end is pointed and furnished with a cell perforated from the inside by three or four small holes, and having a single larger outlet hole on the outside. This presumably acts as a drain if the cocoon should accidentally become filled with water. The moths always emerged in November at 5,000 feet.

(Larva feeds on *Acer campbelli* at Tukvar, 4,000 feet, and on willow at Kurseong in May and June; imago appears in November [*fide* Knyvelt].—*H. J. E.*)

Genus SALASSA, Moore.

28. *S. lola*, Westw.

Sikkim, 8,000 feet. (The females of this species have the hyaline spot on the forewing much larger than in the males.—*H. J. E.*)

29. *S. royi*, Elwes.

Sikhim; Yatung (Thibet), 10,000 feet. I only possess one female taken at the latter place by Mr. Taylor of the Chinese Boundary Commission. (The male is not rare at 8,000 to 10,000 feet on Tongloo.—*H. J. E.*)

29*a*. *S. thespis*, Leech, Entom., 1890, p. 112.

S. megastica, Swinhoe, Trans. Ent. Soc. Lond., 1894, p. 153.

Sikhim (*Hampson*). I do not know this species, it seems nearest to *S. lola* judging from Swinhoe's description of the synonym. (I do not know whether Sir George Hampson identifies *Antherea thespis*, Leech, described from one female taken near Ichang in China, with the Sikhim insect by comparison, but this does not agree in many particulars with my female. I have a female from Sikhim, given me by Mr. Knyvett, a male from Mr. Gammie taken in July, and a pair of *Salassa megastica*, Swinh., from the Khasia hills. Though these differ in many points, they are probably so variable that it is impossible to say from so small a number of examples whether the Chinese, Khasia, and Sikhim insects represent the same or three species. The larva, according to Mr. Knyvett, is like that of *S. lola*, but is much

larger and feeds on a different tree; he found it at Darjeeling in July.—*H. J. E.*)

Genus CRICULA, Wlk.

30. *C. trifenestrata*, Helfer.

Sikhim and Bhutan, 2,000 feet, June. The larvæ are gregarious, and the cocoons are often in dense masses of hundreds together. (May to August. In May and June, 1891, Mr. Knyvett tells me that the larvæ had overrun all the trees at Darjeeling and down to Tukvar in great numbers.—*H. J. E.*)

31. *C. multifenestrata*, H.-S.

Sikhim. I have never received this species. (Common at Jorepokri near Darjeeling at 7,000 feet.—*H. J. E.*)

Family BRAHMÆIDÆ.

Genus BRAHMÆA, Wlk.

32. *B. wallichii*, Gray.

Sikhim and Bhutan, 6,000 to 8,000 feet.

33. *B. hearseyi*, White.

Sikhim and Bhutan, 6,000 to 8,000 feet, May. Both these species do not appear to be uncommon, but I have very few specimens in my collection.

Family BOMBYCIDÆ.

Genus OCINARA, Wlk.

36. *O. signifera*, Wlk.

Sikhim and Bhutan up to 4,000 feet, May, August, and November. This is a variable species chiefly in the extent of the fuscous markings.

37. *O. apicalis*, Wlk.

Sikhim, 1,800 feet, July. I have only one specimen which I believe to be referable to this species. The band within the postmedial line is olive; the black spots are absent except those specks on the veins at the postmedial line; there is a rather large double ferruginous mark on the inner margin of the hindwing at the termination of the postmedial crenulate band.

38. *O. varians*, Wlk.

Sikhim, 1,800 feet. I have three forms of this species taken in the Balasun Valley in March, July, and December. The first is ochreous with a darker patch on the outer margin below the apex; a dusky

mark on the disco-cellulars; all the lines obsolete. The second is reddish-brown and typical. The third is grey with the waved lines distinct.

Genus GUNDA, Wlk.

39. *G. javanica*, Moore.

Sikhim, 1,800 feet (Balasun Valley), August.

41. *G. sikhima*, Moore.

Sikhim. (Occurs rarely in June.—*H. J. E.*)

Genus THEOPHILA, Moore.

42. *T. huttoni*, Westw.

Sikhim, 1,800 feet; Bhutan, up to 3,000 feet. The larva feeds on *Morus serrata* and other plants. Messrs. de Nicéville, Otto Möller, Knyvett, and myself found an orange tree covered with the cocoons of this species, and we preserved a larva, a drawing of which I sent to Mr. Moore. The larvæ had apparently fed on an adjoining tree, and only utilised the orange tree to spin their cocoons on.

Genus MUSTILIA, Wlk.

44. *M. falcipennis*, Wlk.

Sikhim, 7,000 to 9,000 feet; Bhutan. Some specimens are much suffused with bluish-grey. Mr. Elwes remarks that what I call *M. sphingiformis*, Moore, may be a second form of *M. falcipennis*, which he recognises. He says:—"what I call *falcipennis* differs from the other form in being much paler, especially on the hindwing, so that the transverse bands and the discal spot on the forewing are much more conspicuous; the thorax is also much paler and the wings less falcate at the point." My only specimen of *M. sphingiformis*, Moore, was identified for me by Mr. Moore, and compares well with his figure.

45. *M. sphingiformis*, Moore.

Sikhim, 5,500 feet. One female measuring 81 millimetres in expanse. This specimen I reared from a larva. The whole of the thorax and forewing as far as the oblique line from the apex is pinkish-brown, the whole area beyond being chestnut. Hindwing ochreous, becoming chestnut towards the inner margin. Abdomen darker. There are no cell-spots on the upper or under side of either wing, nor is there any grey suffusion.

46. *M. hepatica*, Moore.

Sikhim. I have not seen this species. (Very rare in Darjeeling. I have a single pair from Möller. The female is much larger than the male.—*H. J. E.*).

Genus ANDRACA, Wlk.

47. *A. bipunctata*, Wlk.

Sikhim ; Bhutan, June. I have a pair from the Sip Chu Valley, the male expanding 44 millimetres and the female 60 millimetres. The apex of the forewing in the female is very falcate. The larva is said to feed on tea in Cachar, and to have done much damage, 5,600 lbs. of larvæ were destroyed on one concern in a season.

Family EUPTEROTIDÆ.

Genus GANGARIDES, Moore.

48. *G. roseus*, Wlk.

Sikhim; Bhutan, June. The form *dharma* seems to me to be separable, but I have not sufficient material to judge fairly. Mr. Elwes evidently thinks the same.

Genus PALIRISA, Wlk.

52. *P. lineosa*, Wlk.

Sikhim, 4,000 to 5,000 feet; Bhutan, 3,000 feet. A constant and common species occurring in June and July. The larvæ are gregarious. (Mr. Knyvett notes that this was very common near Buxa in the forest at 2,500 feet, the wings being left by bats in heaps under the trees.—*H. J. E.*)

53. *P. cervina*, Moore.

Sikhim (*Hampson*). I have never seen this species.

Genus TAGORA, Wlk.

54. *T. patula*, Wlk.

Sikhim. I have not procured this species. (I have a single female from Möller which agrees with the Khasia form, but have never seen a male from Sikhim. *T. khasiana*, Moore, appears to be distinct from *T. patula*.—*H. J. E.*)

Genus PSEUDOJANA, Hampson.

58. *P. incandescens*, Wlk.

Sikhim; Bhutan, 7,000 feet. I have only one male expanding 137 millimetres, taken in the Daling hills in June. (Taken by me at 2,000 feet near Mongpoo in June, but seems very rare in Sikhim.—*H. J. E.*)

Genus GANISA, Wlk.

59. *G. postica*, Wlk.

Sikhim; Bhutan, May.

60. *G. pandya*, Moore.

Sikhim; Bhutan. (Not uncommon in some seasons in Sikhim.—*H. J. E.*)

61. *G. glaucescens*, Wlk.

Sikhim. I have a single specimen taken by Dr. Pilcher at Darjeeling in June. (Very common in Darjeeling at light in July.—*H. J. E.*)

Genus APHA, Wlk.

62. *A. subdives*, Wlk.

(I have a specimen from Sikhim which agrees perfectly with those from the Khasias.—H. J. E.)

63. *A. floralis*, Butl.

Sikhim. Not procured by me. (Not uncommon in some seasons. I have taken it at 5,000 feet in July. Knyvett bred it from pupæ found at 3,000 feet.—*H. J. E.*)

64. *A. fenestrata*, Butl.

Sikhim (*Hampson*). I have never obtained it.

Genus APONA, Wlk.

65. *A. cashmiriensis*, Koll.

Sikhim. Not procured by me. (A single specimen from Sikhim is larger [90 millim], and has the markings much more conspicuous than one from Kulu [76 millim]. A female from the Khasias is 120 millimetres in expanse.—*H. J. E.*)

Genus EUPTEROTE, Hübn.

68. *E. undata*, Blanch.

Sikhim, 4,000 feet ; Bhutan, 2,500 feet. Occurs from June to September. Very common at light.

69. *E. fabia*, Cram.

Sikhim ; Bhutan, 2,500 feet, April, June. I think it quite possible that with a very large number of specimens for examination this species and *E. undata* might prove to be only one extremely variable one.

76. *E. lineosa*, Wlk.

Sikhim, 5,500 feet ; Bhutan, 3,000 feet, June, August. This may be, as Mr. Elwes points out, identical with *E. mollifera*, but I think

my specimens belong rather to *E. lineosa* as described by Butler. In case *E. mollifera* be the same species, the name *E. lineosa* has precedence. I think *E. lineosa* can be separated from *E. fabia* by its smaller size, the frons being yellow, and the postmedial line on the hindwing straight or curved inwards.

76*a*. *E. calandra*, Swinh.

Bhutan, 2,500 feet, May. I have only one female specimen of this species, of which I sent a drawing to Sir George Hampson, who identified it as *E. calandra*, Swinh. The antennæ are shorter than those of *E. lineosa*, and both wings are broader ; the costa of the forewing is more arched. There is no trace of a marking of any kind, and the wings are very pale yellow.

83. *E. citrina*, Wlk.

Sikhim (*Hampson*). I have not seen this species. Mr. Elwes says he believes that it is *E. mollifera*, Wlk. It is, however, placed in a different section of the genus by Sir George Hampson, *viz.*, *Sect. II. Female having raised patches of scales at the outer angle of the forewing on the underside, and at the apex of the hindwing on the upperside.*

(*To be continued.*)

THE POISONOUS PLANTS OF BOMBAY.

By Surgeon-Lieut.-Col. K. R. Kirtikar, I.M.S., F.L.S.

Part XVII.

(*With Plate S.*)

(*Continued from Vol. X, page* 627).

NERIUM ODORUM—(*Solander.*)

Natural Order—Apocynaceæ.

MARATHI—कण्हेर. (*Kanher*).

A large erect stout glabrous shrub, containing a cream-coloured, thick, resinous, and sticky juice. The generic name of the plant is derived from Gr. *neros*, moist, which fully indicates its habitat. It thrives in damp ground, and alongside of flowing rivulets and watercourses. It is a beautiful evergreen, easy of culture and propagation, and flowers freely throughout the year.

ROOT.—Crooked ; on young roots the corky layer is very thin, and the interior yellow colour of the bark is seen through it ; inner surface yellow. Odour somewhat acrid ; taste acrid and bitter. In the bark of the roots, the medullary rays are very numerous, their being loaded with yellow resinous juice makes them very conspicuous. (Dymock).

STEM.—6-8 feet high, woody ; abounding in starch ; pithy in the centre. Young branches show more pith. Wood very porous and abounding in large dotted vessels and well-marked ; medullary rays visible to the naked eye. The laticiferous vessels are numerous, and generally in groups of two, three, or more. (Dymock).

BARK.—Thick, soft, corky, with a grey surface externally. In young branches it is greenish ; in old yellowish and abounding in starch.

LEAVES.—Exstipulate ; arranged in whorls of three ; rarely opposite or scattered ; narrow, linear-lane cecolate, 4-6 inches long, thickly coriaceous, acuminate. Margin entire, revolute. Midrib very stout ; main lateral nerves numerous, slender, horizontal, parallel, very close. The under surface, says Brandis, is uneven, and irregularly pitted. The margin narrows as it reaches the petiole.

Petiole.—Very short.

FLOWERS.—Hermaphrodite, showy, sweet-scented ; single or double, variously-coloured, as detailed below ; 1½ inches in diameter ; salver-shaped.

R.J. Budhavarkar del. Mintern Bros. Chromo lith. London.

THE POISONOUS PLANTS OF BOMBAY.

Nerium odorum, Soland. Nat. Ord. Apocynaceæ.

⅔ Nat Size.

INFLORESCENCE.—Racemose cymes.

PEDUNCLES.—Terminal, long, angular.

PEDICELS.—Short.

BRACTS.—Linear, deciduous, coloured.

ÆSTIVATION—Valvate in the upper part of the calyx-tube ; contorted in the corolla, segments overlapping to the right.

CALYX.—Inferior, 5-partite, tubular persistant, slightly accrescent ; segments subulate-lanceolate, erect, says Roxburgh. The base of the calyx-tube glandular within. Professor Vines of Cambridge, *apropos* of the Nectaries, observes thus :—" Nectaries many, in a whorl as rounded prominences, situated extra-staminally, between the corolla and calyx " ("Text-Book of Botany," pp. 526-527—1895).

COROLLA.—5-lobed, twisted, hypogynous, gamopetalous, regular, deciduous. Appendages of the corolla cleft into 4-7 segments (Hooker) ; Brandis, however, says "that the corona of each petal is *trifid* ; the lateral segment is linear, and the centre one short, triangular." This is the common arrangement in single flowers, so far as I have observed. In the flesh-coloured flowers, however, the arrangement is somewhat different, in that the corona is more divided, having five strap-like laciniæ, quite entire half-way up, and then uniformly dividing into a filiform fringe.

ANDRŒCIUM.

STAMENS.—5, alternate with the lobes of the corolla, and included within the corolla-tube.

FILAMENTS.—Distinctly attached to the tube the whole way down.

ANTHERS.—Sagittate, introrse, united to the stigma, 2-celled, dehiscing longitudinally. " Spurs of the anthers, linear, twice as long as the cells " (Solander). The *Connective* prolonged into a feathery process more than twice the length of the anthers. These feathery processes, five together, are spirally-twisted into a bundle, which projects well beyond the tube of the corolla ; the individual processes however are easily separable.

POLLEN.—Globose ; immediately applied to the stigma.

GYNŒCIUM.

OVARY.—Superior, composed of two carpels, which are coherent, but easily separable in the fruit.

STYLE.—Single, uniting the ovaries.

STIGMA.—Hour-glass or dumbbell-shaped. Very characteristic.

OVULES.—Numerous, anatropous.

FRUIT.—A cylindrical capsule, with deep linear striations, slightly twisted, sometimes very much so; 6-9 inches long.

SEEDS.—Numerous, compressed, exalbuminous, comose, with a tuft of fine shining white or greyish silky hairs at the top; fusiform and slightly rugose (Gærtner).

EMBRYO.—Straight—(De Caisne and Le Maout).

COTYLEDONS.—Foliaceous, cordate, convolute.

RADIX.—Superior; slightly rounded.

Both the cotyledons and radix partake of the red or pink colour in the respectively coloured varieties (Gærtner).

GENERAL REMARKS.

It must now be considered that the *Nerium odorum* I am here describing is no other than the *Nerium oleander* of the Mediterranean coast, barring developmental differences due to climatic influences. Linnæus is after all right in considering that they were identical plants. However much the corolla may vary in the two plants, we have the high and unquestionable authority of Brandis, that the fact of a mere climatic variation of the corolla "does not afford distinctive characters of a reliable kind. Special parts may vary but yet their variation need not go to multiply varieties which may reasonably be classed under one and the same species." This is so with *Nerium odorum*, notwithstanding its single and double-flowered white, pink, and crimson varieties, as will be seen from the synonyms I detail below on the authority of several well-known Botanists.

Synonyms :—

1. *N. odoratum*, Lamk.
2. *N. latifolium*, Mill.
3. *N. indicum*, Mill.
4. *N. flavescens*, Spin., Jard. S. Sebast (1812). Kew Index.
5. *N. Koltschii*, Boss. Diagnosis Pl. Or. Nov., VII, p. 21, 1846, Kew Index.
6. *N. luteum*, Nios. Kew Index.
7. *N. verecundum*, Salisb. Kew Index.

The following garden varieties have been noted as growing in Bombay:—

1. The double white (=*N. album plenum*),

2. Single white, a slightly cream-coloured (=*N. album*, or *N. flavescens*).

3. The flesh-coloured, or pale pink (=*N. odorum*, var. *carneum*. See plate 2032. Curtis, Bot. Magazine).

4. Double rich pink (=*N. plenum*). See plate 1799. Bot. Magazine. Syn. *N. indicum*, Mill ; *N. zeylanicum*, Burm. ; *N. latifolium indicum* Commel).

5. Single crimson—The species or variety described as *N. odorum*.

To students of Botany devoted to the microscopical examination of the morphology of the plant I am here describing, Professor Bastin of Philadelphia recommends the following parts as good examples for microscopic section*:—(1) The corky tissue ; (2) simple laticiferous tissue, in contrast with the complex, *i.e.*, articulated laticiferous tissue found in such plants as Poppy and Dandelion ; (3) both the surfaces of the leaves show stomata.

Apropos of the above quotation, under the second head, may be considered a very cogent remark of Kerner's in his Natural History of Plants (translated into English recently by Oliver, page 470, Vol. I), which is to the following effect :—"There are many laticiferous tubes in the oleander." I may add that what is true in this connection of *N. oleander* is equally true of *N. odorum*, in all its varieties bearing variously-coloured flowers.

With regard to the general manner of branching in *N. odorum*, Kerner has very accurate remarks to make, which are borne out by my repeated observations of the severally coloured single and double-flowered varieties visible in and around Bombay. This is what Kerner says :—"In the oleander, when after the fall of the terminal flower, the apical growth is terminated, the scarred apex of the main shoot is over-topped by a whorl of three lateral shoots." This must be noted as the prevailing characteristic of *Nerium odorum*. Although the usual arrangement of leaves is in a whorl of three, sometimes solitary leaves are seen. With regard to this disposition, the observation of Kerner is worthy of the notice of the student of Morphology. It runs thus :—"If a whorl is composed of three leaves, and if the successive whorls be displaced through one-sixth of the circumference as in oleander, six

* *Vide* "Laboratory Exercises in Botany," Philadelphia, 1895.

rectilinear series of leaves or orthostichies originate running parallel to one another down the stem."

The peculiarity in the situation of the stomata in this plant is worthy of special notice. The stomata are at the bottom of deep pits on the lower side of the leaf, and entrance to them is beset with extremely delicate hair-like structures. In its natural position the plant is much exposed to wetting by rain, mist, and dew, just when transpiration is an absolute necessity for it. But even when the leaves are covered on both sides with a layer of moisture, none can force its way into the hair-lined depressions which conceal the stomata, and consequently transpiration is not hindered even in the wettest season of the year (Kerner). Balfour* in describing the stomata says that they are furnished with cellular hair-like processes. It must be observed that the hair-like processes do not arise from the stomata, but from the epidermal layer of cells lining the deep pits in which the stomata are situated.

Mr. W. H. Gower† in his article on Green House Plants, remarks that "notwithstanding the whole plant is poisonous, the splendid larva of the Oleander Sphinx moth (*Chærocampa nerei*) however thrives well upon its poisonous leaves." In Rheede's Hortus Ind. Malab. Tablet I., there is an illustration of the double-flowered pink variety of *Nereum odorum*. There is also a butterfly, a caterpillar, and three figures of chrysalis. It is for an Entomologist to determine what the butterfly is.‡

Gower, in the article quoted above, makes a very useful suggestion for the purpose of securing showy and long-lasting flowers, which is worthy of notice. He says that "it sometimes happens that young shoots start out from the base of the flower stalk, which allowed to grow will entirely spoil the bloom." They must therefore be cut out as soon as seen.

The plant is of great antiquity. It was known to the ancient Greeks and Romans. It was known to Pliny (known as C. Plinius Secundus, Major) who flourished in the first century of the Christian era, and has been referred to by Palladius Rutilius Taurus (a Roman writer on husbandry who flourished in the third century of the Christian era), under the name of *Rhododaphne*, the rose-bay. This is what Pliny§ says regarding it :—" Oleander called in Greeke Rhododendros which some

* P. 537 "Manual of Botany," 5th Edition, 1875.

† Cassell's "Popular Gardening," Volume II, p. 316.

‡ Several species of the genus, *Euplœa* feed on the Oleander—L. de Nicéville.

§ "*Naturalis Historia*" translated by Dr. Holland, Vol. II, pp. 191-192, London, 1601.

name Rhododaphne and others Nerion hath not been so happie yet as to find so much as a name in Latine. A straunge and marvellous qualitie of this plant: the leaves are a very poison to all foure-footed beasts; and yet they serve man as a preservative and counterpoyson against serpents if they be taken in wine, with Rue among. Also sheepe and goats if they chance to drinke of the water wherein those leaves lay soaked, will (by reports) thereupon die." The plant is still to be seen, says Hehn, in Greece and Italy as oleander or rose-laurel, not only adorning gardens, but fringing the roads and dry beds of rivers with its fragrant rose-like blooms, and the faint brilliancy of its long evergreen leaves. (Nairne).

In describing the scent of the flowers, Balfour says that it perfumes the air for a distance around, and has the odour of almonds. The most penetrating odour is that of the double-pink variety, as compared with the odour of the rest of the variously-coloured flowers, and resembles a mixture of the odour of bitter almond and otto of roses, I think.

POISONOUS PROPERTIES.

All the ancient and modern Hindu writers agree in ascribing poisonous properties to this plant. Two varieties are described in each of the following works;—(1) Bhav-Prakâsh (Purva-khanda, Part I, Shl. 79-80); (2) Madanpâl Nighant. (Shl. 337-338); (3) and (4) Dhanvantari and Raj-Nighant (p. 134, Anandâshram Edition 1896, Poona). The following works describe five varieties—red, white, pink, yellow, and dark red:—(1) Nighant-Ratnâkar (Vol. I, p. 102, 1867, Bombay); (2) Nighant-Prakâsh (p. 52, Guna-Dosha, 1837, Bombay). All the works describe the several species as the "killer of horses." In medicine, used externally, the root and bark are considered useful in skin-diseases and leprosy. On what authority Dalzell and Gibson call it a native of Arabia (Aden), it is not easy to understand. (See Supplement to the Bombay Flora, 1861, p. 52). English and Continental Botanists have from time to time dwelt on the poisonous effects the plant has on men and the lower animals. The stem, root, leaves, and flowers are all more or less very deadly. The following remarks of Lindley may be usefully quoted here:—"Although little suspected oleander is a formidable poison. A decoction of its leaves forms a wash, employed in the south of Europe to destroy cutaneous vermin; and its powdered wood and bark constitute at Nice the basis of an efficacious rat-poison.

A few years ago, a child died from having eaten one morning a quantity of oleander flowers; it was seized with violent colic, under which the child sank at the end of two days. In 1809, when the French troops were lying before Madrid, some of the soldiers went a marauding, every one bringing back such provisions as could be found. One soldier formed the unfortunate idea of cutting the branches of the oleander for spits and skewers for the meat when roasting. This tree is very common in Spain, where it attains considerable dimensions. The wood having been stripped of its bark, and brought in contact with the meat was productive of most direful consequences, for of twelve soldiers who ate of the roast seven died, and the other five were dangerously ill. (Gard. Chronicle, 1844, p. 23.) In like manner the root of *Nerium odorum* is found to be a poison in India." Why, then, I ask, is there no mention of this plant in the standard work of Alfred S. Taylor so sumptuously studied of all lawyers in Great Britain, Ireland, and India? I am writing from my knowledge of the Second Edition published in 1873. I have not seen the latest edition recently published. Equally strange is it to say that not even the erudite Dr. Casper, Professor of Forensic Medicine of the University of Berlin, makes any reference to oleander, although he refers to less virulent plants in the four volumes published by the New Sydenham Society, 1861-65. Stranger still, one of our latest writers on Forensic Medicine and Toxicology (1893, London), in the person of Professor Dixon Mann of Owen's College, Manchester, makes not the slightest reference to it, while Lauder Brunton and Schmiedeberg, Mr. Sohn, Dr. Dymock, and Mr. Greenish recognize poisonous alkaloids in *Nerium odorum*. This shows that even our first-rate writers on Toxicology are not in touch with the pharmacological knowledge of the day. This is not as it should be in the interests of human life and public safety. Lawyers defending criminals look up to works on Medical Jurisprudence and Toxicology for their sole information. I deem it my duty to point out that the works which lawyers consider here and in England as their authorities are painfully wanting in placing before the public useful knowledge which has been handed down for hundreds of years as established facts—*facts beyond dispute*.

When O'Shaughnessy toiled in India, as Professor of Chemistry and Materia Medica in the Calcutta Medical College, in the first half of

this century (*vide* Bengal Dispensatory, 1841, p. 445), the active principles causing dangerous symptoms had not been isolated, though he says many attempts were made to obtain the same. O'Shaugnessy, however, firmly believed that the poisonous principle was active and volatile. He even goes to the extent of saying that the vapour of the flowers in a close apartment will prove poisonous. The accuracy of this statement is to me doubtful. O'Shaughnessy says that the wood of this plant is used by some Eastern nations as the best material for gunpowder charcoal.

Coming now to discuss the results of modern researches, the following active principles may be mentioned as described by Sohn (Dictionary of the Active Principles of Plants, p. 65, 1894):—

1. *Oleandrine.*—Alkaloid. ? [Neriodorin, (Schmiedeberg); identical with one of Selmis's Ptomaines (*Finoshi*); statement of different observers concerning *Oleandrin*, *Neriin*, *Neriodorin*, &c., are conflicting; see Leukowsky, *Rep. Chim.* Appliq., III, 77; Schmiedeberg Archiv., Exp. Pathol., XVI, 151: Greenish, Pharm. J., Trans., 3rd Ser., XI., 873, and others.] Amorphous, yellow, resinous, bitter, poisonous. After heating to 240° C. it is no longer soluble in alcohol or water. Melting point above 56° C. with crystalline sublimate. Soluble in water, Betelli; alcohol, ether, chloroform and fatty oils.

Neriodorin scarcely soluble in water or ether, not soluble in benzene or petroleum ether. For further information regarding the precipitants, see Sohn.

2. *Neriin* has all the properties of Digitalin and possibly identical therewith.

3. *Nerianthin* bears similar resemblance to Digitalin.

4. *Rosaginin.*—A Glucoside (*E. Pieszezck*). Amorphous, Archiv. Pharm., 1890, **228**, 352; poisonous; action like Strychnine. Soluble in alcohol; not in water, ether, chloroform or petroleum ethers. For further tests, see Sohn.

The presence of the Glucoside *Rosaginin* would seem to account for tetanic symptoms noticed in two cases reported in the *Indian Medical Gazette* of 1866. (1), In the case reported from the Calcutta Medical College Hospital the trunk and limbs were found rigid, the jaw spasmodically closed, and the pulse very feeble and slow, about 30. (2), Babu K. H. Acharji reports the second case in which tetanic symptoms

were well marked. Babu D. Mukarji reports another case wherein similar symptoms were noticed. He pointedly observes that the action of the poisonous element resembles that of strychnia. He corroborates the statement made above regarding the extreme slowness of the pulse by adding that the marked difference between the effects of oleander and nux-vomica-poisoning consists in the slowness of the pulse. In nux-vomica-poisoning it is generally unaffected, becoming slightly quickened only during a fit; but in oleander-poisoning its preternatural slowness is a marked feature. (Dymock.) This can be accounted for by the fact that this glucoside is not the only poisonous element in the imbibed potion; there are others, such as *Oleandrine* or *Neriodorin*, *Neriin*, and *Nerianthin* which are distinct cardiac poisons. They stimulate the cardiac muscle to start with; they besides stimulate the Vagus Centre, as also the Capillaries. Lauder Brunton classes *Neriin* along with *Digitalin*, *Digitaliin*, *Helleboreine*, *Scillaïn*, *Antiarin*, *Thevetine*, *Theversine*, &c. "The stimulation of the cardiac muscle is shown by increased energy of contraction, the rate of pulsation remaining the same or becoming slower. These are so-called Cardiac Poisons; with a large dose, the stage of stimulation is followed by one of peristaltic action, and final arrest in the systole. This stoppage of heart in systole occurs in frogs, but in higher animals the heart may stop in diastole."*

Dragendorff recognizes *Oleandrine* as the alkaloid found in the plant, but says he is not familiar with it, and refers the reader to the researches of Leukowsky.† Dymock, in referring to the researches of Leukowsky says that the latter recognizes in the leaves of oleander the presence of two alkaloids—namely, *Oleandrine* and *Pseudo-curarine*. Dymock further quotes the researches of Schmiedeberg, which, in view of the quotation from Sohn given above, referring to the difference of opinion as regards the nature of the true alkaloid, may well be repeated here. "Schmiedeberg (1883), who considers *Oleandrine* to be a glucoside, found in the leaves two other glucosides—*Neriine* and *Neriantine*: he considers *Neriine* to be identical with *Digitaleine*."‡

Greenish recognizes two bitter principles in the bark, *Neriodoreïn* and *Neriodorin*, which, he says, are closely allied non-nitrogenous substances,

* Pharmacology and Therapeutics, p. 276, 1885.

† Plant Analysis translated by Greenish, p. 204, 1884

‡ Pharmacographia Indica, p. 401, Vol. II, 1891.

probably glucosides, both possessing the properties of powerful cardiac poisons. In the bark, he says, there are crystals of calcium oxalate. (Year Book of Pharmacy, p. 154, 1881). Gribble classes the plant among irritants side by side with *Plumbago rosea* and *P. zeylanica*. T. N. Mukarji, Jaikisson Indraji, Sakharam Arjun, Lyon, and Chevers note that the root is used to procure abortion. Lyon includes the plant among Cardiac Poisons. The post-mortem appearances which he quotes from Chevers bear out Lauder Brunton's remark, that in higher animals, such as men and quadrupeds, the heart may stop in diastole. For further information I would refer the reader to the observations of Chevers in his Medical Jurisprudence.

Veterinary-Major G. K. Rayment, A.V.D., wrote to me in March, 1896, from Rawalpindi that he was concerned as a witness in a case of poisoning camels by oleander. He subsequently at my request furnished me with a printed memo. of the symptoms. This memo., I am sorry to say, I am unable to find just now. Camels do not object to eating the leaves, but the leaves are invariably fatal to the poor beasts. Sir George Birdwood and Surgeon-General Balfour have noted this fact before, in their respective works, namely, " The Bombay Products " and the " Cyclopædia of India," 3 volumes.

EXPLANATION OF PLATE S.

Fig. 1.—Represents a following sprig of the plant.

Fig. 2.—Shows the insertion of the petiole.

Fig. 3.—Shows the shape of the corolla.

Fig. 4.—Shows the bursting capsule, separated nearly down to the base into two equal portions, each representing the original carpel ; each half dehisces ventrally only, and resembles a follicle ; comose seeds escaping from the openings.

Fig. 5—Shows a comose seed separated from its attachment.

All the parts are shown two-thirds of the natural size.

(*To be continued.*)

SOME LAND AND FRESH-WATER SHELLS COLLECTED IN THE ISLAND OF BOMBAY.

By A. J. Peile, R.A.

(*Read before the Bombay Natural History Society on* 15*th July*, 1897.)

Before going on to the fresh-water shells, I have to correct an error in the description of *Nanina tenuicola*. The animal is possessed of shell-polishing lobes, but they are not very conspicuous. They are like feelers in shape, the one directed backwards lies on the body of the animal and is therefore not easily distinguished. The other is directed forwards in prolongation of the suture line.

I have also to render thanks to those members who have kindly sent in specimens for the benefit of the Society's collection.

Part II. Fresh-water.

Our specimens being divided into operculate and inoperculate, we have of the former three families represented, the first being the well-known *Viviparidæ* (*Paludinidæ*).

Of this family we have two species, both common in Bombay. They have some points in common, both being whitish-coloured shells covered when alive by an olive-coloured periostracum or outer skin; they have a horny pear-shaped operculum fitting the aperture. They are ovoviviparous, the young being born with a perfectly formed shell about $\frac{1}{8}''$ long.

V. bengalensis (Lam.) is the larger of our two species, about $1\frac{1}{2}''$ long, aperture $\frac{1}{2}''$ across. It is easily distinguished by a number of dark lines running round the shell, three being left exposed on the older or upper whorls.

The second species, *V. dissimilis* (Müll.) is smaller and more squat; it is distinguished principally by the squarely-angular appearance of the whorls; this is particularly noticeable in young specimens. The colour is olive-green without any marks, except a faint light line on the bottom of the whorl. The mouth of the shell is edged with black.

This species seems to have received the names *melanostoma* (Reeve), *præmorsa* (Bens.), *remorsii* (Phil.), and *decussata* (W. Bl).

Second Family Ampullariidæ.

A. dolioides (Reeve) is a somewhat globular shell, about $1\frac{1}{2}''$ diameter, with an aperture $1\frac{1}{2}'' \times \frac{3}{4}''$, spire very slightly raised. Colour varies

from yellow to olive-green; and, as in the *Viviparidæ*, depends on the presence of the periostracum. The shell is often banded with streaks and lines, especially in the darker specimens. The operculum is horny and rather solid, with a pinkish tinge.

This species is apparently the *A. malabarica* (Phil.) (not of Reeve), which Theobald says is probably a local variety of *A. carinata*. Our dark-striped specimens closely resemble *carinata*.

A. nux (Reeve), our second species, has been described as from Bombay, but as it delights in running streams the specimens found here have probably been water-borne. It is found near Kalian and in the streams on the Ghâts in abundance. It is a much smaller and more solid shell than the last, and not so globular, the spire being more produced. Size about $1'' \times \frac{3}{4}''$. The surface, especially of the spire, is often much eroded. Colour of the shell olive-green, interior brownish-pink.

Third Family MELANIIDÆ.

Of this family we have two representatives if I may be permitted to stray to Kalian.

Melania tuberculata (Müll.) is a long spiral shell about $1\frac{3}{8}''$ long. It would be pointed but for the fact that the top of the shell is generally truncated by erosion. Young specimens about $\frac{3}{4}''$ long generally have the spire complete. The full-grown shell is dark olive-green, almost black and slightly roughened or tuberculed by lines running round the shell and longitudinal striations; young specimen are much lighter in colour, and the tubercules are picked out with red spots. The operculum is horny and oval in shape. This species is found all over India and Ceylon.

From Kalian we have *Paludomus obesa* (Phil.), a little shell about $\frac{3}{8}'' \times \frac{1}{4}''$, colour dark brown and variously spotted, the spots running in lines round the shell. Operculum similar to that of *Melania*.

I include this shell as it has been described as "from Bombay."

All our unoperculated fresh-water shells belong to one family, the *Limnæidæ*.

Of *Limnæa* we have two species, the first *L. pinguis* (Dohrn.) is a thin fragile shell having a spotted appearance when alive owing to markings on the animal which show through the transparent shell. In Bombay it runs in size to about $\frac{3}{4}'' \times \frac{3}{8}''$, the spire is not much produced and the shell has a generally rounded appearance.

L. rufescens (Gray) is a shell of much more slender shape, and up-country attains a size of $1\frac{1}{2}'' \times \frac{5}{8}''$; it is distinguished by the spire being very much produced, and by the obliqueness of the suture line. In Bombay it seems not to exceed $\frac{3}{4}'' \times \frac{5}{16}''$; it is a slightly less fragile shell than *L. pinguis.* It is not as a rule red, as its name would seem to imply, but reddish specimens are occasionally met with.

Of *Planorbis* we have two species. Shells of this genus are flat spirals like rams' horns in shape.

The first *P. exustus* (Desh.) is the larger, about $\frac{1}{2}''$ in diameter and $\frac{1}{4}''$ thick, the aperture is of a crooked shape and generally longer than the depth of the shell. The shell has a rugged appearance from marks of old lips.

It is common all over India, and has also received the names *coromandelicus* (Kuster), *indicus* (Benson), and *brunneus* (Gray).

The second, *P. compressus* (Hutton), is a little shell about $\frac{1}{4}''$ in diameter and very flat in shape, with no enlargement of the aperture.

This species also is common all over India.

In addition to these *Gasteropoda*, we have, according to Theobald, a small bivalve in Bombay named *Pisidium bombayanum* (Theo.), but I have not yet found it, nor does it exist in the Society's collection.

THE FLORA OF WESTERN INDIA.

By G. Marshall Woodrow, Professor of Botany,
College of Science, Poona.

Part II.

(*Continued from page* 130 *of this Vol.*)

8. *Erinocarpus.*

E. Nimmoanus, *Grah.*, F.B.I.—I-394. *Cherá.* W. Ghâts, Konkan. Nov.-Dec.

9. *Triumfetta.*

T. pilosa, *Roth.*, F.B.I.—I-394. Marmagoa. November.
T. rhomboidea, *Jacq.*, F.B.I.—I-395. *Chikti.* Deccan, Guzerat, widely. Nov.
T. rotundifolia, *Linn.*, F.B.I.—I-395. Poona. August.

10. *Corchorus.*

C. capsularis, *Linn.*, F.B.I.—I-397. Surat, Bombay, Vingurla. September.
C. olitorius, *Linn.*, F.B.I.—I-397. Guzerat, Deccan, widely. September.
C. trilocularis, *Linn.*, F.B.I.—I-397. Deccan, Guzerat, Sind, widely. Sept.
C. fascicularis, *Lam.*, F.B.I.—I-398. *Bahuphali, Harankhuri.* Deccan, Guzerat. September.
C. antichorus, *Rœusch.*, F.B.I.—I-398. *Mudhiri.* Rajkot. Sept.-Oct.
C. tridens, *Linn.*, F.B.I.—I-398. Sind.
C. acutangulus, *Lam.*, F.B.I.—I-398. Parel, Konkan, widely. September.

13. *Elœocarpus.*

E. Ganitrus, *Roxb.*, F.B.I.—I-400. *Rudrâksha.* W. Ghâts, *DeCrespigny.*
E. oblongus, *Gaertn*, F.B.I.—I-403. *Kasava Kasa.* Mahableshwar. May.
E. tuberculatus, *Roxb.*, F.B.I.—I-404. *Rudrak.* W. Ghâts, *DeCrespigny.*

XXIX.—Lineæ.

1. *Linum.*

L. usitatissimum, *Linn.*, F.B.I.—I-410. *Jawas.* Cult. February-March.
L. mysorense, *Heyne*, F.B.I.—I-411. *Undri.* W. Ghâts, Kolhapur. Oct.-Jan.

2. *Reinwardtia.*

R. trigyna, *Planch.*, F.B.I.—I-412. Miradongar, near Pen, Konkan. In gardens widely. Oct.-Jan.

7. *Erythroxylon.*

E. coca, *Lam.*, DC., Prod. I-575. Coca plant. In gardens. Cult.

XXX.—Malpigiaceæ.

2. *Hiptage.*

H. madablota, *Gaertn.*, F.B.I.—I-418. *Mádhumâlati.* W. Ghâts, Mulher. Feb.

3. *Aspidopteris.*

A. Roxburghiana, *A. Juss.*, F.B.I.—I-420. Hills near Satara. December.
A. canariensis, *Dalz.*, F.B.I.—I-420. Kumta-Sirsi Road, Nilkund, N. Kanara. March.
A. cordata, *A. Juss.*, F.B.I.—I-421. *Buryel.* Londa. Matheran. Sept.-Oct.

XXXI.—ZYGOPHYLLEÆ.

1. *Tribulus.*

T. terrestris, *Linn.*, F.B.I.—I-423. *Sarâtâ.* Sind, Deccan, widely, nearly all year.
T. alatus, *Del.*, F.B.I.—I-423. *Nindo trikundri.* Sehwan. Sind. Sept.-Dec.

2. *Seetzenia.*

S. orientalis, *Dene.*, F.B.I.—I-424. Laki, Sind. October.

3. *Zygophyllum.*

Z. simplex, *Linn.*, F.B.I.—I-424. *Alethi Putlani.* Karachi, Sind, widely. Dec.

4. *Fagonia.*

F. arabica, *Linn.*, F.B.I.—I-425. *Dhamásá.* Bijapur. Sind. Oct.-Dec.

XXXII.—GERANIACEÆ.

2. *Monsonia.*

M. senegalensis, *Guill & Perr.*, F.B.I.—I-427. Hill near Ganesh Khind, Poona.
M. heliotropioides, *Cav.*, F.B.I.—I-428. Thano Bulo Khan Road, 51 miles from Karachi. Aug.

4. *Erodium.*

E. cicutarium, *Leman.*, F.B.I.—I-434. Quetta. Tata Dist., Sind. Feb.-Dec.

5. *Oxalis.*

O. corniculata, *Linn.*, F.B.I.—I-436. *Ambushi.* Konkan, Deccan, Guzerat. Oct.-May.

6. *Biophytum.*

B. sensitivum, *DC.*, F.B.I.—I-436. Poona, Baroda. Oct.Jan.

7. *Averrhoa.*

A. carambola, *Linn.*, F.B.I.—I-439. *Karmar.* Cult.
A. Bilimbi, *Linn.*, F.B.I.—I-439. *Bilimbi.* Cult.

8. *Impatiens.*

I. Beddomei, *Hook. f*, F.B.I.—I-442. Western India. *DeCrespigny.*
I. Stocksii, *H. f. & T*, F.B.I.—I-442. Mountains of the Konkan. *Law. Stocks.*
I. acaulis, *Arn.*, F.B.I.—I-443. W. Ghâts. October.
I. rivalis, *Wight*, F.B.I.—I-444. Konkan, *Stocks.* Aug.-Feb.
I. chinensis, *Linn.*, F.B.I.—I-444. *Sumpkund, Yacombi.* N. Kanara.
I. Kleinii, *W. & A.*, F.B.I.—I-445. Castle Rock. *Sumpkund.* N. Kanara. Oct.-July.
I. incouspicua, *Benth.*, F.B.I.—I-447. *Dalzell & Gibson.*
I. oppositifolia, *Linn.*, F.B.I.—I-448. Ghât Road, Wadi to Paladpur. Oct.
I. Lawii, *H. f. & T.*, F.B.I.—I-448. Castle Rock, W. Ghâts. October.
I. Dalzellii, *H. f. & T.*, F.B.I.—I-449. Purandhur, Mahableshwar. Sept.
I. balsamina, *Linn.*, F.B.I.—I-453. *Terda.* W. Ghâts, widely. Aug.-Nov.
I. pulcherrima, *Dalz.*, F.B.I.—I-458. Londa Road, Wadi, to Paladpur, W. Ghâts. Sept.-Oct.

XXXIII.—Rutaceæ.

1. *Ruta.*

R. graveolens, *Linn.*, F.B.I.—I-485. *Sûap.* Cult.

R. tuberculata, *Forsk.*, F.B.I.—I-485. Boogta hills in Sind, *Vicary.* Sibi. Dec.

3. *Peganum.*

P. Harmala, *Linn.*, F.B.I.—I-486. *Harmal.* Bijapur, Phaltan, Hydrabad, Sind Oct.-Dec.

5. *Evodia.*

E. Roxburghiana, *Benth.*, F.B.I.—I-487. Mahableshwar. May.

8. *Zanthoxylum.*

Z. ovalifolium, *Wight*, F.B.I.—I-492. Ramghat, *Dalzell.* Nov.-Dec.

Z. Rhetsa, *DC.*, F.B.I.—I-495. *Chirphal, tirphal, tisal.* Warul, Ratnagiri Dist., in fruit. October.

9. *Toddalia.*

T. aculeata, *Pers.*, F.B.I.—I-497. Ramghat, *Dalzell*, Sirsi. Nov.-Dec.

10. *Achronychia.*

A. laurifolia, *Blume.*, F.B.I.—I-498. Karwar, Godhuli, N. Kanara, *Talbot.* August.

12. *Glycosmis.*

G. pentaphylla, *Correa.*, F.B.I.—I-499. *Kirmirá.* Castle Rock, Khandalla. Nov.-Mar.

14. *Murraya.*

M. exotica, *Linn.*, F.B.I.—I-502. *Kunti, Chula juti.* Khandala, W. Ghâts. June-Oct.

M. Kœnigii, *Spreng.*, F.B.I.—I-503. *Kadhi Limba.* Hills near Poona, planted widely. Feb.-April.

15. *Clausena.*

C. indica, *Oliv.*, F.B.I.—I-505. W. Ghâts. *Dalzell.*

C. Willdenovii, *W. & A.*, F.B.I.—I-506. Chorla Ghat, east of Goa. *Dalzell.*

16. *Triphasia.*

T. trifoliata, *DC.*, F.B.I.—I-507. Gardens.

18. *Luvunga.*

L. eleutherandra, *Dalz.*, F.B.I.—I-509. Divimana Ghat. January.

19. *Paramignya.*

P. monophylla, *Wight*, F.B.I.—I-510. *Kurwa Wagati.* Amboli Ghât, forest 23 miles west of Ratnagiri. Nov.-Jan.

20. *Atalantia.*

A. monophylla, *Correa*, F.B.I.—I-511. *Mâkad-limbu.* Amboli Ghât. November.

21. *Citrus.*

C. medica, *Linn.*, F.B.I.—I-514. *Mahâlungi.* Cultivated.

C. do. *Acida.*, F.B.I.—I-515. *Limbu*, Sour Lime. Cultivated.

C. do. *Limetta.*, F.B.I.—I-515. *Mitta Limbu*, Sweet Lime. Cultivated.

C. aurantium, *Linn.*, F.B.I.—I-515. *Narangi*, Sweet Orange.
Ladoo, Navel ,,
Cintra, Nagpur ,,
Khaguzi, Mozumbique, ,, thin-skinned.
Ghoradya, Do. ,, thick-skinned.

C. decumana, *Linn.*, F.B.I.—I-516. *Papanis.* Pumelo.

22. *Feronia.*

F. elephantum, *Correa.*, F.B.I.—I-516. *Kavath.* Deccan, planted widely. March.

23. *Ægle.*

Æ. Marmelos, *Correa*, F.B.I.—I-516. *Bael.* Deccan, planted widely. April-May.

XXXIV.—SIMARUBEÆ.

1. *Ailanthus.*

A. excelsa, *Roxb.*, F.B.I.—I-518. *Mahârukh.* Deccan.

A. malabarica, DC., F.B.I.—I-518. Kumta-Sirsi Road, Nagotna. March.

9. *Balanites.*

B. Roxburghii, *Planch.*, F.B.I.—I-522. *Hinganbet.* Dharwar, Deccan widely. March.

XXXV.—OCHNACEÆ.

1. *Ochna.*

O. squarrosa, *Linn.*, F.B.I.—I-523. Gardens often, Castle Rock, W. Ghâts. June.

O. pumila, *Ham.*, F.B.I.—I-524. S. Konkan. *Dalzell.*

XXXVI.—BURSERACEÆ.

1. *Boswellia.*

B. serrata, *Roxb.*, F.B.I—I-528. *Sâlai.* Hills in Deccan, widely. Feb.-March.

3. *Garuga.*

G. pinnata, *Roxb.*, F.B.I.—I-528. *Kákad.* Guzerat and Deccan hills. Jan.-February.

4. *Balsamodendron.*

B. mukul, *Hook.*, F.B.I.—I-519. *Gugul.* Planted. Probably synonymous with B. Roxburghii.

B. Roxburghii, *Arn.*, F.B.I.—I-529. *Gugul.* Planted. Peit, Poona District.

B. pubescens, *Stocks.*, F.B.I.—I-529. Rocky parts of Sind. *Stocks.*

B. Berryi, *Arn.*, F.B.I.—I-529. May.

7. *Canarium.*

C. strictum, *Roxb.*, F.B.I.—I-534. Ainshi. N. Kanara. Talbot. February.

10. *Filicium.*

F. decipiens, *Thw.*, F.B.I.—I-539. Planted. Poona.

XXXVII.—MELIACEÆ.

1. *Turræa.*

T. virens, *Linn.*, F.B.I.—I-541. Dhamanghol. December.

T. villosa, *Benn.*, F.B.I.—I-542. Koina Valley, near Pen. May-June.

2. *Naregamia.*

N. alata, *W. & A.*, F.B.I.—I-542. Savantwadi, Karwar. Nov.-Dec.

4. *Melia.*

M. Azadirachta, *Linn.*, F.B.I.—I-544. *Nim, Kadunimb.* Planted widely. March.

M. Azedarach, *Linn.*, F.B.I.—I-544. *Bukhan.* Planted widely.

M. dubia, *Cav.*, F.B.I.—I-545. *Limbárá.* Harihar, Yacombi, N. Kanara, Purandhar Taluka.

5. *Cipadessa.*

C. fruticosa, *Blume*, F.B.I.—I-545. *Gudmei,* Khandalla, W. Ghâts, Sept.

6. *Dysoxylum.*

D. binectariferum, *Hook. f.*, F.B.I.—I-546. Khandalla. Aug.-Sept.

10. *Lansium.*

L. anamalayanum, *Bedd.*, F.B.I.—I-558. *Telyá.* Hoolical, Amboli, W. Ghâts Nov.-Feb.

11. *Amoora.*

A. Rohituka, *W. & A.*, F.B.I.—I-559. Widely planted in Gardens.

A. canarana, *Benth. & Hook.*, F.B.I.—I-560. Goand. March.

A. Lawii, *Benth. & Hook.*, F.B.I.—I-561. Nilkund Ghât. November.

12. *Walsura.*

W. piscidia, *Roxb.*, F.B.I.—I-564. *Walsura, Walursi,* Ramghat. November.

13. *Heynea.*

H. trijuga, *Roxb.*, F.B.I.—I-565. *Limbárá.* Khandalla. February-March.

SWIETENIA. (*Occidental*)

S. Mahogani, *DC., Prod.*, I-625. Mahagony. Planted. May.

S. macrophylla, *King.*, Large-leaved Mahogany. Widely planted.

16. *Soymida.*

S. febrifuga, *Adr. Juss.*, F.B.I.—I-567. *Rohan.* Thana District. March.

17. *Chickrassia.*

C. tabularis, *Adr. Juss.*, F.B.I.—I-568. *Lál devdari Dalmara.* Yellapur. Jan.-Feb.

18. *Cedrela.*

C. toona, *Roxb.*, F.B.I.—I-568. *Mahanim, Tuni, Kudak.* Panchgany. Khandalla.

19. *Chloroxylon.*

C. Swietenia, *DC.*, F.B.I.—I-569. *Haldâ.* Near Belgaum, Gokak.

XXXVIII.—CHAILLETIACEÆ.

1. *Chailletia.*

C. gelonioides, *Hook. f.*, F.B.I.—I-570. Hegami Siddapur. *Young.* May.

XXXIX.—OLACINEÆ.

1. *Ximenia.*

X. americana, *Willd.*, F.B.I.—I-574. Desur, Badami, S. M. Ry. February

5. *Olax.*

O. scandens, *Roxb.*, F.B.I.—I-575. Khandalla in fruit. Nilkund, N. Kanara. Apr.-Mar.

O. Wightiana, *Wall.*, F.B.I.—I-575. Dahili, near Poona. December.

O. nana, *Wall.*, F.B.I.—I-576. Rajkot. *C. MacNaghten.* July.

6. *Strombosia.*

S. ceylanica, *Gurdn.*, F.B.I.—I-579. Poteli, N. Kanara. December.

9. *Cansjera.*

C. Rheedii, *Gmel.*, F.B.I.—I-582. Yelapur, N. Kanara. December.

13. *Gomphandra.*

G. polymorpha, *W. & A.*, F.B.I.—I-582. Santaveri. December.

15. *Mappia.*

M. fœtida, *Miers.*, F.B.I.—I-589. *Ránwángi.* W. Ghâts, widely. September. November.

XL.—ILICINEÆ.

1. *Ilex.*

I. malabarica, *Bedd.*, F.B.I.—I-598. W. Ghâts. *DeCrespigny.*

XLI.—CELASTRINEÆ.

1. *Enonymus.*

E. indicus, *Heyne.*, F.B.I.—I-608. Divimana, Castle Rock, W. Ghâts. Dec.-Feb.

4. *Lophopetalum.*

L. Wightianum, *Arn.*, F.B.I.—I-615. *Balpale.* Konkan, Sumpkand. Feb.-June.

6. *Pleurostylia.*

P. Wightii, *W. & A.*, F.B.I—I-617. Ghâts, Konkan. *Dalzell.*

7. *Celastrus.*

C. paniculatus, *Willd.*, F.B.I.—I-617. *Karadkángoni Málkángoni.* Deccan and Guzerat, widely. Nov.-Feb.

8. *Gymnosporia.*

G. Rothiana, *W. & A.*, F.B.I.—I-620. Panchgani, Matheran. Feb.-July.

G. montana, *Roxb.*, F.B.I.—I-621. *Hekal.* Kamatkee Ghât, widely. October.

10. *Etœodendron.*

E. glaucum, *Pers.*, F.B.I.—I-673. *Bhutyá, Bhutkes, Alun.* Deccan hills, Peint Taluk. Feb.-Aug.

11. *Hippocratea.*

H. obtusifolia, *Roxb.*, F.B.I.—I-623. Ainshi, N. Kanara. January.

H. Grahamii, *Wight*, F.B.I.—I-624. *Lokhandi.* Ghâts, common. *Dalzell.* Jan.-April.

H. indica, *Willd.*, F.B.I.—I-624. Divimana. April.

12. *Salacia.*

S. prinoides, *DC.*, F.B.I.—I-626. Dehalli, N. Kanara. *Talbot.* January.

S. Brunoniana, *W. & A.*, F.B.I.—I-626. Ramghat. *Dalzell.*

S. Roxburghii, *Wall.*, F.B.I.—I-627. Jambhodara, near Atgaon. March.

S. macrosperma, *Wight*, F.B.I.—I-628. Ainshi Ghât. November.

S. obolonga, *Wall.*, F.B.I.—I-628. Chorla Ghât. *Dalzell.*

XLII.—Rhamneæ.

1. *Ventilago.*

V. madraspatana, *Gaertn.*, F.B.I.—I-631. *Lokhandi.* 23 miles east of Ratnagiri. Jan.

V. calyculata, *Tul.*, F.B.I.—I-631. Dharwar, Yellapur, Sumasgi, Oct.-Dec.

V. bombaiensis, *Dalz.*, F.B.I.,—I-631. Tinai, Chorla Ghât, Konkan. *Dalzell.*

3. *Zizyphus.*

Z. Jujuba, *Lamk.*, F.B.I.—I-632. *Bor.* eccan, Guzerat, Sept.-Oct.

Z. glabrata, *Heyne*, F.B.I.—I-632. Ahmedabad, Surat. Nov.-Dec.

Z. nummularia, *W. & A.*, F.B.I.—I-632. Broach, Guzerat. Dec.

Z. Œnoplia, *Mill.*, F.B.I.—I-632. Badami, Dharwar. August.

Z. xylopyrus, *Willd.*, F.B.I.—I-632. *Ghoti, Ghotbor.* Hills near Poona. June-August.

Z. rugosa, *Lamk.*, F.B.I.—I-636. *Toran.* Igatpura, Forests near W. Ghâts. Feb.

5. *Rhamnus.*

R. triqueter, *Wall.*, F.B.I.—I-639. Kori Fort, 12 miles South of Lanauli. Feb.

7. *Scutia.*

S. indica, *Brongn.*, F.B.I.—I-640. *Chimat.* Mahableshwar. Feb-.April.

11. *Gouania.*

G. microcarpa, *DC.*, F.B.I.—I-643. Divimana, N. Kanara. Dec.

XLIII.—Ampelideæ.

1. *Vitis.*

V. quadrangularis, *Wall.*, F.B.I.—I-645. *Kândvel, Chaudhâri.* Bhownagar.

V. repens, *W. & A.*, F.B.I.—I-646.

V. discolor, *Dalz.*, F.B.I.—I-646. W. Ghâts, widely. Oct.-Dec.

V. pallida, *W. & A.*, F.B.I.—I-646.

V. glauca, *W. & A.*, F.B.I.—I-647. Nilkund, N. Kanara. Oct.

V. gigantea, *Bedd.*, F.B.I.—I-648. Karwar. August.

V. repanda, *W. & A.*, F.B.I.—I-648. *Gernul.* Bowdhan near Poona. June.

V. adnata, *Wall.*, F.B.I.—I-649. Bowdhan near Poona, Kudra, N. Kanara. *Talbot.* May-Nov.

V. Linnæi, *Wall.*, F.B.I.—I-649. Badami. August.

V. erioclada, *W. & A.*, F.B.I.—I-651. Kudgal, N. Kanara. Jan.

V. latifolia, *Roxb.*, F.B.I.—I-652. W. Ghâts. August.

V. vinifera, *Linn.*, F.B.I.—I-652. *Drâkshavel.* Cultivated.

V. setosa, *Wall.*, F.B.I.—I-654. *Khajgolichavel.* Deccan, widely. July-August.

V. carnosa, *Wall.*, F.B.I.—I-654. *Ambatvel.* Deccan, widely. August.

V. elongata, *Wall.*, F.B.I.—I-658. Sirsi, Kumta Road, Mahableshwar. May-October.

V. auriculata, *Roxb.*, F.B.I.—I-658. On rocks, sea-shore, Bombay, Deccan. March.

V. tenuifolia, *W. & A.*, F.B.I.—I-658. Godhali, Karwar. March-August.

V. lanceolaria, *Roxb.*, F.B.I.—I-660. Matheran.

3. *Leea.*

L. macrophylla, *Roxb.*, F.B.I.—I-664. *Dindâ.* W. Ghâts. August.

L. aspera, *Wall.*, F.B.I.—I-665. Karwar. August.

L. sambucina, *Willd.*, F.B.I.—I-665. *Karkani.* W. Ghâts and Deccan hills. August.

XLIV.—SAPINDACEÆ.

1. *Cardiospermum.*

C. Halicacabum, *Linn.*, F.B.I.—I-670. *Kanphuti.* Near Bombay, Deccan hills. December.

2. *Hemigyrosa.*

H. canescens, *Thwaites*, F.B.I.—I-671. *Karpâ.* Matheran, Diggi Ghât. Feb.-April.

4. *Erioglossum.*

E. edule, *Blume*, F.B.I.—I-672. Girgaum, Bombay. Planted.

5. *Allophyllus.*

A. cobbe, *Blume*, F.B.I.—I-673. *Tipâni.* Matheran, Lanowli. May-August.

8. *Cupania.*

C. (Blighia) sapida, *Kœn.*, B.F. SUPP—13. *Akee* tree. Planted at Parel and in Lanauli wood. In fruit. March.

11. *Schleichera.*

S. trijuga, *Willd.*, F.B.I.—I-681. *Koshimb.* Khandalla, Sirsi. February-May.

13. *Sapindus.*

S. trifoliatus, *Linn.*, F.B.I.—I-682. *Ritha.* Londa, Ainshi, N. Kanara, Oct.-Nov.

15. *Nephelium.*

N. Lit-chi, *Camb.*, F.B.I.—I-687. The Litchi Cultivated in gardens rarely.

N. longana, *Camb.*, F.B.I.—I-688. Mahableshwar. March-April.

17. *Harpullia.*

H. cupanoides, *Roxb.*, F.B.I.—I-692. Near Goona, N. Kanara. *Talbot.* Nov.-Jan.

21. *Dodoncea.*

D. viscosa, *Linn.*, F.B.I.—I-697. *Jakhmi*, Badami, Dharwar, Sind. Widely planted as a fence. November.

23. *Turpinia.*

T. pomifera, *DC.*, F.B.I.—I-698. Konkan and N. Kanara. *DeCrespigny.* Jan.

XLVI.—ANACARDIACEÆ.

1. *Rhus.*

R. Mysorensis, Heyme, F.B.I.—II-9. *Amoni.* Hills near Poona. June.

3. *Mangifera.*

M. indica, *Linn.*, F.B.I.—II-13. *Ambá.* The Mango. Wild and cult. Jan.-Feb.

3ª *Anacardium.*

A. occidentale, *Linn.*, F.B.I.—II-20. *Káju.* Naturalised and cultivated, southern districts. Jan.-Feb.

6. *Buchanania.*

B. latifolia, *Roxb.*, F.B.I.—II-22. *Char.* Dang. Singhur, Poona, Pal forests. Feb.-Mar.

12. *Odina.*

O. Wodier, *Roxb.*, F.B.I.—II-29. *Moya, Shimti,* Rajkot, Bowdhan, Poona. June.

14. *Semecarpus.*

S. Anacardium, *Linn.*, F.B.I.—II-30. *Bibbá, Bhiláva.* Sonapur, Singhur. July.

16. *Holigarna.*

H. Arnottiana, *Hook. f.*, F.B.I.—II-36. *Hoolgeri.* Divimana, Kalare, Mysore border. Feb.

H. ferruginea, *March*, F.B.I.—II-37. Haisikutti, *Young.* March.

H. Grahamii, *Hook. f.*, F.B.I.—II-37. *Bibbâdá.* Khandalla. July.

18. *Northopegia.*

N. Colebrookiana, *Blume*, F.B.I.—II-40. *Amberi.* Divimana Ghât. Feb.

20. *Spondias.*

S. mangifera, *Willd.*, F.B.I.—II-42. *Ambádá.* Guzerat, widely planted.

21. *Dracontomelum.*

D. mangiferum, *Blume*, F.B.I.—II-43. Hewra, planted. April.

SCLEROCARYA (*South African*).

S. caffra. Introduced tree. Planted, Poona. March.

XLVIII.—MORINGEÆ.

1. *Moringa.*

M. pterygosperma, *Gaertn.*, F.B.I.—II-45. *Shevgá.* Widely planted. Jan.-Apr.

M. concanensis, *Nimmo.*, F.B.I.—II-45. Differs from above only in its larger leaflets; it is probably the wild form of M. pterygosperma. Bodeli, Guzerat. April.

(*To be continued.*)

ON SOME BATS OBTAINED IN THE SURAT AND THANA DISTRICTS BY Mr. R. C. WROUGHTON.

By Oldfield Thomas, British Museum.

(*Read before the Bombay Natural History Society*, 30*th September*, 1897.)

Mr. R. C. Wroughton, Conservator of Forests, has recently sent to the British Museum, through the Bombay Natural History Society, a small collection of bats from the Surat and Thana districts, and although only six species are represented, one of them is new, and I have therefore thought it worth while to give a list of all the species sent. It may be noted that these are the first bats received from India made up as proper skins, with measurements and skulls, and are, therefore, proportionally acceptable. I venture to hope that other British naturalists in India will follow Mr. Wroughton's excellent example, for similar specimens from all localities are much wanted.

1. MEGADERMA LYRA, Geoff.

a—c. Kim, Surat. 22nd April, 1897.

2. PIPISTRELLUS * ABRAMUS, Temm.

a—e. Pareli, Thana. 28th April and 1st May, 1897.

3. PIPISTRELLUS DORMERI, Dobs.

a. Mandvi, Surat. 10th April, 1897.

About the proper allocation of this rare bat there has been much difference of opinion, Dobson first forming a special genus—*Scotozous* for its reception and afterwards considering the latter merely as a subgenus of "*Vesperugo*." Blanford, in the "Mammals of India," places it in *Nycticejus* (*i.e.*, *Scotophilus*). Both the foundation of *Scotozous* and its reference to *Nycticejus* were due to its asserted possession of only a single upper incisor on each side. But a careful examination of the two

* The name *Pipistrellus*, used by Dobson in many of his earlier papers on Indian Bats, but afterwards abandoned by him in favour of *Vesperugo*, proves to have a superior claim to adoption over the latter, as it dates from 1829 ("Kaup, Entwick. Europ. Thiere," p. 98), while *Vesperugo* was only founded in 1839.

specimens obtained by Mr. Blanford at Chanda, Berar, and mentioned both by him and Dobson, shows that they do possess second incisors external to the median pair. These teeth are excessively minute, and can scarcely be of functional importance, and are probably deciduous, for Mr. Wroughton's specimen has no trace of them. The condition of the type it is unfortunately impossible to determine, for its premaxilla have been wholly broken away.

Further specimens of this interesting bat are much to be desired, in order that its normal dentition may be definitely ascertained.

4. SCOTOPHILUS KUHLII, Leach.

a—*b*. Mandvi, Surat. 10th April, 1897.

c. Pareli, Thana. 28th April, 1897.

5. SCOTOPHILUS WROUGHTONI, sp. n.

a. ♀. Kim, Surat. 21st April, 1897.

General characters as in *S. kuhlii*, but size much smaller, and without yellowish suffusion in the fur.

Ears of medium size, their inner margin evenly convex, their outer slightly concave below the tip, then slightly convex, continued below into a long rounded lobe in front of the base of the tragus. Tragus rather narrow, its inner margin concave, its outer with an angular lobe at the base succeeded by an emargination, above which it is strongly convex, curving round to the narrow tip; its anterior face with a distinct ridge across it, as in *S. kuhlii*.

Fur close and soft, uniform brownish from above, without any tinge of yellowish; the hairs white at their bases and gradually darkening to the brownish tips. Top of muzzle darker brown. Undersurface very pale fawn, almost white.

Skull and dentition apparently quite as in *S. kuhlii*, apart from the much smaller size. Last upper molar of the narrow shape characteristic of true *Scotophilus*.

Dimensions of the type, an adult female, measured in the flesh by collector :—

Forearm, 50 mm. (=1·96 in.)

Head and body, 75 ; tail, 40 ; hind foot, 11 ; ear, 9 mm.

Skull, basal length in middle line 13·7, greatest breadth 13, combined lengths of upper premolar and first two molars 4·7, front of lower canine to back of m_3 7·3.

Type.—B. M. 97, 6, 8, 12.

This bat may be readily distinguished from *Scotophilus kuhlii* by its much smaller size and the absence of a yellowish suffusion in the colour, while from *S. emarginatus*, of about the same size, it differs by the presence of a ridge across its tragus, by its ear not being markedly emarginated and by the different colour of its fur.

It is perhaps most nearly allied to the African *S. nigrita*, of which it may be the Indian representation, but is distinguished by its smaller size and whitish belly.

The discovery of so marked a new species as *Scotophilus wroughtoni* shows how far from being worked out the bats of India are. I have ventured to name the species in honour of Mr. Wroughton, to whom mammalogical science is already indebted for the discovery of the peculiar pale squirrel described by Mr. Blanford in this number of the Journal.

6. TAPHOZOUS LONGIMANUS, Hardw.

a. ♂. Mandvi, 2nd April, 1897.

Horace Knight ad. nat. lith.

Weet, Newman chromo.

INDIAN MOTHS.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

PART I.

By Sir G. F. Hampson, Bart., F.Z.S., F.R.S.

(*With Plate A.*)

(*Read before the Bombay Natural History Society on 30th September*, 1897.)

The following paper is the first of what I hope may be a series of annual papers aiming at keeping pace with the growth of the subject with which I have attempted to deal in my volumes in the "Fauna of India" series. These volumes can hardly be considered more than the necessary preliminary setting in order of a vast subject so as to reduce it to a workable state. Of how much still remains to be done, not only in collecting and classifying new species, but also in getting together sufficient material to settle disputed points with regard to those already described, no one can be conscious till he has worked at the subject, not to mention the immensely interesting field of the life-history of nearly all the species. Without referring to the smaller collections or the collections gradually acquired by the East India Company's Museum and the British Museum, the material for the subject-matter of the "Moths of India" almost entirely rests on the following collections :—

North-West Himalayas.—The large collections made in the outer ranges by the Rev. J. Hocking and Major Harford, whilst the moths of Kashmir are only known from one season's collecting by Mr. J. H. Leech and his assistants, who brought home a number of forms, including several *Sphingidæ*, which have never been taken since, although the valley is yearly frequented by such a large number of Europeans who are interested in sport and natural history, who have however let the moths severely alone ; the fauna is especially interesting from the large number of Palæarctic and Central Asian species represented. The Sikhim fauna is comparatively well known from the numerous collections made by W. Atkinson, Otto Möller, Elwes, and more recently by Dr. Pilcher, and the steady working at the subject by Mr. G. C. Dudgeon.

The Bombay Presidency was well worked for a number of years by Colonel Swinhoe, but a great deal still remains to be done, especially amongst the smaller species, whilst Central India has hardly been touched, though it cannot be expected to be very rich.

Mysore and Madras have had collections made in them by Captain Watson, and exhibit the typical widespread fauna of the plains of India, leaving, however, plenty of work to be done amongst the smaller species.

The hill ranges of Southern India and the Western Ghâts are by far the richest collecting ground in peninsular India, and may be said to be practically untouched, as far as systematic collecting is concerned, except for the collections made on the Nilgiris by Mr. Alfred Lindsay and myself, and it will be realized how much still remains to be done by any collector who will really work at the subject when it is said that I only collected moths there for a year and-a-half, and during that time I took over a thousand species, of which some three hundred proved to be undescribed.

Ceylon is the district in which more has been done in the way of steady collecting—spread over a large number of years—and in breeding than in any other ; the collections made by Thwaites, Mackwood, Green, Butt, Pole, and others have given us considerable knowledge of its moth fauna, yet a constant stream of new species shews there is still much to be done, even though decrease is beginning to be shown both in numbers and size.

In Upper Assam valuable collections were made at Margharita and in the Nâga Hills by W. Doherty during one of his rapid and brilliant expeditions ; but it is to the Khâsis we must turn if we wish to see what can really be done by systematic collecting in a wonderfully rich district, as will be observed by any one noting the overpowering proportion of new species from that locality in the following pages. This result is due to the immense collections made by the trained body of native collectors acting for Mr. A. Doncaster, and his immense series of specimens of innumerable species, all in most perfect condition, and linking the Indian fauna with that of China and Japan on the one hand, and the Malayan sub-region on the other, must be seen to be fully appreciated. I am much indebted to him for supplying me with specimens for description, and to the Hon'ble W. Rothschild for the

loan of the species described in his collection from the same source. Lastly, we must touch on the subject of Burma, lightly however, because of the small amount of work at the moths that has been done there compared to what remains to be done. The only collections of any size were made at Moulmein by Archdeacon Clerk, at Rangoon by Noble and by Doherty in Eastern Pegu and Tenasserim, though smaller collections were made by Fea, Colonel Bingham, and Captain Watson. These are sufficient to show how immensely rich the country is, a marked feature in the fauna being the numbers of brilliant *Sesiidæ*, *Syntomidæ* and *Zygænidæ*. It is to the hill ranges of Burma that we must look for a large proportion of the additions to the Indian fauna in the future, many of its species being also found in Borneo and Sumatra.

I have written the above sketch of the material of our present knowledge in the hopes of interesting more naturalists in India in the subject of its moths. It is probable that hitherto people who would otherwise have taken up the subject have been frightened by the vast numbers of species and the impossibility of acquiring any knowledge of their names and classification; but I hope that the volumes on the "Moths of India" may now have cleared the groundwork of the subject, and I shall be happy to send any one lists of the names of any species of which numbered specimens are sent to me at the British Museum.

EUPTEROTIDÆ.

54. TAGORA PATULA del. *Sphingognatha khasiana.*

54*a*. TAGORA KHASIANA. Moore. Lep. Atk., p. 77.

♂. Ochreous-brown; palpi black fringed with brown hair; wings with very numerous waved fuscous lines. Forewing with small hyaline discoidal spot; a double oblique line from apex to outer margin beyond middle; a waved submarginal line with fuscous and white spots on it at the veins. Hindwing with the basal half paler, with brownish patch at base of inner margin; a double waved postmedial line filled in with gray; a waved submarginal line with fuscous and white spots on it at the veins. ♀. With the submarginal line of forewing more distinct and curved; underside with the submarginal lines of both wings more prominent.

Habitat.—Khàsis. *Exp.* 98 mm.

SPHINGIDÆ.

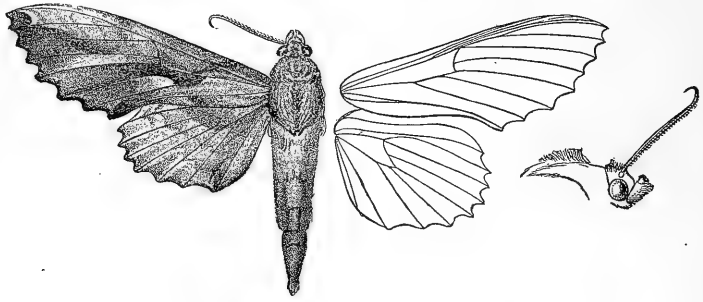
Genus PHYLLOSPHINGIA.

Phyllosphingia, Swinh. A. M. N. H. (6), XIX, p. 164 (1897).

Type.—*P. dissimilis*, Brem.

Range.—Siberia, China, Assam.

Palpi upturned, broadly scaled and not reaching vertex of head, which has a somewhat pointed crest ; antennæ fasciculate, recurved at tip ; thorax with sharp dorsal crest. Forewing long and narrow ; the outer margin oblique, evenly and deeply crenulate ; the outer angle lobed, the outer margin excised before it. Hindwing with the costa excised to middle, then produced upwards to a lobe ; the outer margin deeply and evenly crenulate ; veins 6·7 from upper angle.



Phyllosphingia dissimilis ♂

926. **Phyllosphingia dissimilis.** Brem., ' Bull. Acad,' Pét., III. p. 475., and Lep. Ost. Sib., pl. 3, f. 12. *perundulans*, Swinh., A.M.N.H. (6), XIX, p. 164.

♂. Red-brown, crest on head and thorax blackish. Forewing with the basal costal area suffused with fuscous, the inner area and costal area towards apex with gray ; an obscure dark line from costa before middle to below end of cell then running obliquely to apex before which it is incurved, the wedge-shape area between it and lower end of cell and vein 4 dark rufous ; the area between apex of wedge and outer angle fuscous-brown ; the apical part of outer area bright rufous ; a dark spot on costa beyond middle ; traces of two pairs of postmedial lines meeting towards inner margin. Hindwing with faint traces of postmedial lines ; some fuscous suffusion near upper angle of cell and anal angle. Underside of forewing with three ill-defined whitish bands from costa

of forewing towards apex converging to vein 5 ; hindwing with curved pinkish-white medial band.

Habitat.—Amur, China, Jaintia Hills, Assam. *Exp.* 120 mm.

130*a*. CHÆROCAMPA GRISEO-MARGINATA, n. sp. (Pl. A, fig. 12).

♀. Head gray ; palpi brown at sides ; thorax olive-brown with dorsal grey line, the collar and patagia outlined with gray ; abdomen pink at sides, gray-brown above, the segments edged with brown, paired lateral series of white spots, a dorsal gray stripe. Forewing gray with diffused patches of olive-brown and black ; a blackish patch at base of median nervure ; an oblique gray streak near base of inner area ; three very obscure waved black antemedial lines ; a black speck in cell, with a gray streak from it to beyond end of cell on vein 5 ; three indistinct dentate black postmedial lines ; gray streaks on the veins of outer area crossing a whitish submarginal band narrowing to apex and just above outer angle. Hindwing fuscous, the basal and inner areas grayish ; traces of a postmedial band ; cilia gray. Underside suffused with pink, the outer area grayish ; an indistinct waved black postmedial line.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 62 mm. *Type.*—In British Museum.

NOTODONTIDÆ.

P. 135. Under **Gargetta** insert *Phycidopsis* (Hampson) Ill. Het., IX, p. 91 (1893).

1956. *Phycidopsis* ALBOVITTATA. insert (syn.).

225*a*. GARGETTA *albovittata*.

226*a*. GARGETTA PUNCTIFASCIA, n. sp.

♂. Differs from *albimacula* in the vertex of head being pale. Forewing without the white patch ; indistinct double antemedial and medial series of black specks connected by traces of waved lines ; a more prominent postmedial double series of specks connected by a highly crenulate line ; an indistinct submarginal crenulate line ; marginal and cilial series of specks. Hindwing with the line parallel to the outer fuscous area reduced to a series of marks on the veins.

Habitat.—Khásis. *Exp.* 52 mm. *Type.*—In British Museum.

230*b*. *Pydna aroides* is a variety of 232*a*. **P. bela.**

238*a*. PYDNA OBLIQUA, n. sp.

♂. Head, thorax, and abdomen brownish-ochreous tinged with gray. Forewing ochreous irrorated with brown ; an oblique fuscous shade

from apex to inner margin before middle, with darker spot on it below the cell, and crossed by a diffused fascia along median recurve, olive-yellowish at base, brown towards end of cell ; a sub-basal dark point below costa ; ante-and postmedial series of dark points ; a submarginal series of oblique striæ. Hindwing fuscous with the cilia ochreous.

Habitat.—Khásis. *Exp.* 38 mm. *Type.*—In British Museum.

282*a*. CHADISRA ATRIFUSA, n. sp.

♂. Antennæ bipectinate, the apex simple ; palpi short and porrect. Head and thorax gray and brown ; branches of antennæ rufous ; abdomen reddish-brown and fuscous. Forewing gray, irrorated with brown and almost wholly suffused with black, leaving patches of gray at base, middle of costa and inner margin and middle of outer area ; a double irregularly-waved antemedial line, a discocellular lunule, a double curved crenulate postmedial line. Hindwing yellowish-white suffused with rufous ; traces of a medial line, especially on inner area ; some rufous marks on cilia towards anal angle and a blotch at anal angle.

Habitat.—Khásis. *Exp.* 50 mm. *Type.*—In British Museum.

285*a*. PHEOSIA CENTRISTICTA, n. sp.

♂. Head and thorax gray ; abdomen fuscous with some white in anal tuft. Forewing fuscous-grey ; a whitish patch at base of costa bounded by a curved black line ; an antemedial black line incurved from costa to below cell where it is angled outwards, then again incurved to inner margin ; a large white patch in and beyond end of cell with a very prominent black spot on it, traces of a yellowish reniform stigma and black striæ on median nervures ; a postmedial black line nearly straight from costa to vein 3, near outer margin then very obque, the veins beyond it streaked with black ; apical area rufous. Hindwing pure white, with black marginal patch near anal angle.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 54 mm. *Type.*—In British Museum.

288*a*. PHEOSIA PICTIBASIS, n. sp.

♂. Head and thorax dark brown mingled with gray hairs ; patagia mostly fiery-red ; abdomen blackish. Forewing with short white streak at base of median nervure, with fiery-red beyond it ; the costal half of wing pale fawn, with brown speck and streak on costa towards apex ; an oblique streak from outer margin below apex with some brown suffusion below it ; a diffused chocolate fascia along median

nervure to outer margin, emitting a bar before middle half-way to inner margin ; the inner area purplish-gray with traces of minutely dentate postmedial line. Hindwing fuscous-brown.

Habitat.—Khásis. *Exp.* 40 mm. *Type.*—In British Museum.

298*a*. HYPERÆSCHRA TRICHOSTICHA, n. sp.

♂. Fuscous-brown ; collar blackish ; thoracic tuft fringed with black. Forewing with traces of highly crenulate lines on basal area, and two small tufts of raised black scales below the cell ; an antemedial line with tufts of raised black scales on it, excurved in cell and above inner margin ; a postmedial double crenulate line, obsolescent towards costa, incurved below vein 3 and with tufts of raised black scales on it ; small raised submarginal tufts of black scales with fuscous marks on their inner side near apex, above vein 4 and above and below vein 2. Hindwing uniform fuscous-brown.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 58 mm. *Type.*—In British Museum.

CYMATOPHORIDA.

329*a*. THYATIRA UNDULANS, n. sp.

♀. Head and thorax reddish-brown, vertex of head and a patch on patagia pinkish-white ; abdomen grayish. Forewing with black line from base of costa running with a sinuous curve to interno-median interspace beyond middle, then up to costa before apex, enclosing a large brown costal area with median diffused triangular pinkish-white patch on it, and oblique brown costal striga ; below the line is a sinuous pinkish-white patch from base to middle of wing ; the inner area brown, with fine whitish line from end of the white patch much retracted on vein 1 and defined by black above inner margin, and another fine line from lowest point of sinuous line to inner margin ; outer area pinkish-white, with oblique subcostal striga and indistinct crenulate submarginal line with some brown suffusion beyond it, becoming a prominent bidentate blackish mark above vein 2. Hindwing whitish with indistinct curved medial line and some marginal brown suffusion.

Habitat.—Khásis. *Exp.* 40 mm. *Type.*—In British Museum.

SESIIDÆ.

351*a*. TRILOCHANA CHRYSOCHLORIS, n. sp.

♂. Palpi clothed with very long hair. Head, thorax, and abdomen

black ; apical half of palpi yellow ; frons, collar, patches on patagia and meta-thorax golden-green ; abdomen with golden-green spots on basal segment ; five bands on following segments and two streaks meeting at extremity on anal segment ; third and fourth segments ventrally white. Forewing reddish-brown with golden-green spot at base. Hindwing hyaline, the veins and margins brown.

Habitat.— Khásis. *Exp.* 46 mm. *Type.*—In British Museum.

SYNTOMIDÆ.

452. **Syntomis baicea** is distinct from **actea**, the former having the antennæ serrate in ♂ and belonging to the section *Hydrusa*, the latter bipectinate.

461*a*. SYNTOMIS PHŒNICOZONA, n. sp.

♂. Black ; antennæ white at tips ; thorax with crimson patches below ; meta-thorax and first segment of abdomen crimson ; wings with the outer area suffused with dull blue. Forewing with short wedge-shaped hyaline patch in end of cell and irregular quadrate patch below the end ; a small postmedial spot above vein 6 and two in interspaces between veins 3 and 5. Hindwing with two small hyaline postmedial spots in interspaces between veins 2 and 5.

Habitat.—Andamans. *Exp.* 20 mm. *Type.*—In British Museum.

ZYGÆNIDÆ.

ZYGÆNINÆ.

481*a*. CALLARTONA MICROSTICTA, n. sp.

♂. Differs from *purpurascens* in being browner; head brown with some yellow on frons and palpi. Forewing with two small yellow post-medial spots on costa. Hindwing with the yellow beyond cell not extending above vein 4 ; underside without the yellow costal fascia.

Habitat.—Khásis. *Exp.* 22 mm. *Type.*—In British Museum.

CHALCOSIINÆ.

514*a*. HERPA EUPOMA, Swinh. A. M. N. H. (6) XIX, p. 166.

Forewing with vein 9 from upper angle of cell. ♂ Black ; collar yellowish ; tegulæ with large crimson spots. Forewing with yellow costal fascia, crimson at base and narrowing to before apex ; subbasal black line with some yellow on its inner edge ; veins finely streaked with yellow ; cilia yellow. Hindwing with broad brilliant crimson

costal fascia, with an orange-yellow fascia below it, filling the lower part of cell ; the margin and cilia orange-yellow.

Habitat.—Khási and Jaintia Hills. *Exp.* 42 mm.

PSYCHIDÆ.

627. Acanthopsyche subteralbata.

The larva is destructive to tea in Chittagong. The type only has the neuration as figured ; three specimens from Ceylon and four from Chittagong have veins 4-5 of forewing shortly stalked or from cell ; 7 shortly stalked with 8 ; 9 absent ; hindwing with vein 6 absent.

Acanthopsyche, sub-gen. Hemilipia, nov.

Antennæ bipectinate to middle, the branches increasing from base, then suddenly shortening : fore tibia with a long spine. Forewing produced, the outer margin very oblique ; veins 1*b* and *c* separate, 1*c* reaching outer margin ; 1*b* without branch to inner margin ; a forked veinlet in cell ; veins 2 and 3 at intervals before angle ; 4, 5 from angle ; the upper part of cell very much produced and the discocellulars highly angled ; 6 from below upper angle ; 7, 8 from angle ; 9 absent ; 10, 11 free. Hindwing with the apex rectangular, the anal angle lobed ; veins 2 and 3 at intervals ; 4 from angle ; 5 absent ; 6 from below 7 ; a forked veinlet in cell.

Acanthopsyche punctimarginalis ♂ ½

632*a*. Acanthopsyche (*Hemilipia*) punctimarginalis, n. sp.

♂. Antennæ fulvous ; head, thorax and abdomen clothed with long black hair. Forewing with the costal area to beyond middle and the inner area to outer angle whitish marked with black specks and conjoined spots and strigæ ; the rest of the wing hyaline with the veins black, and with some sparsely scattered black scales. Hindwing hyaline with a few black scales and the vein black ; the whole inner area clothed with black hair.

Habitat.—Puttalam, Ceylon (Pole). *Exp.* 26 mm. *Type.*—In British Museum.

633*a*. Psyche (*Heylærtsia*) quadripuncta, n. sp.

♂. Forewing with vein 6 from below angle of discocellulars ; 7 stalked with 8 ; 9 from near base of 8. Uniform black-brown with a slight

silky lustre. Forewing irrorated with a very few white scales; a white bar on discocellulars and spot on the junction of veins 1*b* and *c*.

Habitat.—Puttalam, Ceylon (Pole). *Exp.* 16 mm. *Type.*—British Museum.

ARBELIDÆ.

676*a*. ARBELA MILLEMACULATA, n. sp.

♂. Head, thorax, and abdomen black mixed with long orange hairs. Forewing orange-brown, tessellated with very numerous black spots somewhat conjoined towards middle of outer margin. Hindwing black, with the cilia golden. ♀. With the abdomen orange-yellow, the anal tuft black, wings orange-yellow, forewing with the basal area black, except at costa; a medial black band composed of spots run together, the outer area with three series of spots approximating towards outer angle. Hindwing with broad postmedial black band composed of confluent spots.

Habitat.—Khásis. *Exp.* 22 mm. *Type.*—In British Museum.

DREPANULIDÆ.

P. 329. Under **Macrocilix** insert (syn.)

Dipriodonta.—Warr. Nov. Zool. iv., p. 14 (1897).

Section III (*Dipriodonta*). Antennæ of male laminate; forewing with veins 10 and 11 stalked, 10 anastomosing with 9-8 to form an areole.

700*a*. MACROCILIX SERICIA. Warr, Nov. Zool., iv., p. 14.

Silky white; palpi and forelegs blackish below. Forewing with traces of a waved brown antemedial line angled below costa; a large hyaline patch in, below, and beyond lower end of cell; black points at lower angle of cell and origin of vein 3; a double-waved postmedial brown line, curved below costa, with some brown suffusion between it and apex and a sub-apical black point, with a black point beyond it on inner margin; traces of a waved submarginal line and marginal series of black specks. Hindwing with black point at lower angle of cell; traces of double-waved postmedial line and submarginal line; a marginal series of fine black striæ.

Habitat.—Khásis. *Exp.* 22 mm.

P. 331. Under **Auzata** insert (syn.) *Gonocilix*. Warr. Nov. Zool. iii, p. 337 (1896).

702*a*. AUZATA SIMPLICIATA. Warr. Nov. Zool., iv., p. 13.

♂. White. Forewing with the outer margin evenly curved ; traces of two sinuous fuscous antemedial lines and two postmedial lines, the latter with slight ocellate spot on vein 4 ; traces of a sinuous submarginal line. Hindwing with indistinct antemedial and medial and dentate submarginal lines ; the outer margin slightly angled at vein 4.

Habitat.—Khásis. *Exp.* 34 mm.

Section II (*Gonocilix*). Forewing with vein 10 arising from cell and anastomosing with 8-9 to form an areole.

702*b*. AUZATA OCELLATA. Warr. Nov. Zool. iii, p. 337.

White ; head blackish ; abdomen with fuscous patches on dorsum ; forewing with the base of costa fuscous ; a sinuous antemedial series of three fuscous spots ; a postmedial fuscous line broken below costa, then very acutely angled and expanded into a patch, then very strongly incurved, and with a large olive-fuscous patch on its outer side; with the veins near lower angle of cell on it white ending in black specks, then double with a yellow mark on it, and with a fuscous speck on each side of it on inner margin ; a hyaline spot beyond the olive patch between veins 2 and 3 ; a diffused crenulate submarginal band interrupted below costa, and with two hyaline specks on it between veins 2 and 4 ; a marginal series of fuscous spots. Hindwing with two subbasal and three antemedial waved fuscous lines not reaching costa and interrupted near vein 1 ; three postmedial hyaline spots between veins 2 and 5 ; a maculate fuscous submarginal band, wide at middle, and with two hyaline spots on it between veins 2 and 4 ; a marginal series of fuscous spots.

Habitat.—Khásis. *Exp.* 34 mm.

719*a*. DREPANA HUMERATA. Warr. Nov. Zool. iii, p. 335.

Pale violaceous-gray ; head fuscous. Forewing with the costa fulvous ; an antemedial fulvous line very acutely angled below costa ; a black spot at upper angle of cell, and cluster of black and white-centred gray specks at lower angle ; a ferruginous line from middle of costa, very acutely angled below costa, then postmedial and sinuous ; the costa more strongly fulvous towards apex ; a dentate black submarginal line, obsolete towards costa ; a black speck with a white one on each

side of it at apex and a marginal series of specks ; cilia fulvous. Hindwing paler, with indistinct sinuous postmedial rufous line.

Habitat.—Khásis. *Exp.* 22 mm.

720. DREPANA LILACINA insert (syn.) *Albara gracillima.* Warr. Nov. Zool. iv., p. 12.

722*a*. DREPANA OPALESCENS, Warr. Nov. Zool. iv., p. 12.

♂. Dark or pale purplish-gray; head blackish. Forewing with traces of highly-waved antemedial line ; some ochreous specks at lower or both angles of cell ; an indistinct line running out to a very acute angle below apex, then becoming submarginal, crossing a prominent brown oblique line with fine line beyond it from apex to middle of inner margin; the apex highly produced and dark; cilia brown. Hindwing with indistinct curved subbasal line ; an oblique prominent brown medial line ; an indistinct dentate submarginal line ; cilia brown.

Habitat.—Khásis. *Exp.* 34-40 mm.

726. DREPANA TRILINEARIA insert (syn.) *Tridrepana trisulcata.* Warr. Nov. Zool. iii, p. 340.

734. DREPANA ALBONOTATA insert (syn). *Tridrepana septempunctata.* Warr. Nov. Zool. iii, p. 339.

Var. with the whole forewings suffused with bright rufous except the base and outer angle, the submarginal spots below apex larger.

738. DREPANA QUADRIPUNCTATA insert (syn.) *Tridrepana diluta* Warr. Nov. Zool. iv, p. 18.

Under PROBLEPSIDIS insert *Euphalacra*, Warr. Nov., Zool. iv., p. 195 (1897).

Antennæ strongly laminate ; forewing with the outer margin twice excised between apex and vein 4 ; 6 from areole ; 10 anastomosing with 8-9. Hindwing with the outer margin excised between veins 6 and 4.

741*d*. PROBLEPSIDIS NIGRIDORSATA, Warr. Nov. Zool. iv., p. 196.

♂. Pale ochreous, clouded with rufous ; frons fuscous ; abdomen with a fuscous band on second segment. Forewing with very numerous crenulate rufous lines ; a rufous shade below costal area ; black obliquely placed specks at the angles of cell ; an oblique line from outer margin below apex to middle of inner margin ; the crenulate lines when they meet it becoming oblique and running along with it, the line beyond it also oblique and diffused ; a marginal series of

dark points. Hindwing with numerous crenulate rufous lines, two subbasal and two postmedial more prominent; black specks at angles of cell; a marginal series of specks.

Habitat.—Khásis. *Exp.* 38 mm.

746*a*. PHALACRA MULTILINEATA. Warr. Nov. Zool. iv., p. 16.

Differs from *vidhisara* in being much more clouded with fuscous. Forewing with the crenulate lines more distinct, less oblique and much more numerous; a pale rufous fascia in the fold from middle of cell to outer margin below apex. Hindwing with numerous less oblique lines on basal area; the medial area without lines; the postmedial area with four fine prominent oblique quite straight lines between the postmedial and submarginal waved lines.

Habitat.—Khásis. *Exp.* 32-38 mm.

747. PHALACRA EXCISA insert (syn.) *Phalacra strigata.* Warr. Nov. Zool. iii, p. 331.

An ochreous variety with the markings of forewing obsolescent and replaced by a curved dark brown medial band very oblique below costa, then interrupted and met by the dark brown fascia from outer margin; some dark brown patches and points on the submarginal markings.

Habitat.—Khásis.

THYRIDIDÆ.

764. *Striglina decussata* insert **Striglina glareola.** Feld. Reise Nov., pl. 134, f. 11, which has precedence, and (syn.) *Striglina duplicifimbria.* Warr. A. M. N. H. (6), xviii, p. 227.

766*a*. RHODONEURA BULLIFERA. Warr. Nov. Zool. iii, p. 343.

♀. Palpi with the second joint reaching vertex of head, the third long and porrect; outer margin of both wings slightly excised below apex. Yellow-brown, thorax suffused with fuscous; wings ochreous, finely reticulated with red-brown. Forewing suffused with fuscous on medial and inner areas; costa with numerous minute black points; a whitish basal spot, a series of small antemedial spots, a medial oblique maculate band from below costa to vein 1; an obliquely-curved maculate band from apex to inner margin before outer angle, and some marks on outer margin, all these markings being reticulated with rufous. Hindwing with subbasal maculate whitish band, a postmedial band of spots, two towards costa and two beyond lower angle of cell small, and a curved series from apex to outer margin at vein 3, all reticulated

with rufous. Underside of forewing with fine black and white streaks in cell and beyond upper angle.

Habitat.—Khásis. *Exp.* 25 mm.

756*b*. RHODONEURA MOLLIS. Warr. Nov. Zool. iii, p. 341. (Pl. A fig. 13).

Bonisia mediostrigata, Warr. Nov. Zool. iv., p. 197.

♂. Palpi with the third joint long and porrect ; outer margin of both wings slightly excised below apex ; pale yellowish-brown ; abdomen dark, with whitish segmental lines ; wings with rather sparse brown striæ Forewing with fuscous line along median nervure and vein 3 ; basa costal area, an oblique medial band terminating at lower angle of cell, another terminating at upper angle, a band across apical area becoming diffused towards outer margin, and two spots towards apex, grayish ; some brown lines across inner half of wing, two at middle crossing each other ; a brown line on inner side of apical band and another line across apex. Hindwing with postmedial and submarginal lines oblique from costa to middle, then curved round.

Habitat.—Sikhim ; Khasis. *Exp.* 42-60 mm.

780*a*. RHODONEURA CURVILINEA. Warr. A. M. N. H. (6), xviii, p. 229.

♂. Gray-brown, wings evenly striated with dark brown. Forewing with obscure subbasal antemedial and medial lines; the postmedial and sub marginal lines more distinct, very oblique below costa, the former angled on vein 6, the latter curved ; apical area bright chestnut. Hindwing with curved subbasal and oblique medial fine dark lines ; the postmedial line forking from middle to anal angle ; a submarginal line from costa to vein 2. Underside of forewing with bright chestnut subcostal fascia and black and white streaks in and beyond end of cell ; chestnut patches below cell and at outer angle. Hindwing chestnut.

Habitat.—Khásis. *Exp.* 24 mm.

786 will stand as RHODONEURA RETICULATA, Moore.

786*a*. **Rhodoneura dissimulans.** Warr. A. M.N. H. (6), xviii, p. 227.

Banisia ordinaria. Warr. A. M. N. H. (6), xviii, p. 228.

Differs from *reticulata* in having no black and white streaks on forewing below. One specimen is much more rufous in tone, with the bands bright chestnut.

Habitat.—Khásis, Borneo, Queensland. *Exp.* 24-40 mm.

786*b*. RHODONEURA TETRAGONATA, Wlk. Journ. Linn. Soc. vii, p. 78.

Rhodoneura quadripunctula, Pag. Iris. v, p. 100.

Pharambara vinosa, Butl. P.Z.S. 1892, p. 130, pl. vi, f. 8.

Rhodoneura jubralis, Swinh., A. M. N. H. (6), xvi, p. 299.

Differs from *reticulata* in being smaller and grayer; both wings with a pair of hyaline white spots near origin of vein 2; forewing without black and white streaks below.

Habitat.—Khásis, Borneo. *Exp.* 30 mm.

789. RHODONEURA ALTERNATA insert (syn.) *Banisia bifimbriata*. Warr. Nov. Zool. iv, p. 20.

790*a*. RHODONEURA ATRICLATHRATA. Warr. Nov. Zool. iii, p. 340.

♂. Pale reddish; head, thorax, and abdomen suffused with rufous, the last with blackish dorsal line and some lateral and ventral spots, Forewing with rufous suffusion striated with fuscous on basal half, costa, and a discocellular patch conjoined to costa; the rest of wing reddish-ochreous; an ill-defined postmedial band with black specks and spots on it, and narrowing at middle; outer area with black specks and spots. Hindwing suffused with rufous and spotted with black.

Habitat.—Khásis. *Exp.* 25 mm.

798*a*. RHODONEURA DOHERTYI, Warr. Nov. Zool. iv., p. 196.

(Pl. A, fig. 1.)

Rhodoneura stenosoma, Hmpsn. P.Z.S. 1897 ined.

♂. Palpi with the third joint long and reaching well above vertex of head; abdomen very long. Gray; abdomen with some dark marks on dorsum; wings sparsely irrorated with black scales and closely striated with fine dark striæ; traces of five bands on forewing and three on hindwing; forewing with whitish mark below apex, with dark speck on it, more prominent on underside. Underside of hindwing with some dark brown patches.

Habitat.—Ceylon, Bali, Queensland. *Exp.* 28 mm.

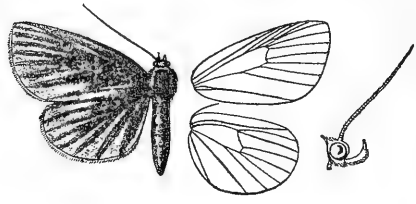
Genus BEGUMA.

Beguma, Warr. A. M. N. H. (6), xviii, p. 228 (1896).

Type.—*B. constellata*, Warr.

Range.—Assam.

Palpi upturned and reaching vertex of head, the second joint fringed with scales, the third naked and acuminate; antennæ thickened and flattened. Forewing with the apex rounded, the outer margin evenly curved; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7 from angle; 8 anastomosing with 9, which is given off from 10 to form an areole. Hindwing with veins 3-4 from angle of cell; 5 from above angle; 6-7 from upper angle; 8 free.



Beguma constellata ♂ ½

808*a*. Beguma constellata. Warr. A.M.N.H. (6), xviii, p. 228.

♂. Head fulvous; thorax black-brown; abdomen fulvous. Forewing pale, suffused with pale red, deeper and purplish at base, along veins only on outer area. Hindwing similar, but with the purplish confined to inner basal area. Underside of forewing with a few silvery-blue spots below costa and in cell; the basal half of inner area thickly spotted. Hindwing with the basal area thickly spotted with silvery-blue running outwards to beyond middle on costa and below cell.

Habitat.—Khásis. *Exp.* 42 mm.

LIMACODIDÆ.

822*b*. Macroplectra apicalis, n. sp.

Glossy black-brown. Forewing with small triangular yellowish-white apical spot; vertex of head, frons, and palpi pale yellow.

Habitat.—Khásis. *Exp.* ♂ 16, ♀ 18 mm. *Type.*—In British Museum.

This species has the extremely thickened and flattened antennæ of *semiaurantia* in the ♂, also the large tuft of scales on metathorax; vein 10 is from the cell, but the long palpi and spurs will separate the genus from *Oxyplax*.

Section IV. Antennæ of male serrate throughout.

844*a*. Natada acatharta, n. sp.

♂. Gray-brown suffused with fuscous. Forewing with dark points at base and end of cell and traces of a dark line below the cell; a large dark postmedial patch between vein 7 and inner margin with obscure pale centre with dentate outer edge; a dark marginal apical line. Hindwing uniform fuscous.

Habitat.—Khásis. *Exp.* 30 mm. *Type.*—In British Museum.

849*a*. Birthama diffusa, n. sp.

♀. Head, thorax, and abdomen clothed with whitish and rufous hair; abdomen with some of the lateral scales tipped with black. Forewing rufous, with whitish patches at base of inner area and outer angle, and a large semi-circular apical patch extending down to vein 3, and bounded on inner side by a fuscous line; a diffused black medial band broad at costa, narrowing to inner margin. Hindwing black-brown with some whitish near anal angle.

Habitat.—Khásis. *Exp*. 36 mm. *Type*.—In British Museum.

862*a*. Parasa pæera, n. sp. (Pl. A, fig. 10.)

♀. Pale gray-brown; vertex of head and thorax bright yellow-green. Forewing with gray-brown basal patch wide at costa, narrowing to inner margin, and bounded by a dark line; medial half bright yellow-green bounded by a curved minutely-waved dark line; outer area gray-brown. Hindwing gray-brown tinged with fuscous.

Habitat.—Puttalam, Ceylon (J. Pole). *Exp*. 32 mm. *Type*.—In British Museum.

880*a*. Trichogyia metamelæna, n. sp.

♂. Head, thorax, and anal tuft reddish-brown; abdomen fuscous. Forewing reddish-brown slightly irrorated with fuscous. Hindwing fuscous-black.

Habitat.—Sikhim, 1,800 (Dudgeon). *Exp*. 12 mm. *Type*.—In British Museum.

882*a*. Aræogyia cupreata, n. sp.

♀. Cupreous-brown tinged and irrorated with fuscous. Forewing with a bright cupreous tinge; a dark sinuous submarginal line, the area beyond it with a purple gloss; a prominent black marginal line becoming obsolete near outer angle; cilia yellow at tips. Hindwing dark brown; cilia pale yellow with a dark line through them.

Habitat.—Khásis. *Exp*. 16 mm. *Type*.—In British Museum.

884*a*. Cania notodonta, n. sp.

♂. Antennæ bipectinate with rather short branches to apex; forewing with scale-tooth on middle of inner margin. Pale silky yellow-brown; forewing with series of dark points from costa before apex to end of scale-tooth on inner margin.

Habitat.—Khásis. *Exp*. 30 mm. *Type*.—In British Museum.

891*b*. NAROSA ENDODONTA, n. sp.

♂. Differs from *conspersa* in the lines near inner margin of forewing being strongly dentate, the postmedial line not bent inwards to lower angle of cell, and without orange patch above it. Thorax with more white suffusion; abdomen with the dorsal tufts fiery-red.

Habitat.—Khásis. *Exp*. 26 mm. *Type*.—In British Museum.

893*a*. NAROSA PACHYCERA, n. sp.

Antennæ of male one and-a-half times the length of forewing, and extremely thickened and flattened. Hindwing with vein 6 from cell well separated from 7. ♂. Pale gray-brown of a silky texture and irrorated with a few fuscous scales; antennæ and anal tuft ochreous. Forewing with the subcostal nervure white towards end of cell; a diffused sinuous ill-defined fuscous band from costa beyond middle to outer angle; a slight dark marginal line. Hindwing somewhat more fuscous. ♀. Much more rufous; forewing with a medial whitish patch on costa; the postmedial band indicated by indistinct sinuous lines; cilia mostly fuscous. Hindwing pale.

Habitat.—Khásis. *Exp*. ♂ 20, ♀ 22 mm. *Type*.—In British Museum.

911*a*. **Metanastria** *rubra*= *Odonestis* **dieckmanni**, Græser. Berl. Ent. Zeit., xxxii, p. 128, Amur.

942. ODONESTIS LÆTA insert (syn.) *Odonestis ossa*, Swinh., A. M. N. H. (6), xix, p. 410.

LYMANTRIIDÆ.

972*a*. AROA ATRESCENS, n. sp.

♂. Head and anal tuft rufous-brown; thorax and abdomen fuscous-brown. Forewing rufous-brown suffused with fuscous; very indistinct pale waved ante-postmedial and submarginal lines. Hindwing black-brown; cilia of both wings rufous.

Habitat.—Khásis. *Exp*. 20 mm. *Type*.—In British Museum.

996*a*. CIFUNA BIUNDULANS, n. sp.

♂. Ochreous; abdomen suffused with fuscous. Forewing with strongly bisinuate pale antemedial line with broad fuscous band on its inner side; a minutely-waved postmedial pale line strongly excurved at middle and with fuscous suffusion on its outer edge strongest towards costa. Hindwing paler with slight fuscous irroration.

Habitat.—Khásis. *Exp*. 22 mm. *Type*.—In British Museum.

1060*a*. EUPROCTIS ENDOPLAGIA, n. sp.

♂. Pale yellow ; forewing with diffused fuscous patch on middle of inner area.

Habitat.—Khásis. *Exp*. 22 mm. *Type*.—In British Museum.

1091*a*. EUPROCTIS OLIVATA, n. sp.

Head whitish; thorax brownish ; abdomen fuscous, the anal tuft orange. Forewing gray-brown irrorated with black and suffused with olive-yellow ; a waved white antemedial line ; a lunulate postmedial line angled inwards below costa, oblique below vein 4 and angled inwards below 2 to near the antemedial line ; cilia chequered brown and white. Hindwing white suffused with fuscous, the costal area whiter.

Habitat.—Khásis. *Exp*. ♂ 28, ♀ 40 mm. *Type*.—In British Museum.

1091*b*. EUPROCTIS XANTHOPERA, n. sp.

Forewing with vein 7 absent. ♂. Head and thorax gray-brown; abdomen blackish with the anal tuft orange. Forewing gray-brown irrorated with black; a yellow spot in cell; a sinuous whitish medial line angled below costa, and crenulate submarginal line highly excurved at middle; patches of brown irrorated with black in the interspaces between the two lines ; an apical yellow patch with two spots below it and two spots above outer angle ; cilia yellow and brown. Hindwing with the basal half fuscous ; the outer half yellow.

Habitat.—Khásis. *Exp*. 34 mm. *Type*.—In British Museum.

1092*a*. EUPROCTIS ATRIPUNCTA, n. sp.

♂. Head, thorax, and abdomen rufous and white ; shaft of antennæ white. Forewing whitish suffused with rufous ; double white ante and postmedial lines, the former slightly waved, the latter crenulate, bent inwards below vein 4 and joining the antemedial line at inner margin ; a black discocellular spot ; the outer area white ; the rufous suffusion beyond the postmedial line angled outwards below costa and at middle. Hindwing yellowish-white. ♀. With the rufous suffusion on forewing more prominent. Hindwing brownish-ochreous, the margin whitish.

Habitat.—Khásis. *Exp*. ♂ 28, ♀ 46 mm. *Type*.—In British Museum.

1102*a*. EUPROCTIS BIDENTATA, n. sp.

♂. Yellow ; abdomen blackish, except at base and extremity. Forewing with the basal two-thirds suffused with brown and irrorated with black, leaving a yellow patch on costa before middle, its outer edge sending two strong teeth outwards below veins 6 and 5; a subapical dark spot. Hindwing pale yellow.

Habitat.—Sikhim (Lidderdale). *Exp.* 38 mm. *Type.*—In British Museum.

ARCTIIDÆ.

LITHOSIINÆ.

1281*a*. CYANA CATORHODA, n. sp.

Differs from *peregrina* in the forewing being without the black edge to the bands. Hindwing and underside bright rose-pink ; male with the sexual characters on hindwing.

Habitat.—Khásis. *Exp.* ♂ 24, ♀ 30 mm. *Type.*—In British Museum.

1284*a*. *Cyana dudgeoni*, the ♀ described is *alborosea*, Wlk., the true female has three black spots on forewing ; veins 4-5 from cell. Hindwing with veins 6-7 stalked ; underside as in male. It will form Section II-E. *Habitat.*—Khásis.

1289*a*. CYANA WATSONI, n. sp.

♂. Pure white ; palpi, frons, and legs tinged with fuscous ; collar, patagia, and metathorax fringed with orange. Forewing with orange spot near base of costa ; a broad slightly sinuous oblique antemedial orange line ; the postmedial line bent inwards to costa, with the uppermost black spot beyond it at end of tuft and divided into two, the line expanding above inner margin ; a submarginal line bent inwards and expanding below apex and not reaching inner margin. ♀. With the upper black spot single, the postmedial line well beyond it and not bent inwards to costa.

Habitat.—Khásis, Upper Burma (Watson). *Exp.* ♂ 30, ♀ 38 mm. *Type.*—In British Museum.

1289*b*. CYANA KHASIANA, n. sp.

♂. White ; palpi black ; forelegs banded with black ; antennæ brown ; thorax with three orange bands. Forewing with the base of costa orange ; a short subbasal band ; an oblique antemedial band, the spot at upper angle of cell small ; the postmedial band oblique to vein 4, and

with a small black spot beyond it below costa. ♀. Forewing without orange on base of costa, the black spot at upper angle of cell large, and no spot beyond the postmedial band.

Habitat.—Khásis. *Exp.* ♂ 38-46, ♀ 52 mm. *Type.*—In British Museum.

1303*a*. KERALA DORSOVIRIDIS, n. sp.

Differs from *punctilineata* in the thorax being pale sea-green, the head brown. Forewing gray-brown with rufous specks and suffusion; discocellulars without white scales; the inner area below the submedian fold pale sea-green; the postmedial line near the submarginal line which is maculate; no marginal white line. Hindwing with the sexual patch of male cream-coloured.

Habitat.—Khásis. *Exp.* 40 mm. *Type.*—In British Museum.

1328*a*. CHRYSORABDIA AURANTIACA, n. sp.

♂. Differs from *bivitta* ♀ in the palpi, frons, and patagia being black, the last fringed with yellow. Forewing with no blue on the fasciæ, the costal fascia broadening to near apex, then slightly narrowing; the submedian fascia broadening to its extremity near outer margin; cilia blackish at tips.

Habitat.—Khásis. *Exp.* 60 mm. *Type.*—In British Museum.

1381*b*. GAMPOLA PUNCTIVENA, n. sp.

♂. Head, collar, and anal tuft orange-yellow; thorax and abdomen gray. Forewing gray-brown, with black point below end of cell in interno-median fold. Hindwing dirty white; cilia of both wings pale yellow.

Habitat.—Sikhim; 1,800 feet (Dudgeon). *Exp.* 20 mm. *Type.*—In British Museum.

This species and *binotata* belong to the same section as *normalis*.

1381*c*. GAMPOLA MURICOLOR, Wlk. Journ. Linn. Soc., vol. vi., p. 105.

Silky gray; vertex of head and costa of forewing pale yellow; cilia yellowish.

Habitat.—Khásis, Borneo. *Exp.* 16-22 mm.

(To be continued.)

THE LARGE INDIAN SQUIRREL (*SCIURUS INDICUS*, ERX.) AND ITS LOCAL RACES OR SUB-SPECIES.

By W. T. Blanford, F.R.S.

(*With two Plates*).

(*Read before the Bombay Natural History Society, on 30th Sept.*, 1897.)

As is well known, one of the largest and handsomest of all squirrels inhabits several of the tree forests in the Peninsula of India. Unlike the small striped forms, the large Indian squirrel is by no means generally distributed ; it may have had a more extensive range formerly, and it is probable that its haunts have been gradually restricted by the clearing of the forests and the spread of cultivation, as is the case with so many woodland types of beasts, birds, reptiles, insects, &c. At the present time, the large squirrels appear, so far as I have been able to ascertain, to be only found in the forest tracts near the western coast, in some parts of Southern India, such as Mysore, and in the great wooded region between the Ganges and Godavari, east of longitude 80°E. (the meridian of Jubbulpore). The question of the occurrence of this squirrel beyond the limits of the Indian Peninsula (Cis-Gangetic India) will be noticed in the sequel.

Until the other day it was generally supposed that the races of *Sciurus indicus* were pretty well known, and the only question was, whether we should divide these squirrels into three species with Jerdon (Mam. Ind., pp. 166, 167), or into two with Anderson (Zool. Res., Yunnan Exp., pp. 222, 223), or whether, as proposed by W. Sclater (Cat. Mam. Ind. Mus., Pt. 2, p. 10), we should unite all under one specific heading. The latter view was adopted in my work on Indian Mammals (Faun. Brit. Ind. Mam., p. 371), but I expressed an opinion that Jerdon's three forms were readily recognizable as races or sub-species. One of these races remained nameless, for I shewed that the specific term *S. maximus* adopted by Jerdon belonged to another race. Some further evidence as to the range of the different races, and the degree to which they pass into each other, is still wanted to complete our information, but it has not for a long time past been supposed that in the case of so conspicuous and so well-known an Indian mammal any very important addition was likely to be made to its natural history.

Mintern Bros. Chromo lith. London.

1. SCIURUS INDICUS (typical form)
2. SCIURUS INDICUS var. DEALBATUS.

Mintern Bros Chromo lith. London.

1. SCIURUS INDICUS var. MALABARICUS.
2. SCIURUS INDICUS var. BENGALENSIS.

I believe it was as great a surprise to others as it was to myself to hear that a new squirrel had been found in the Bombay Presidency. I was not greatly astonished some years ago when a new *Paradoxurus* (*P. jerdoni*) was found on the Anamalis,* but then a *Paradoxurus* is a thoroughly nocturnal animal, and although in many parts of the country one of the commonest mammals is very rarely seen, whereas squirrels are diurnal in their habits, and are amongst the most familiar and conspicuous of the mammalia.

When, however, Mr. Phipson placed in my hands three skins and skulls of a peculiar pale squirrel obtained by Mr. R. C. Wroughton in the Dangs, the fever-haunted and little-visited tract of forest between Khandesh and the coast land, south of the Tapti River, I was convinced that something had been found very different from any known Indian form. I subsequently received letters on the subject from Mr. Wroughton himself and from Mr. G. W. Vidal, who later shewed me a healthy young individual now living at his house near London, and I quite agree with both gentlemen that this peculiar pale squirrel is not an albino, but a well-marked and distinguishable race that may be regarded as either a sub-species, or a species. I prefer to class it as a sub-species, because there is, so far as I am aware, no structural distinction between the pale animal and *S. indicus*, because many mammals, and squirrels particularly, vary much in coloration, and because there is, in the nearly allied but distinct *S. bicolor*, which replaces *S. indicus* in the Trans-Gangetic regions, and is found in the Eastern Himalayas, Assam, Burma and Malayana, a very similarly colored pale whitey-brown or *café-au-lait* race inhabiting part of the Malay Peninsula. For the peculiar pale squirrel found in the Dangs I propose the name *Sciurus indicus* var. *dealbatus*, or simply *Sciurus dealbatus*. I also propose to call the unnamed variety of Western Bengal and Orissa *S. indicus* var. *bengalensis* or *S. bengalensis*.

* I am very sorry that I am sceptical as to the distinctness of Mr. Taylor's *P. nictitatans* (this Journal, Vol. VI, p. 429, pl.) from Orissa. Mr. Taylor was so kind as to send his type to me and to allow me to deposit it in the British Museum. It is immature, and is, I think, a partial albino of *P. niger*. Albinism to a slight extent had been observed in this species previously, part of the tail being occasionally white, though I have never heard of an instance in which the white portions were as extensive as in Mr. Taylor's specimen. Mr. Oldfield Thomas, who examined the specimen with me, agreed in this view.

The question may probably be asked, why I do not adopt the American system and use trinomials, *Sciurus indicus dealbatus*, etc., as has been done by several good naturalists. My reason is that the plan appears to me a retrograde step in nomenclature and a reversion from the simple and convenient binomial terms of Linnæus to the cumbrous polynomials of his predecessors. Not only is it certain, if once trinomials are admitted, that additional terms will be added to suit the whims of specialists and to flatter the vanity of name-givers, but there is a radical difference between the various kinds of sub-specific forms for which a distinctive name is wanted. For many years trinomials have been largely used by horticulturists to label cultivated varieties of plants, and by several writers for races of tame mammals. There are many wild varieties both of plants and animals that are not dependent on geographical distribution; there are geographical races, as in the case of the Indian squirrels, and there are in some cases, as amongst insects, seasonal varieties. Moreover, in some of the lower animals there are alternating generations of various kinds, and besides these, there are the "Mutations," as they have been termed, of fossil species found in successive divisions of geological strata. Why, amongst all these kinds of variation, the trinomial method should be reserved for geographical races is a question that does not appear easy to answer; it has not been so reserved in the past, nor, if it continues to be employed, is it likely to be in the future, but surely there should be a distinction maintained between the nomenclature applied to distinct types of variation, such as artificial varieties and geographical races.

The following is the synonymy (very briefly given), the coloration and distribution of the different races of large Indian squirrels.

1. *Sciurus indicus* or *S. indicus* var. *typicus*—The Bombay Squirrel.

   The Bombay Squirrel, Pennant, Syn. Quad., p. 281 (1771).

   Sciurus indicus, Erxleben, Syst. Reg. An., p. 420 (1777).

   Sciurus purpureus, Zimmermann, Spec. Zool. Geog. Quad., p. 518 (1777).

   Sciurus bombayanus, Boddaert, Elench. Anim., p. 117 (1785).

   Sciurus elphinstonei, Sykes, P. Z. S. (1831), p. 103; Jerdon, Mam., p. 167; Fraser, Zool. Typ., pl. 26.

Upper parts, including the ears, shoulders, external surface of hind limbs to the feet and tail, bright chestnut-red, a narrow cheek stripe

the same, end of the tail for a varying length, sometimes amounting to one-half or even three-quarters, whitish or white ; lower parts, outer surface of forearm, and a broad band across the forehead in front of the ears, pale buff or whitish ; face in front of the pale band, rufous-brown, varying in tint ; upper surface of feet the same.

Range.—The forest near the western coast from the neighbourhood of Bombay to North Malabar and Mysore.

The exact limits of the area inhabited by this race and by *S. indicus* var. *malabaricus*, respectively, are not known, but I am informed by Mr. G. Vidal that only the Bombay squirrel is found in North Canara. This form is said by Jerdon to range as far south as North Malabar (probably the neighbourhood of Cannanore), and it was obtained by Sir O. B. St. John, as he informed me, in Mysore.

2. *Sciurus indicus* var. *dealbatus*, subsp. nov. (or *Sciurus dealbatus* if regarded as a distinct species)—Wroughton's Squirrel.

General color of upper parts pale rufescent sandy, growing slightly more rufous on the posterior portion of the body and on the outside of the hind limbs, and becoming brown on the outside of the forelimbs and on the basal portion of the tail ; ears bright rufous ; forehead, a band down the back, all the tail except the basal portion and the lower parts sullied white.

The following measures were taken by Mr. Wroughton in millemetres ; I have added the equivalent in inches :—

	Female.		Male.	
	Mm.	Inches.	Mm.	Inches.
Head and body	370	14·6	369	14·55
Tail alone	408	16·10	417	16·5
Tail with hair at end...	466	18·4	475	18·75
Hind foot	69	2·75	75	2·95

Basal length of the male skull (from anterior border of *foramen magnum* to end of premaxillaries) 2·4, extreme length 2·8, zygomatic breadth 1·8. The skull of the female slightly smaller. Both skulls are those of adult animals.

Range.—This sub-species has hitherto only been found in the forest of the Dangs, to the west of Khandesh, by Mr. Wroughton, to whom we are indebted for the discovery. Though I was never in the Dangs, I travelled, about thirty years ago, all over the Rajpipla Hills, north of

the Tapti, and I did not meet with this squirrel, so its range probably does not extend beyond the Tapti to the northward.

This is the most distinct in coloration of all the races. It was found by Mr. Wroughton to be scarce even in the limited tract to which it is restricted. He observed that when this squirrel erects the hairs of the tail, as it has a habit of doing, bottle-brush fashion, the dark hairs at the base of the tail are not erected. He obtained the young animal that is now living in Mr. Vidal's house. It was very young, and although, on its nest being pulled down, it fell to the ground, a distance of between 60 and 80 feet, it escaped quite unhurt.

Even among the four specimens, three skins and the living animal, which are the only representations of this form hitherto available, there is some difference in coloration, one of the skins being paler than the others, while Mr. Vidal informs me that the living individual has grown somewhat more rufous since it has been in his possession. The faint white stripe down the back which at first sight appears to mark a difference in the coloration from that of the other races is occasionally found in typical *S. indicus* as is shewn by one of the skins of that form in the British Museum.

3. *Sciurus indicus* var. *malabaricus* (or *S. maximus* if regarded as a distinct species). The Malabar Squirrel.

Le grand Ecureuil de la Côte de Malabar, Sonnerat, Voy. aux Indes Orient., ii, p. 139, pl. 87 (1782).

Sciurus maximus, Schreber, Säugth. IV, p. 784, pl. 117B (1784).

Sciurus malabaricus, Scopoli, Del. Faun. Flor., Ins., ii, p. 85 (1786), Jerdon, Mam., p. 166.

Middle of nape, shoulders and anterior portion of the back with generally a band down the middle of the back, loins, rump, outside of thighs and tail, black ; short hair on lower surface of tail, rufous buff ; sides of body with more or less of the back in the middle, sides of nape, ears, face and a broad stripe down each cheek from the base of the ear, chestnut ; lower parts and band across forehead in front of the ears buff.

There is in specimens from different localities a considerable variation in the amount of black. In some skins the nape and middle of the back are black, in others chestnut.

The following measurements in inches of four females obtained east of Trevandrum in Travancore were given to me some years ago by Mr. F. W. Bourdillon :—

	No. 1.	No. 2.	No 3.	No. 4.
Head and body ...	16·5	16·5	15·5	16
Tail	20·5	17·5	18·5	18

The tail is evidently measured with the hair at the end. Jerdon gives head and body 16 to 18, tail with hair 20 to 21. The measurement I quoted in the "Mammalia," head and body 17, tail 14·5, was given to me, I believe, by Mr. Fairbank, and must have been from an animal with the tail (without hair of course) rather shorter than usual.

Range.—The forests near the Malabar coast as far north as the Wynaad (perhaps farther, as according to Elliot, this variety occurs in the Southern Mahratta country) ; also some of the other forests of the Madras Presidency. Specimens in the Indian Museum from Tenmalai, South Arcot, belong to this race. A skin in the British Museum from near Amarkantak, the source of the Nerbudda, is intermediate between this race and *S. indicus* var. *bengalensis.*

The name *maximus* appears to have been published by Schreber according to the dates of the publication of his work for which we are indebted to Mr. Sherborn (P. Z. S., 1891, p. 589) in 1784 on Plate 217B. The text appeared in 1785, whilst the specific term *malabaricus* was only made known by Scopoli in 1786. To use a name like *S. indicus* var. *maximus* would be absurd, for this race is no larger than the others, but if specific rank be awarded to the form, Schreber's name ought, I fear, to be used. At the same time this would be extremely inconvenient, because another race was the *S. maximus* of Jerdon, Anderson and others, and if Indian naturalists prefer to call the Malabar squirrel *S. malabaricus* I do not think the cause of scientific nomenclature will suffer.

4. *Sciurus indicus* var. *bengalensis* (or *S. bengalensis*). The Red Bengal Squirrel.*

Sciurus maximus, Jerdon, Mam. Ind., p. 166, *nec* Schreber.

* Jerdon's name, the "Central Indian Red Squirrel," cannot be used, because the term "Central India," as I have already pointed out in this *Journal*, now applies to a very different part of India from that for which it was used by Jerdon.

Chiefly chestnut-red above, but with the rump and tail black, the tip of the latter usually yellowish. Lower parts, feet and band across forehead buff as in other races. Face brownish-red, more or less grizzled with white hairs. Intermediate forms occur between this and *S. indicus* var. *malabaricus*.

Range.—Western Bengal, Orissa, Chutia Nagpur, and the Northern Circars, ranging on the north to the Khárgpúr Hills near Monghyr and south to Bastar, Jaipur, and the neighbourhood of the Godavari.

Jerdon states that he saw this squirrel at the base of the Pachmari Hills near Seoni, in the Central Provinces. Probably the squirrel there occurring resembles the skin already noticed from Amarkantak.

I believe this form to be confined on the eastward to the forest country between the Ganges and Godavari, but one of the allied races has twice been reported to occur beyond these limits to the north-east, first by Hodgson (Journ. As. Soc. Beng., xviii) (1849), p. 775, and P.Z.S. (1855), p. 126, who mentioned the occurrence of *S. purpareus* (*S. indicus*) together with *S. macruroides* (*S. bicolor*, var.) in the lower region of the Nepal Himalayas; and, secondly, by Oldfield Thomas, who published a list of Hume's mammalian collections (P.Z.S.,1886, p. 60), including a specimen of *S. indicus* from Manipur. The latter locality I accepted in the "Mammalia" of the Fauna of British India, p. 372, but I ventured to doubt the first. I now feel sceptical regarding both localities, because, so far as it is possible to judge, *S. indicus* is replaced by *S. bicolor* throughout the Trans-Gangetic region. *S. bicolor* is common in Nepal and Sikhim and on both sides of the Assam Valley. There are several specimens in the Calcutta Museum from the Gáro and Nága Hills, and it would be truly extraordinary if the Cis-Gangetic species were found further east in Manipur.

With regard to the supposed occurrence of *S. indicus* (*S. purpureus*) in the Nepal Terai, the statement by Hodgson above quoted appears at first sight to be supported by the inclusion of the name in the "Catalogue of the Specimens and Drawings of Mammalia and Birds of Nepal and Thibet" (*sic*)* presented by Mr. B. H. Hodgson to the British Museum (1846), p. 22. As is well known, however, several of the mammalian specimens mentioned in this catalogue were not from Nepal, amongst these *Bos frontalis* (p. 24) and *Panolia eldi* (misprinted

*Hodgson of course always wrote the name Tibet.

P. Eedii, p. 34). The only specimen of *S. purpureus* enumerated in the Catalogue is thus entered : " A specimen of the male (from R. W.), shoulders, loins, and tail black." On examination of the British Museum collection I find that this specimen is the skin from Amarkantak already noticed. It is identified by the Museum label, and it still bears a paper ticket with the locality carefully recorded, the record being initialled " R. W." This, I think, satisfactorily disposes of the supposed Terai locality.

The specimen labelled " Manipur " is not so easily discredited. Hume's collections were carefully labelled and the greatest pains taken to preserve all records of localities. But so great is the improbability of this species inhabiting Manipur, that I cannot but think it possible that in this case also a mistake has occurred. A few of the labels, as Mr. Thomas reminds me, must have become detached from the skinsof the Hume collection, and although it is believed that in almost every case the specimen and its label were correctly brought together again, there was one case of a label having been attached to the wrong specimen, also a squirrel, that was noticed by me in 1878 (Journ. As. Soc. Beng., XVII, part II, p. 162). I suspect a similar accident has occurred to the supposed Manipur skin of *S. indicus*. It should be recollected that in numerous cases the labels of the Mammalian specimens had only the locality and date marked on them, the name of the animal having been left for future identification ; consequently if two or three labels were found loose at one time there was always a possibility of their being reattached to the wrong skins.

The accompanying figures are partly from specimens of the races *dealbatus* and *malabaricus* now living in Mrs. G. W. Vidal's possession, partly from skins in the British Museum. To facilitate reference, the label of each skin from which the coloration was copied has been marked, so that these specimens may, if necessary, be regarded as types.

MISCELLANEOUS NOTES.

No. I.—THE NEPAL WILD SWAN (*CYGNUS MUSICUS* not *C. BEWICKI*).

In the first number of the Society's Journal for the current year, heads of *Cygnus olor* and *C. bewicki* (*minor*) are figured, and a good account is given by Mr. Stuart Baker of the evidence upon which the inclusion of these two species in the "List of Indian Birds" is decided. I have recently had occasion to go over the evidence critically whilst preparing the last volume of birds in the "Fauna of British India," and there is, I find, a correction of some importance necessary. I ought to state that had the data before me been those available to Mr. Baker, I should have come to the same conclusion as he has done: indeed, I had put down *C. bewicki* as one of the Indian Swans on the authority of Mr. Hume, confirmed by that of Count Salvadori, in the "Catalogue of the Birds in the British Museum," vol. xxvii, p. 32, when I found that there had evidently been an error in the identification.

The facts as quite clearly stated by Mr. Baker are that, whilst *Cygnus olor* has been several times killed in the Punjab and Sind, the only recorded occurrence of any other species of Swan in India is that of a single specimen obtained by Hodgson in the valley of Nepal in January, 1829. Of this a drawing was made, now, with Hodgson's other drawings, in the library of the Zoological Society; the skin was destroyed, but the skull and feet were preserved, and are now in the British Museum.

The drawing was regarded as that of *C. bewicki* by Hume on account of the coloration of the bill. This drawing is not so carefully made as most of Hodgson's drawings are; and so far as the coloration of the bill is concerned, it seems to me that either the Whooper (*Cygnus musicus*) or Bewick's Swan might be represented. No dimensions are noted, though most of Hodgson's drawings have full measurements on them.

The skull and foot are included in the "British Museum Catalogue" under Bewick's Swan. Mr. Ogilvie Grant was good enough to have them brought out, and we compared them with several specimens of *C. musicus* and *C. bewicki*, and came to the conclusion that they must undoubtedly be assigned to the former as they were much too large for Bewick's Swan. It is necessary here to note that the length of the tarsus given for Bewick's Swan in the British Museum Catalogue (p. 31) and copied by Mr. Baker (*ante*, p. 14) namely, 4·8 inches, must, I think, be a mistake: probably a misprint in the first instance for 3·8. Dresser, in the "Birds of Europe," gives 3·85, and this agrees with the tarsi in the skins I examined.

I am thus compelled to conclude that the Whooper (*C. musicus*) must be included amongst the birds of India and Bewick's Swan (*C. bewicki*) must be omitted.

W. T. BLANFORD.

LONDON, *23rd July*, 1897.

No. II.—THE GREAT INDIAN HORNBILL IN CAPTIVITY.

(*With two Plates.*)

In August, 1894, just three years ago, Mr. H. Ingle of Karwar presented to our Society a young male specimen of the Great Indian Hornbill (*Dichoceros bicornis*), which was then apparently about four months old. It was fairly tame when it arrived, and was ready to make friends with any one who fed it, and especially with those who could find time to play with it occasionally.

Since its arrival it has grown steadily, both in stature and in friendliness, and may now be said to be quite a popular character in Bombay society, where, owing to the brilliant yellow colouring of its huge beak, and the position it has gained for itself as a member of the Museum Staff, it is familiarly referred to as the "Office Canary."

The accompanying photographs were taken some months ago by Mr. E. Comber, and they convey a very fair idea of the shape and plumage of this curious bird, but in the back view the white tip of the tail has unfortunately come out quite dark, owing to a shadow, while the brilliant yellow colour of the neck feathers, the casque, and the upper part of the beak must, of course, be imagined. The bird may now be considered to be fully grown, as it measures 4'-3" from the tip of its beak to the extremity of its tail, but the front part of the casque is still perfectly flat on the top, whereas in adult specimens it is deeply concave. The irides also are now only just beginning to assume the blood-red colour which is one of the characteristics of the full-grown male.

Its food consists of plantains (which it swallows whole when hungry) and all sorts of jungle fruit, such as banyan berries, and wild figs, but it is always glad of live lizards, mice, scorpions, snails, beetles, and centipedes, and when such animal food is not forthcoming we give it small pieces of raw meat, which it eats with avidity. When it first came, water was placed in its cage daily, but as it never made any use of it, either for bathing or drinking, we gave up the practice, and have long since ceased to give the bird any liquid food. It appears, however, to enjoy the rain, which drives into its cage with full force during the monsoon months.

It is suspicious of strangers, and inclined to be savage, striking viciously at them, against the wire netting of its cage, but to those with whom it is familiar, it is exceedingly gentle and exhibits a considerable display of affection by attempting to put food into one's mouth, and by other birdlike endearments. It never appears to get tired of playing, and the way in which it catches a tennis ball when thrown at it, with considerable force, from a distance of 30 feet, excites the admiration of all our Museum visitors.

It never makes any noise unless it is hungry, and then it shouts for its food in a loud, braying, rasping voice, which can be heard all over the building and which quickly summons its attendant.

By far the most curious thing about this quaint bird is the fact that the bright yellow colour on the casque, the upper part of the beak, the neck, and to a certain extent on the white wing feathers, is artificial, inasmuc has it is put on by the bird itself. The specimen in the Society's rooms can be seen any morning carefully painting itself up for the day. With the extreme tip of its beak it arranges the small feathers which surround the uropygial gland on its back, at the root of the tail, and then proceeds to rub its casque and neck on to the open gland, which is about the size of a shilling, and from which an oily yellow secretion is exuded. This it does several times during the early part of the day, and for some hours afterwards the yellow colour is apt to come off on to one's hands and clothes when the bird is romping with its friends.

H. M. PHIPSON.

BOMBAY, *August*, 1897.

No. III.—THE GREAT INDIAN HORNBILL IN THE WILD STATE.

Mr. Phipson has asked me to state on oath what I know as to the character and habits of the prisoner at the bar—I mean the bird in the cage, at our Society's Rooms, which he has described in the foregoing note. This I do with pleasure.

The names by which this bird is known are many, being *Homrai* in Nepal, *Banrao* in Mussoorie (both words meaning "King of the Jungles"), *Garuda* amongst the Canarese, *Male moraki* in Malayalum, *Hwang* in Assam, and *Ouk-chin-gyi* amongst the Burmese; but notwithstanding all this, like Ali Baba's famous Nubby Bux, he means nothing by it, and a child might play with him—that is, when he is in a good temper.

Scientific folks call him *Dichoceros bicornis*, the Great Hornbill, and he is great, the biggest of his tribe in India, measuring fully four feet from tip of beak to tip of tail, with wings in proportion, the noise whereof, when he is flying, can be heard a mile off. As can be inferred from his many names, he is widely distributed in India, and is not only common, but obtrusive where he occurs.

In the forests of Burma and Tenasserim *D. bicornis* is particularly plentiful, going about sometimes in pairs, but generally in parties of five to twenty in number.

Once in my early days in Burma I was encamped in high forest close to the bank of the Salween river. It was the month of February, and the various species of *Ficus—F. religiosa*, *F. indica*, &c.—were in full fruit. I do not think I have ever seen forest fruits of all kinds in such abundance since. All fruit-eating birds, but especially Hornbills, swarmed, and of these *D. bicornis* was in great force. The whizzing creak of their wings was incessant through the day round my camp, and in the early mornings and evenings

Photographed by E. Comber. Mintern Bros. Photo imp. London.

THE GREAT HORNBILL.

Dichoceros bicornis.

From a live specimen in the Society's Rooms.

Photographed by E. Comber. Mintern Bros Photo imp. London.

THE GREAT HORNBILL.

Dichoceros bicornis.

From a live specimen in the Society's Rooms.

a party always assembled on a tree not a hundred yards off my tent and brayed by the hour. These were all grass-widowers, their wives being probably all safely walled up in their nests. This party was very conversational, and seemed to have a great deal to talk about, chiefly scandal I fancy, for now and again a couple would quarrel and go for each other open-mouthed. This was, no doubt, when aspersions were cast one by the other on their respective ladies.

At that time I managed to find only a single nest, but the year after in the Thaungyi valley I found several, and got together a fine series of the eggs The following note of mine on these nests is recorded in Hume's " Nests and Eggs of Indian Birds" :—

Of the eight nests visited and eggs obtained, four contained two eggs each, and four one each. These were laid in natural hollows in various trees, and two in immense *Ficus* encircled old teak trees. The height of the nest-hole from the ground varied from 25 to 70 feet, and the trees selected were invariably close to some *Ficus* in fruit.

To five of the nests I ascended myself, and found the opening much narrowed in every one with a plastering of earth leaf-mould and the birds' own droppings; the stench of decaying vegetable matter in one or two of the nests was quite unbearable; altogether the insides of the nest and the old hens themselves presented a filthy sight, but these latter were all able to fly when released and did not seem a bit cramped. The way, though, they hissed and quacked and fought for their eggs, was a caution. My arms were black and blue from their ferocious digs and bites. In a few cases the males came and looked on, but took no part in the fight, not even to the uttering of a croak in encouragement to their mates.

The colour of the eggs varies, but depends, I think, more on the nature of the wood of the tree chosen for the nest and the material used in plastering which, by the way, is well laid on inside as well as round the openings of the hollow, than upon the length of times the eggs have been laid; for two eggs out of the lot I procured had the chick almost ready to break through, and are yet only of a dull white, but slightly stained; while again, two other eggs are the colour of iron-rust all over, and these, though undoubtedly hard set, were still easily cleaned, but they were taken out of a Thingan tree, the wood of which gives off a rusty stain.

All the eggs, except one, have a perceptible gloss.

The exceptional non-glossy egg is rough, almost like sand-paper, to the touch. All are very finely pitted over their whole surface, and some have little raised tubercles or bumps, chiefly in a zone round the centre. In shape some are long and narrow and much pointed at one end, some short globular. The largest eggs were those found singly, and of these one measured 2·75″ by 1·98″; the smallest taken measured 2·40″ by 1·93″, but the average of twelve eggs is 2·62″ by 1·88″. It is remarkable that even the chick in the eggs has a well-marked protuberance above the upper mandible—the rudiment, it would seem, of the future casque.

The one absolute outward distinguishing mark between the male and female bird is the colour of the eyes. In the male this is blood-red; in the female pearly-white. According to my experience, *D. bicornis* affects heavy forests as a rule, but I have noticed it occasionally in thin jungle where *Ficus* trees in fruit occur. Mr. Blanford notes that " it appears never to descend to the ground." I have, however, more than once flushed a party

seated on the ground picking up and eating fallen fruit. In addition, in its wild state, *D. bicornis* is said to feed on insects or lizards. I cannot say I have ever noticed this, and I am certain that it is more exclusively frugivorous than its ally *Authroceros albirostris,* the Indo-Burmese pied hornbill as Blanford calls it. This bird I have frequently seen picking up lizards, and even dabbling in a stream for small fish.

C. T. BINGHAM, LIEUT.-COLONEL.

RANGOON, *August,* 1897.

No. IV.—THE KOL-BHALU.

Last Sunday evening at about 7-40 as I was returning from a walk with two brother-officers, we heard a Jackal calling out about a quarter of a mile away on the other side of a small river. This Jack was not making use of the ordinary call, so well-known to all, but a most unearthly cry, which, no doubt, is familiar to many members of the Society, and which, I believe, has given rise to the Jackal using it being dubbed a "Balu" by natives. I have often heard this cry, but have never been able to identify the particular animal from which it emanated, though I believe it to be a Jackal. It being sufficiently light to see, we three went in the direction of the sound. One of my companions, A——, had a small rifle with him, which he put in my hands for a shot should we see the animal. Arriving at the near bank of the river, we saw, on the opposite side, close down to the water's edge, a Jackal; the light was bad, but so far as I could tell, he was a good specimen; he did not notice us, but repeated his weird cry, once or twice, with his head down; so as there was no doubt from whence the sound came, I fired at him, and though I missed, must have gone close, for he bolted up the steep bank. We then heard a lot of puffing and blowing beneath us, and on looking down we saw an animal swimming towards the place where the Jackal had just been standing. We at first thought it was another Jack. On closer inspection it turned out to be a bull-dog belonging to B——of my regiment. Almost simultaneously we saw another of B——'s dogs, a large greyhound, in the water near the opposite bank, and not ten yards off where the Jack had been standing when fired at. Approximately, within a minute of my firing, the Jackal reappeared and ran down the bank towards the water, and at the same time a second Jack put in an appearance but kept in the offing. A—— had a shot at the first Jack, but, as it was dark, did no damage, though it effectually drove the Jack away. The two dogs then went up the river for about twenty yards along the further bank. Presently we heard a row and saw a scuffle going on, which turned out to be a third Jack. There was a bit of a scrimmage; the Jackal getting away eventually and running up the bank, closely followed by the bull-dog. They sat contemplating each other, at about eight yards

distance, for a short while, after which the dog returned to the water, and the Jack dragged himself off. Just about this time B—— came up and said his dogs had run a Jack, which doubtless was the one in the water. The day had been very hot, and the evening was most oppressive, which more than accounts for the dogs being too done up to polish off the Jack. What appeared to me so curious was the behaviour of the first Jack, for there he was, regardless of everything, within a few yards of a particularly big greyhound, apparently fearless, and returning to the charge after having been fired at. Probably instinct told him the dog was too done up to do him injury. To me it seemed he was trying to distract attention from his companion, who was recouping himself in the water, and whose whereabouts, up to this, had not been discovered.

With regard to this peculiar cry I have heard it said that Jackals make use of this weird call when they are mad, toothless, old, decrepit, etc., but I have never heard any really satisfactory explanation. This is the only occasion I have ever been able to identify a Jackal as the author of the cry. From the surrounding circumstances I should attribute its use, in this instance, to fear, excitement, annoyance at, or hatred of, the dog, or possibly as a warning cry to other Jacks of danger, or to summon them to the assistance of a companion in distress. Should any member of the Society be able to throw any light on the use of this weird and hideous cry, I should like very much to be enlightened, as I have long wished for an explanation.

R. M. BETHAM, CAPTAIN,
8th Bombay Infantry.

CAMP BARODA, *8th June*, 1897.

In vol. 8, page 438, Mr. F. A. Hill gave an interesting account of his investigations into the meaning of the expression, *Kol-Bhalu*, as applied by natives in Guzerat, the Konkan, and in Kanara to old Jackals which give utterance to this peculiar cry. His experiences coincided with those of Capt. Betham in a remarkable manner. He said:—

On one occasion, in the evening, whilst returning to my camp, I saw a Jackal at a short distance off, and having dogs with me I set them after him; but, to my astonishment the Jackal made no great efforts to escape, but ran into a small bush a few yards away, and as soon as the dogs came up, the *Kol-Bhalu* cry was uttered; the dogs stopped, and after sniffing round the bush for a short time came back to me. I never saw these dogs behave in this manner before, as they had always been keen in attacking Jackals and had killed many. I can form no reason why this Jackal, which, from the cry uttered, must be called a *Kol-Bhalu*, was left in peace.

[It is quite possible that the Jackals which utter this curious cry give off some peculiar smell, indicating the existence of mange. It is also well known that dogs have an instinctive dread of this disease, and will carefully avoid animals which are suffering from it.—EDITOR.]

No. V.—NOTES ON SHOOTING IN OUDH.

It would seem as if we had yet to discover a factor for the comparative measurement of tigers. All length measurements appear to be eminently unsatisfactory, and skull measurements, which I, amongst others, at one time thought might be of service, do not afford any reliable results. I append skull measurements of three tigers lately shot :—

	Length.	Skull.
No. 1	9′-9″	$13\frac{1}{4}$″ × $9\frac{7}{8}$″
No. 2	9′-9″	$13\frac{1}{2}$″ × $9\frac{3}{8}$″
No. 3	9′-0″	$13\frac{1}{2}$″ × $10\frac{3}{8}$″

No. 2 was undoubtedly the biggest, heaviest, and fattest of the three ; but No. 3 was much heavier and more powerful than No. 1. I have no means of determining actual weights, but incline to think that this process would yield, on the whole, the best comparative results. Still it would have to be taken into consideration that a tiger which had not fed for a week might weigh 50 lbs. or more less than a tiger which had just had a full meal. The heaviest panther, out of ten shot this season, measured 7′-6″ and scaled 138 lbs. Panthers do not appear to put on flesh in the same way as tigers do, probably because they are of more restless and active habits. The skull measurements of the panther above-mentioned were $9\frac{5}{8}$″ × 6″. Two immature tigers (7′-9″) and the mother (8′-6″ estimated) were secured. The former had still the milk canines, but these were of abnormal length, having been pushed out of the socket about $\frac{3}{4}$″ by the advancing permanent canines. The pugs of these tigers were as large as those of the mother. Both of them were shot from a *machan* constructed over the head of a buffalo, the sole remnant of a family feast. One arrived immediately the *shikaries* had left. He received a ·577 hollow-pointed express bullet, intended for his brains, about one inch below his left eye. This did not seriously injure him, but he dropped to the second barrel in the body as he charged past the *machan*—another proof that facing shots at tigers' heads are unsatisfactory. The second tiger came out in about five minutes undisturbed by the firing, and fell to one shot. A third cub was in the vicinity, but would not show. The tigress for five days wandered about roaring, although these cubs must have been three years old, and she still had one with her. When shot, it was found that her tail had recently been cut off at about eight inches from her body, the wound was quite smooth and clear. It is probable that the whole party had been fired at, and perhaps the tigress wounded some 15 miles away in Nepal. The third cub was doing well a fortnight after the break-up of the family ; she was killing deer, but I have known a cub of much tenderer age survive his mother's death, feeding on frogs and other vermin until he attained strength to kill more legitimate food.

Only one bear was bagged during the season ; she was, with a well-grown cub, driven to a *machan* badly placed at a low elevation on a sloping

tree exactly on the only exit from the jungle. This is always a great mistake. The bear was dropped as she came towards the *machan*, but being only slightly wounded she at once recovered; the second barrel missed fire, and the enraged brute crossed under the tree and commenced to climb the sloping trunk. Fortunately, a second rifle was available, and the ·500 express bullet, striking the chest, knocked her over backwards, though without doing any mortal injury. However, a second shot, as she rose to her feet, broke her spine, and she was speedily put out of pain. Had not a second rifle been handy, it might have been awkward for the hunters.

No wild dogs were bagged during the year, but it is feared that these pests are on the increase. My trackers brought in a Chital stag which had been killed by three of these brutes, and reported that the dogs were leaping at the haunches of the running deer, tearing away the flesh. Ultimately the stag fell screaming with the pain and fear, whilst the dogs continued to attack it from behind. They were then driven off, and the deer, unable to rise and injured beyond recovery, was killed and brought into camp.

Neither Jerdon or Blanford afford much information about the Indian Badger, but I can vouch for its courage, as the following adventure will prove. I noticed a pair of these animals in some long grass at the edge of a stream, and the *mahout* begged me to secure one for medicinal purposes. I therefore fired at short range with a rifle and missed. The smaller badger, presumably the female, then ran away, whilst the larger faced the elephant, erecting all the hair on his back, shewing his teeth and uttering a hissing, growling note. The elephant was much terrified, and the little fellow made good his retreat, slowly turning every few feet to threaten his pursuers, until he reached his burrow in the bank, down which he disappeared with a final growl.

S. EARDLEY WILMOT,
Conservator, Oudh.

NAINI TAL, 23*rd May*, 1897.

No. VI.—SCORPION CARRYING A FLOWER.

One evening last February, while sitting in the verandah of my house at Aden, my attention was drawn to an object advancing across the floor, which seemed to be some peculiar leaf-insect or *Phasma*. On looking at it closer I saw it to be a scorpion (identified by Mr. Pocock from my description as *Parabuthus liosoma*), which was holding over its back by one claw a large blossom of *Poinciana regia*, known in Aden as the white gold-mohur tree. Its tail, curled over its back, further assisted in retaining the flower in position. The nearest tree from which it could have obtained it was at least 30 feet away, and to bring it the scorpion must have carried it over a low stone parapet and up two or three steps, so that intention seems to be proved. What

that intention was it is hard to define. Hardly for concealment, for the size of the flower made it more conspicuous; besides it was night. If it was the lamp-light it wanted to avoid, it is necessary to assume that, finding the light too strong, it went back to get the flower. It could hardly be as food, for scorpions are not known to live on vegetable substances; nor, as far as I know, do they construct nests. I regret that I did not allow the creature to reach its destination, and so ascertain its intention; but, unfortunately, I gave in to my first impulse and crushed it. My wife suggested that perhaps it was going to a wedding, but this explanation is more poetical than scientific.

Some of your readers may be able to throw a little light on this curious instance; but Mr. Pocock of the British Museum, to whom I related the above, said he had never heard of a similar case.

A. NEWNHAM, CAPTAIN.

ADEN.

[The above appeared in *Nature*].

No. VII.—SOME NOTES ON CROWS, AND ON THE PROTECTIVE POWER OF SCENT IN ANIMALS.

In No. 3 of Volume X of our Journal there is a short account of crows aiding the sportsman apparently for pure love of mischief, and the case may be strengthened by the following evidence. In December, 1896, I was extremely interested in bagging a large male panther that was well known in the neighbouring villages for his boldness and cunning, and, after discovering his whereabouts approximately, my trackers persuaded him to kill a tied-up goat, sending me word early next morning. On arrival at the spot, accompanied by my wife, we found that the kill had been dragged about 100 yards into tree forest, and that only the head and skin of the neck remained. As this, however, had been concealed under dry leaves and grass, and as three or four crows were in the vicinity and appeared to have some information, we concluded it was good enough to put up a *machan* and therein to await events for a couple of hours. The crows left the locality almost as soon as the *shikaries* took their departure, and a few minutes later we could hear them making a great commotion some half mile away. The noise drew nearer, and presently, by the signs made by my companion, I became aware that the panther was in sight, whilst, to judge by the excitement evinced by the crows, he was coming steadily, though slowly, towards his kill. Of the panther I could see nothing, as he was directly behind me and I dared not move. The crows, however, pestering him with their noisy attentions, brought him up to a tree some eight yards from the *machan* and, after wheeling round once or twice as if to make sure that all was in order, departed not to reappear. The panther lay down and seemed relieved; he was not hungry, having some 15 or 20 lbs. of goat inside; but he was drowsy, for, after 5 or 6 minutes, he

rolled over on his side, and lying at full length, commenced to snore gently. On being informed in a whisper that he was asleep, I was able to turn round without disturbing him and so secure him. Two circumstances on this occasion excited my wonder: *first*, that the crows appeared to know when we were ready, and started at once to fetch the panther, which they might have done at any previous time; and, *second*, that this experienced beast, who was for 10 minutes or more within 30 feet of the *machan*, was not able by scent to detect our presence. Both panthers and tigers will hunt by scent, especially in the case of a drag or of a wounded animal; and I have frequently seen them smelling carefully and with deep inhalations the tracks of men or elephants, yet their noses seem powerless to warn them of an enemy who is raised a few feet only from the ground. A somewhat remarkable instance of this occurred later on, when in very open forest a tiger was in the vicinity of a *machan*, and ultimately laid down under it without, during the 25 minutes of his visit, detecting anything wrong. He also departed without being fired at, but this I hardly regretted at the time in the interest of observing a tiger so near and for so long. He was a full-grown male, an old beast to judge by his colour and appearance, and during the time he was under observation he was never still for half a minute at a time. It was a warm evening in April, and the tiger felt the heat badly; the flies annoyed him intensely, and he was incessantly driving them off his face with his paws and off his body with his tail; he tried every conceivable attitude to attain some comfort, but apparently without avail; whilst his heavings, pantings, gruntings and eructations convinced me that tigers, when not on company manners, are decidely vulgar and disagreeable. Ultimately, he lay down within 15 feet of the *machan*, where he remained until, attracted by some distant sounds, he sat up to listen and then retired as quietly as he had come, thus flying from an imaginary danger after courting real peril for so long. I would add that the times mentioned in this narrative were taken from a watch which I always on these occasions hang on a convenient twig to permit of accurate observation; and I must, in all honesty, state that I would have killed the tiger if I could have done so, but that I never got a chance to fire from the right shoulder, whilst I am unable to shoot from the left.

Can anyone say how it is that "the tainted gale" due to man's presence a mile off can be a source of alarm to animals that take no notice of it when the origin is at a vertical distance of a few feet? Why, the most careful of the deer tribe will without concern graze all round a tree concealing the most odoriferous of native *shikaries*. If scent rises so rapidly as to prevent it from reaching animals directly under its source, what must be its elevation at long distances?

S. EARDLEY WILMOT,
Conservator, Oudh.

NAINI TAL, *June*, 1897.

No. VIII.—NESTING OF THE WHITE-BROWED BUSH BULBUL (*PYCTONOTUS BITEOLUS*) IN GUZERAT.

Oates remarks, in compiling Hume's "Nests and Eggs of Indian Birds," that, although the White-browed Bush Bulbul is common in parts of India, only two of his correspondents, Messrs. B. & E. Aitken, appear to have obtained the nest or eggs. The late Lieut. H. E. Barnes found them breeding in July and August at Sion near Bombay (see page 249, vol. iv, of the Society's Journal); he also states that Mr. Davidson discovered them doing the same along the Kanara Coast. I have now found them breeding here (Baroda), for I took a nest on the 25th June and another on the 29th, each containing two eggs. I believe this to be the first occasion on which they have been found to breed here: they are fairly plentiful, but, owing to their lurking habit of frequenting low and dense thickets, the nests are difficult to discover. Both those I found were situated between 3 and 4 feet from the ground; one was more or less suspended, being attached to several twigs on different branches, towards the extremities of an overhanging shrub, while the other was on a slender shrub; they were both well concealed from view. The nests are of the bulbul (*Molpastes hæmorrhous*) type, only of slighter build; they are more shallow or saucer-shaped; the materials used being fine twigs and stems, with an apology for a lining, a certain amount of cobweb was also employed, and a leaf incorporated in one nest. I did not see the birds constructing the nests, but I should say the twigs, &c., had been plucked off shrubs and not picked up from the ground. In both instances I found an old nest, last year's probably, in close proximity. I have noticed these birds invariably frequent the same thicket; it is, therefore, more than likely they build annually in or near the same locality. Two eggs would appear to be the full complement, at any rate in this place, and as I left the first nest for a couple of days, no more eggs were laid. On blowing both clutches, I found incubation had commenced. The eggs are of the bulbul type—white ground, profusely marked with claret and purplish-red; at the same time they could hardly be mistaken for those of the common Madras Bulbul. When first taken and before blowing, they were of a very dark colour, almost purple, but since they have faded considerably, though kept in a box away from light.

I wonder if other egg collectors have had the same experience as myself regarding destruction of nests. I have found at least half a dozen or more nests of the White-spotted fantail (*Rhipidura pectoralis*), but, as yet, have not obtained the eggs. The same fatality appears to hang over many other species. In the case of the Iora (*Œgithnia tiphia*) I have found a dozen nests or more, and have only got three eggs; they appear to construct many nests, and then desert, for no reason whatever so far as I can judge. Can it be that they are in want of employment!

The breeding season is in full swing here, and egg collectors can have a royal time. I have found the following birds:—Paradise Flycatcher (*Terpsiphone*

paradisi), Golden Oriole (*Oriolus kundoo*), King Crow (*Dicrurus ater*), White-browed Fantail (*Rhipidura albifronta*), Magpie Robin (*Copsychus saularis*), Dusky Crag Martin (*Ptyonoprogne concolor*), Brown-backed Indian Robin (*Thamnobia cambaiensis*), the three Mynahs, Small Minivet (*Pericrocotus peregrinus*), White-eyed Tit (*Zosterops palpebrosa*), Pied-crested Cuckoo (*Coccystes jacobinus*), Bay-backed shrike (*Lannis vittatus*), Pond Heron (*Ardeola grayi*), and Cattle Egret (*Bubulcus coromandus*). I have obtained the eggs of all the above. I have found the nest of the Red-rumped Swallow (*Hirundo erythropygia*), but it contained young: also those of the Wire-tailed Swallow (*Hirundo smithii*), Large Cuckoo Shrike (*Graucalus macei*), and Black-headed Cuckoo Shrike (*Campophaga sykesi*), whose eggs I hope to get later.

This, I think, is rather a record—the nests of the Paradise Fly-catcher, Golden Oriole, King Crow, White-browed Fantail and Madras Bulbul, all on one babul tree in the Public Gardens!

R. M. BETHAM, CAPTAIN,
8th Bombay Infantry.

CAMP BARODA, 11*th July*, 1897.

No. IX.—PEARL FISHING IN THE BASSEIN DISTRICT (BURMA).

Extracts from a Report by Capt. F. D. Maxwell, Deputy Commissioner, Bassein, to the Commissioner of the Irrawaddy Division, dated 1st February 1897.

I have the honour to supply the following information concerning the pearl fisheries of this district—information which I have gleaned from men who have known these parts for many years and who have collected oysters for eating for a long time.

As regards the habits of the mussel, it lives on mud, sand, or on rocks. Beds appear and disappear either during or at the end of the rains—some say the former, some the latter. The more general opinion seems to be that they appear about November, when the water is getting salt. In the paper marked A I send some shells of the *Placuna* taken out of the river about five miles above its mouth on the 2nd January. The man who shewed me this bed informed me that the bed appeared last November. I pressed him as to whether the bed had not really appeared in the rains, but that it was in November he knew of it for the first time. He would not allow, however, that the bed had appeared before November, and said that he was daily over the place during the monsoon and saw no signs of any oysters.

As to the appearance, disappearance, and breeding of the oyster, none of the Burmans whom I examined could give me any information on the subject. An answer to the question is, however, to be found in *Theobald*,

page 124: "The young are hatched within the body of the parent and are discharged in cloud-like swarms of tiny creatures to seek each its own living. The embryos at first swim freely about, in which stage they represent the permanent condition of the *Pteropoda*, but soon dropping their filamentous organs, of motion, as tadpoles do their tails, they either attach themselves permanently to any convenient roosting place within their reach, as *Ostrea* or *Chama*, moor themselves securely by a *byssus* or cable, like *Pinna* or *Mytilus*, or lead a free and roving life, like *Cardium* or *Union*." See also *Dictionary of Economic Products*, vol. vi, page 121, where the following passage occurs: "The molluscs possess locomotive powers and frequently disappear from certain banks and migrate to more favourable situations." The Burmans say that no bed is known to be in existence for more than six years. During that time the action of the sea either covers them up with mud, thus smothering them, or breaks them away from their moorings, doing them mortal injury.

The numbers to be found in one bed varies very much; sometimes many millions are found; at others only a few thousands. Sand appears to be the favourite bed, though mud is also appreciated. The oyster is also to be found on rocks, but not in such large numbers as on sand and on mud. This, the Burmans explained to me, is because there is only a limited supply of rocky bottom, whereas the other two are practically unlimited in extent. I see however, from the *Agricultural Ledger*, No. 36 of 1896, that the oyster prefer a muddy bottom (see page 5). The pearl is said to appear when the oyster is about three years old—that is to say, never before two years and never after four years. The pearls are very minute and require a microscope to see them, but a pair of sharp eyes can occasionally pick out the larger pearls. On enquiring why the pearls are so small, the villagers say that the pearl as it grows prevents the oyster from closing and so allows the mud and sand to get into the shell and thus to kill the oyster. You will observe from the shells sent that they are remarkably flat and that the smallest obstruction would prevent the oyster from closing. In many oysters that I examined I found three, four, and once as many as eight, small pearls, and I am informed that sometimes as many as fifteen are found, but they are so infinitesimally small that it is extremely difficult to count them. When the larger pearls are found, they are found usually singly.

The *Modus operandi* of getting the pearls away from the flesh is as follows:—The oysters having been collected are put into a large cauldron of hot water; they then open and keep open. The flesh is then scraped off the shell with a knife and thrown into a basin. When the basin is half full, it is put into the sun, and the flesh allowed to decompose. After three or four days, when the flesh has more or less thoroughly decomposed, water is added and the whole mess stirred. The pearls being heavier than the decomposing and decomposed oyster fall to the bottom and are easily got out of

the basin. The rest is then passed through a fine sieve, so that no pearl of even the smallest description shall escape. The only thing that appears to receive no consideration in the matter are the oysters. It is to be hoped that they do not long survive the hot bath ; but on this point the villagers appear to be somewhat doubtful, saying that they have great tenacity of life and do not finally succumb until they have been in the basin some hours.

Oysters, found on rocks, sand, and on mud, produce very different quantities of pearls. I give the following figures for what they are worth—they were given me by men who had worked on all the different bottoms last year, so they ought to be fairly accurate and of some value : "Three thousand oysters found on rocky bottom produce R1 weight of pearls; 6,000 from a sandy bottom and 40,000 from a muddy bottom produce the same weight of pearls." My informants were unable to explain this great difference, and I am unable to offer any reasonable suggestion unless the following may be considered worth anything :—At page 127 of *Theobald* it is stated that pearls are "merely a deposit of the lustrous lining material of the shell round some foreign and offending object." This view is now apparently disputed, if not exploded. See the following from *Dictionary of Economic Products*, vol. vi, page 118 :—

The popular notion that the foreign matter is generally a grain of sand is untenable. According to several eminent conchologists, it is in most cases a minute parasite, but Dr. Kelaart believes the nucleus to be in most cases at least an ovum or ova escaped through the distended coats of an overgrown ovary and become imbedded in the interstices of the mantle. "I have repeatedly examined seeds or young pearl," he writes, "in process of formation, and with a magnifying power, one-fifth of an inch lens, I was able to see distinctly the outlines of two or three ova through the first or superficial layer of nacre surrounded by groups of ova." Theory is further supported by the fact that pearls are most frequently found imbedded in the mantle "near the hinge (the place where the ovarium is most likely to be liable to rupture) and by the fact that with careful examination he was generally able to find, when the pearls were not actually found in the interstices of the mantle near that locality, cicatrices on the structure where they once existed." The difference in the weight-producing capacity of the pearls found on different bottoms would seem to give colour to the popular belief that pearls are nothing more than "foreign and offending objects surrounded by the lustrous lining of the shell," but it is quite possible that the real explanation is something quite different.

The oysters were said, in last year's report, to be found in shallow water. This statement is, I find, only partially true. The oysters found last year were certainly found in shallow water, but I am informed that villagers have often found them in water at various depths—30 feet or more—so that if this is the case there seems no reason why they should not live in greater depths still.

I had about 300 oysters opened in my presence, and in each I found always one, sometimes two, small crabs. When only one, it is the ordinary hard-coated grey type found on the sands ; when there is a second it is to all appearance a different kind altogether—a blue shell and very soft. It is

possible that these crabs live parasitically in the oysters (see *Theobald*, page 128). It is noticable, too, with regard to the remark made there, that it is to the presence of these small crabs that the unhealthiness of the mussel is attributed, that the Burmans regard the oyster as very unwholesome; but the reason they give is the presence of a minute worm found in nearly every shell. Even when this worm is extracted, the Burman will not eat the oyster uncooked, though I swallowed several without feeling any ill effects.

In the *Agricultural Ledger*, No. 36, of 1896, page 5, an opinion of Dr. Alcock is quoted to the effect that the pearl fishery is not likely to interfere with the turtle banks, because the turtle prefer reefs and *Placuna* a muddy bottom. As to this, I would remark that all along the mouth of the Thekithoung river, where *Placuna* are found in large numbers, the turtle known as *laitkwe* comes up to lay its eggs in the season from the month of September to that of December. If men were allowed to dive at night off the banks where the turtle come, I think there can be no doubt that the turtle would be scared away. It may be, and probably is, correct that turtle prefer reefs, but they do not by any means select the sands nearest the reefs to lay their eggs. If they did so, they would not go up the Thekithoung river, but would remain out at sea and near Diamond Island. The turtle known as *laitpyintha* never come near the river, but remain out at Diamond Island, whereas the number of *laitkwe* which lay there is very small. Out of 50 or 60 I saw on the island I only saw one *laitkwe*.

Regarding the remark of the same gentleman, that it is unwise to interfere with the poor people who collect *Placuna*, I think in future that in selling the right to collect oysters it should be stipulated that the villagers should be allowed to take what they want for their own consumption, as the number they would take would be insignificant compared to the numbers taken by the lessee.

Probably 30,000 at most would supply the wants of the villagers.

Theobald states, page 127, that the true pearl oyster is found all along the Arakan Coast. The lessee of that part of the district recently went up the coast with a view to working these pearl fisheries, but I have not yet heard the result of this attempt.

I have not entered into the question as to whether the fisheries should be sold yearly as in the last two years, as I have not been asked to do so. I think, however, if the villagers are allowed to take what they want for their own consumption that the fisheries might be put up to auction as heretofore. If not sold, it is certain that they will be poached by Natives of India. There would hardly seem to be any necessity for insisting on a close season, as the monsoon itself puts an end to all oyster-collecting. Possibly the fisheries should only be sold for three years and then allowed to lie fallow for, say, two years.

[From the *Agricultural Ledger*, No. II, 1897.]

No. X.—THE FLAMINGO BREEDING IN INDIA.

In the last number of our Journal (page 4, vol. xi) Mr. E. C. Stuart Baker, in his series on the "Indian Ducks and their Allies" says that it is unlikely that it, the Flamingo (*Phœnicopterus roseus*), breeds anywhere within our limits, or anywhere nearer than the northern shores of the Persian Gulf. He appears, however, to have overlooked the Miscellaneous Note on page 553, vol. viii, of this Journal, in which the Rao of Cutch recorded that about twenty eggs and two recently hatched flamingoes had been obtained from one of his officials at Khadir, and that the men who picked up the eggs found numerous nests in one place on the Run.

C. D. LESTER, LIEUTENANT,

BHUJ, CUTCH, 6*th July*, 1897. 17th Bombay Infantry.

No. XI.—LATE STAY OF WATER FOWL.

It will be of interest to ornithologists to know that there are still three Black-tailed Godwits (*Limosa ægocephala*) on the Hamir-Sar Tank, just outside Bhuj City. I saw these birds to-day at a distance of some 30 feet from the raised road which passes one side of the tank, and they are in their *winter plumage*. Surely, there is something wrong with the season this year.

C. D. LESTER, LIEUTENANT,

BHUJ, CUTCH, 7*th July*, 1897. 17th Bombay Infantry.

No. XII.—THE OCCURRENCE OF THE WATER-COCK (*GALLICREX CRISTATUS*) IN CUTCH.

His Highness the Rao of Cutch recently sent me a couple of birds which he had shot for identification. They turn out to be the Water-Cock (*Gallicrex cristatus*), male and female, hitherto unrecorded in Cutch. In my small collection, obtained almost entirely in Cutch, I have some eggs which answer the description of those of the above-mentioned bird, and now that the bird has been found to occur here I feel inclined to put them down as *Gallicrex cristatus*. They were taken by my *shikari*, but he did not see the bird. The measurement and colouring coincide with those mentioned by the late Lieut. Barnes on page 138 of vol. VI of this Journal, but they are not a bit like what is depicted in the plate opposite page 129 of the same volume, the colouring of the blotches and markings of which are altogether far too red in colour when compared with the description as written by him.

C. D. LESTER, LIEUTENANT,

BHUJ, CUTCH, 7*th July*, 1897. 17th Bombay Infantry.

No. XIII.—THE ELEPHANT IN BURMA.

Extract from a Report by Vety.-Capt. G. H. Evans, A. V. D., Superintendent, Civil Veterinary Department, Burma.

The Elephant met with in Burma is the Asiatic species (*Elephas indicus*)—Burmese, *Hsen*, wild elephant, *Tor-Hsen*; Shan, *Sant-Haun*, wild elephants, *Sant-Htaint*; Karen, *Ka-Sau*.

From time immemorial the Burmese and Siamese have regarded the white elephant as a sacred beast. Sir John Bowring states that the reason why this animal is so specially reverenced is "because it is believed that Buddha, the divine emanation from the Deity, must necessarily in his multitudinous metamorphoses or transmissions through all existences, and through millions of æons, delight to abide for some time in that grand incarnation of purity, which is represented by the white elephant. While the Phongyis (priests) teach that there is no spot in the heavens above, or the earth below, or the waters under the earth, which is not visited in the peregrinations of the divinity, whose every stage or step is towards purification, they hold that his tarrying may be longer in the white elephant than in any other abode, and that in the possession of the sacred creature they may possess the presence of Buddha himself."* The same author states that these animals have been the cause of many a war, and their possession more an object of envy than the conquest of territory.

The kings of Burma were very proud of the titles of "Lord of the Celestial Elephant" and "Lord of many White Elephants." The kings of Siam also glory in these pompous titles; in that country everything associated with majesty and rank bears the image of the white elephant. These animals are surrounded with all the adjuncts of royalty, *viz.*—gold umbrellas, etc.—and when they die are accorded a royal funeral. The Burmese being Buddhists, are naturally kind to all dumb creatures, so that the elephant, in common with other domestic animals, is well cared for.

Wild Elephants.—These animals are very numerous and roam about in large herds in the dense jungles at the foot of the hills; very few are caught and tamed by Government for the use of the State. The kings of Burma used to carry on "kheddah" operations on a small scale in the Mandalay and other districts, and were, I believe, fairly successful. I feel certain that if operations were properly conducted, large captures could be made, as the animals are plentiful enough.

As a general rule, the herds vary in number from five to sixty animals, but the latter figure may often be exceeded. The animals met with are compact, massive, and of fair height; with regard to the latter point there may be slight

* Sir Monier Monier Williams, K.C.I.E., says the elephant is perhaps the most sacred of all animals.—*Buddhism*, pp. 23, 24, 84, 525.

variations between Indian, Burmese and Siamese animals. The usual pace of elephants is a walk; it is only when annoyed or scared that they take on a faster rate of locomotion, which is a shuffling amble, but the wonderful amount of speed these creatures can attain in an incredibly short time is only known to those who have had an enraged monster after them. The elephant is no doubt "King of the Forest;" they are rarely interfered with by other wild beasts: now and again, however, a hungry tiger may attack a solitary animal. A year or two ago, in the Tharrawaddy district, a tiger attacked, on different occasions, one or more animals, the property of a Burman contractor, inflicting such severe injuries that, I believe, one or more succumbed. It is the calves that usually fall victims to tigers, and the manner in which they catch them is as follows:—A tiger having observed calves in a herd lies in ambush close by, awaiting an opportunity (which usually occurs while the herd is busily engaged feeding), and then springs out, seizes a calf by the leg, just above the pad, and bolts. The herd after his attack is on the *qui vive*, so he keeps out of the way, but while they are moving off to fresh ground the tiger follows; the little one being lame, probably lags behind, thus giving the tiger another chance. If he does not get one he waits till the herd settles down again to feed, and then when the opportunity offers he makes another dash at his victim and invariably bites a second limb. The calf is now *hors de combat*, and the tiger knows that he has only to wait, since the herd, if large, cannot stay long in one place; twenty or thirty animals will soon clear all the "tit bits" on the ground where they are feeding, or they may want water, so the young one has to be left behind. I believe, however, that they will not abandon a calf until they are forced. As soon as the herd is clear, the tiger finds a young beast an easy prey, and no doubt a very excellent meal. In January last a tiger attacked a calf in a cane-brake. The little fellow was crying pitifully; his legs were so badly bitten that he was really unable to walk a few yards, so had to be shot. Two cows were on guard, and charged so furiously that they also had to be killed. All this occurred within fifty yards of a main track through the jungle. The people sometimes catch a "rogue" or other destructive beast by means of pitfalls. These are made in the following manner:—The point selected for digging a pit is on one of their well-known tracks to certain water or cultivation, and usually at a spot where the grass or jungle is very thick. The pit having been dug, all traces of fresh earth are removed, and the mouth is then carefully concealed with bamboos, elephant grass, etc. After this a good amount of fresh droppings is procured and these are thrown over the grass. This *ruse* tends to throw an animal off his guard, and so he falls into the trap. The men then turn out and destroy the animal with spears or a gun. Karens now and again capture one or two with the aid of tame elephants. Considering their great size elephants are wonderfully active—climb up and go down steep places in a surprising manner; and they are also excellent swimmers. When in

deep water, the whole body is immersed ; only the end of the trunk is kept above water.

Value of Elephants.—In a country like Burma the great value of these creatures can readily be appreciated, large areas being covered with dense impenetrable jungle, immense marshy tracts, steep hills and deep ravines ; added to which the whole country is intersected by rivers, large and small. In the absence of waterway in a place such as described, elephants are more than useful—they are indispensable ; they can with ease penetrate the dense and pathless jungle, their great size and weight causes them to leave a very fair track as they move along ; they can cross wide rivers, ford fast-running streams, carry men and baggage across swamps and heavy marshes penetrable to no other kind of transport animal. The value of an animal for transport purposes possessed of such strength and docility cannot be over-estimated.

In Burma elephants are largely employed in the timber trade ; in fact, the great commerce carried on in this line may be said to depend almost entirely on elephant-labour. The timber being scattered over wide areas of country without roads or slips, the logs have to be dragged by elephants through the jungle, over ridges, down ravines, and finally pushed into the floating streams, when, owing to the immense strength of these animals, they can stand in the strong current and sort the timber for rafting, clear it when the logs get jammed, and push them back into the water when stranded. In the large timber yards in Rangoon, Moulmain, etc., they have to haul the logs out of the river, bring them up to the sawbench, and after they are heaped, the elephants remove and stack them as neatly as if done by human hands, and in all these operations they are cheap and most efficient. It is quite one of the sights in Burma to see the timber-yard animals at work.

Powers of Endurance.—Though such enormous creatures, they are constitutionally delicate. I fear that, through lack of appreciation of this fact, these animals have not received the amount of attention they justly deserve ; and owing to the popular opinion that they are very strong, they have been too highly tasked. A great deal of the ill-health and mortality amongst elephants may well be ascribed to this cause. It cannot be too forcibly impressed on those persons entrusted with the care of public animals that untiring and vigilant superintendence over the attendants is the means, above all others, for the proper preservation of the efficiency of the animals committed to their charge. They must remember that the class of men usually employed with transport, if left to themselves, are, from general indolence, carelessness, or from a desire to avoid the fatigue and hardships of a campaign, quite liable to render their animals unserviceable. Ample supervision enables the carrying out of systematic checks against carelessness, and still more of checks to malpractices. A little neglect will often deprive a force of the valuable services of many animals.

Purchasing.—To begin with, it will perhaps be as well to mention the points of a healthy elephant.

The animal is in constant motion, with the ears flapping, and the tail and trunk swinging to and fro. The skin is almost black, and the bristles covering the body are firm to the touch; the light-coloured spots on the head and trunk are of a pinkish colour ; the eye is bright and clear, pulse from 48 to 50 per minute ; mucous membranes of mouth, etc., are of a beautiful pink colour ; the back is free from scars ; a moist secretion exudes around and above the nails, and is easily seen by throwing a little dust on the parts ; the pads are hard, and free from tenderness ; any signs of the latter may readily be detected, as the tender patches are smooth and of a yellowish-pink colour. If the appetite is good, the animal sleeps for a few hours every night, and on waking commences to feed.

The signs of ill-health are general languor, the skin looks greyish in colour, as also do the spots on the head and trunk ; the mucous membranes are pale or deep red, with or without dark blotches on the palate; pulse is abnormal, appetite is lost ; the animal does not take proper rest ; eyes are dull, and there is frequently a copious flow of tears ; there is usually fever, and the animal may be out of condition. As with other things, when buying elephants the purchaser should not be in a hurry, as his bargains may not afterwards prove to be all he desired. A little time should be taken to ascertain the idiosyncrasies of the beast about to be bought. The manner in which the keeper goes about his charge should be noted. Some animals are very full of tricks, and, if not approached to their liking, may attack a new keeper, or if timid, be scared for ever. The animal should be marched about, and the pads carefully inspected after exercise ; it is a common thing to fill up holes in the pads with stopping.

Burmans look upon elephants with certain habits with superstitious dread ; such creatures may be bought at very moderate figures. An elephant showing a peculiar general restlessness of the body somewhat after the manner of a bear, is much dreaded, as also is a creature that has the habit of swinging his trunk only to the right and left.

The height of elephants is measured in cubits. The cubit is about twenty inches.

With regard to age, the appearance of an old animal is as follows :—The head is lean, deep hollows are present over the eyes, there is frequently a certain amount of opacity around the margin of the corneæ (*Arcus senilis*), and an abnormal flow of tears. The edges of the ears are torn and frayed ; the skin of the trunk is rough, something like shark skin ; the trunk itself seems to have lost a certain amount of its suppleness ; the skin over the body is much shrivelled ; the tail is hard, and the end may be devoid of hair ; the skin around the nails presents a rough or warty appearance ; the legs are thinner than they ought to be. Other indications of age are, the general appearance,

and an awkward mode of progression, etc. A rough guess at the age may be made by observing the condition of the ears, the upper edges of which lap over to the extent of an inch at the age of thirty, which increases to two inches between this age and sixty years. The teeth also afford some information as to probable age ; it is, however, most difficult to determine with any degree of certainty the age of these animals.

(*From the "Agricultural Ledger*, 1896, *No.* 42.")

No. XIV.—GUM FROM THE WEAVER'S BEAM TREE.

(*Schrebera Swietenioides*, Roxb.)

Can any of our members furnish me with information regarding the gum thrown off by this tree, which is found in Central India and particularly in the forest parts of the Gwalior State ? The aborigines eat the gum when travelling, and say that it tends to keep off hunger and thirst, thus enabling them to go for several days without proper food. The gum tastes like bad brown sugar.

C. MARIES.

GWALIOR STATE GARDENS, 18*th July*, 1897.

No. XV.—WOUNDED TIGERS.

Having read with much interest an article on following up wounded tigers by Mr. Gilbert, published in the Society's *Journal* (Vol. IX, page 61), it has lately occurred to me that, without having any pretensions to the experience of that gentleman, the relation of some attempts of my own in the same direction, attended with more or less success, might also prove of interest to others. I have not the above-mentioned article by me at the present moment, but, so far as my memory serves, no mention is made in it of discovering the position of a wounded tiger (or panther) in thick cover, by means of village buffaloes. As most shikaris are aware, the village buffalo to be met with near villages well out in the jungle, is a much finer-built animal than those usually seen near towns, or where there is much cultivation ; and several instances are on record where these animals have combined and given an unwary tiger a very bad time of it. Sir S. Baker in "Wild Beasts and their Ways" mentions an instance of this ; there is also the delightful story of the death of Sher Khan in Kipling's "Jungle Book." Hence it is a fairly common custom in some parts of the Deccan, when dealing with a wounded tiger which has taken refuge in cover, to collect as many buffaloes as possible and have them driven backwards and forwards through the cover, until the wounded animal is located and his exact position known—theoretically, the herd, more especially if composed of old bulls or cows with calves, will, on finding the tiger, form battle array, and either bear down on him *en masse*, or should he charge out,

administer such punishment as to make him glad to retire if still able to do so; in the meanwhile the shikari himself, who is presumably either following the herd or posted in a position to command the scene of operations, watches his opportunity for a shot, either before the buffaloes have made up their mind to assume the offensive or when the tiger has determined on retreat. I think it may be assumed, in the great majority of cases at any rate, that a tiger when wounded (even slightly) will not try to evade the buffaloes and slink away unperceived. The above is the theory based on sound general principles, by the practical application of which everything may work out smoothly and the tiger be finished off without any great danger. Let us now take individual instances where everything was not perfection.

(A.) On 20th April, 1892, at about 3 p.m., I shot at and wounded a tiger. When last seen at about 6 p.m. it was going lame in forequartors, so apparently was hit in foreleg. Next day left camp at 9 a.m., with 38 buffaloes, including several old bulls; at about 12 p.m., having come 5 miles, these were driven in a more or less compact line through some grass jungle where the tiger was last seen. There was no trace of anything in it. On the far side was a stretch of burnt ground perfectly bare, except for a few scattered clumps of bamboo leading to a deep pool of water. The herd was driven over this burnt bit within a few yards of the bamboos, towards the water, into which latter they at once plunged. I was following some ten yards behind the herd, and had given up all hope of finding the tiger just then, when a native said that it was lying behind one of the clumps growing at the base of a steep hill, so went back and looked from about 30 yards off, but could see nothing. Thinking that the man was either mistaken or that the tiger was dead (the buffaloes having given no sign), I fired one barrel into the clump. The result was the immediate appearance of a very angry and lame tiger rushing towards me—fired second barrel into its mouth and got the brain. In this case the whole herd had passed within five yards of the tiger over open ground without giving any sign of its presence. On examining the body I found that on the first day one bullet had broken a foreleg low down near the wrist joint so to speak, whilst a second had raked the animal from behind nearly the whole length of the body, causing much internal bleeding.

(B.) On 21st April, 1894, shot at and wounded a big tigress in the Central Provinces. She was accompanied by two well-grown cubs—a difficult shot through intervening branches of trees and tangle, only loins and hindquarters being visible; knew that she was wounded, but not badly, somewhere in the hindquarters. Next day collected nearly a hundred buffaloes, including some old bulls and a good many cows with calves. On arriving near the ground, which was about 10 miles from camp, left the buffaloes and went to reconnoitre saw tigress and got difficult shot, as she

was lying in some short grass, at a white patch of hair which I took to be that on her face; bullet took effect somewhere in vicinity of head or neck. The buffaloes were then driven into the cover; when about 20 yards from where the tigress was supposed to be, she stood up and roared loudly, once. This caused a general stampede of the whole herd, every one of which made off as hard as they could go. The tigress did not move a yard, but lay down again in the same spot, where she was eventually finished off without again employing the buffaloes. The roar was almost her last effort, as when next seen, within half an hour afterwards, she was barely able to stand, and when examined subsequently, it was found that the second bullet had struck her rather low down on one side of the head in line with the ear, and from the hæmorrhage of this wound she was gradually succumbing.

These two instances sufficiently illustrate some of the possibilities which may occur from time to time. In the first case although the *dénouement* was somewhat unexpected, the employment of buffaloes in the manner described enabled me to explore the ground where the tiger was last seen, and eventually to approach the animal itself without incurring more than what I consider was a fair sporting risk; that the result was nearly being disastrous was entirely due to my own inexperience and stupidity in firing at a dangerous animal through a clump of bamboos without even being able to see the object; whilst in my own case this too had its uses, for I am not likely to make the same mistake again. In the second case, the thickness of the cover and nature of the ground made the work of locating the animal almost impossible without the help of buffaloes, unless indeed beaters had been employed in their place; but to this I am personally strongly opposed. There are men, I believe, who have no compunction in allowing practically unarmed beaters to penetrate jungle more or less dense and endeavour to drive the wounded tiger out towards themselves; in many cases there may be little real danger, provided the beaters have some experience of the nature of the animal, and keep together in groups of four or five, but to permit them to incur the undoubted risk of being mauled by an animal rendered dangerous, and very probably aggressive by reason of its wound or wounds, is, in my opinion, both cruel and unnecessary. In this connection I can call to mind an official of mature years and considerable experience, who enjoyed an unenviable notoriety for the number of beaters who had been killed or mauled in his service; at length matters came to such a pass that he resorted to the expedient of filling the hollow points of his bullets with strychnine, and in this manner "inoculated tigers," to use what is, I believe, his own expression. This method may have its advantages from an humanitarian point of view, and may have been the means of preventing a certain number of fatalities, but as to its merits and demerits, from a sporting point of view, I leave it to others to decide. It has always

seemed to me that no one should go out into the jungle with the avowed purpose of shooting, or endeavouring to shoot, tigers (and who is there, now-a-days, who has not done so?) unless fully prepared (to use a colloquial but very expressive phrase) to "see the show through"—by which I mean, incur all personal risk and shrink from no amount of personal exertion, when by so doing a wounded animal may be brought to bag. There are cases, no doubt, when a combination of circumstances may render it almost impossible to carry out this principle in its entirety; but in that part of India, at all events, to which reference is made in this article, *viz.*, the southern part of the Central Provinces and the country lying generally between the Tapti and the Godavery, such cases must be rare during the hot weather—at any rate when so much of the jungle is burnt or dried up. Before finally dismissing the subject of using buffaloes in the manner indicated, I would add a word of warning to those desirous of trying the experiment. It is:—Do not, when following the herd, keep too close behind them, as in the event of a sudden stampede you are likely to be run over; by keeping near trees, usually to be found scattered about, this danger may be avoided.

Let us now consider the case of a tiger which has been wounded, perhaps early in the day, so that there are still some hours of daylight remaining. The shikari is naturally unwilling to go back to camp without at least making some further attempt; the thought that perhaps the tiger may be lying dead within a few yards has lured on many a man before now, or even if he has learnt by experience to mistrust all evidence, in the case of a wounded animal, which points to death until he has actually pulled its tail or satisfied himself in some other way that there is no question about its demise being a reality, still it is tantalising to know that the animal for which you have perhaps toiled hard and toiled often is now lying more or less "done for" within a short distance—to know that perhaps on the morrow by the time buffaloes have been collected and all arrangements made for a thorough search, you may only find a swollen carcase and a ruined skin—or worse still, to find that he has vacated during the night without leaving any address—there is also a feeling of unwillingness to admit defeat, even though it may be only temporary, which spurs a man on to do something then and there instead of returning quietly, like a wise man, to camp and make arrangements for the next day. Such, at all events, have been my own feelings more than once, and in the expectation that they will be, or have been, those of others as well, I will now describe the procedure which has proved effective on occasions of this kind. A tiger had been wounded, apparently not very badly, and had laid up in thick grass jungle reaching about up to the waist; first of all men were posted on high ground or in trees all round, but some distance from the cover into which the animal had been marked. These had instructions to at once call out if they saw anything move, otherwise to

keep perfectly silent; then with a few picked men I myself slowly made my way from tree to tree inside the cordon thus formed, towards the centre, sending up flankers into the trees on both sides of me to examine the ground immediately to the front and flanks; bushes and thick patches of grass into which it was difficult to see were stoned by the men in trees from a supply provided for that purpose, particular attention was paid that no attempt should be made to explore the ground too far ahead whilst proceeding in this way, as by so doing places in the immediate vicinity might escape proper search; also that stones were only thrown at marks specified, and then only when instructed by me, so that I could concentrate all my attention on each spot in turn and so guard against surprise.

Having at length arrived at about 80 yards from where the tiger was supposed to be lying without having received any indications of its presence, I was not sorry to hear a man call out from the very top of a small tree close by that he could see a portion of the animal's skin. Giving my rifle to one of the four or five men who had collected near, I told the man in the tree to come down and myself proceeded to take his place. Having reached the topmost branch, which was very slender and swayed most unpleasantly, I called for the rifle. Just as I did so, out came the tiger from about 80 yards off, bounding over the grass towards the knot of men standing at the foot of the tree. After coming on about 50 yards or so, it lost heart, or did not think it "good enough," as, whisking round, back it went again, and by the time I could get hold of the rifle was out of sight. As it was now getting dark, we returned to camp and eventually bagged it with the help of buffaloes next day.

On another occasion I was wandering through the jungle early one morning looking for a suitable place in which to tie up a *hela*—two natives followed some distance behind—on the bank of a stream met a small crocodile making for the water and shot it, leaving the two natives to bring it along. I went on ahead, but had not proceeded more than 300 yards, when my progress was arrested by a deep narrow nullah overgrown with grass which crossed the path at right angles. I was standing on the bank of this and inwardly debating as to whether it would afford sufficient cover for a tiger to lay up in after killing in the vicinity, when from almost under my feet, and certainly not more than ten yards away, out bounded a fine tiger looking exactly like a long striped barrel on legs, and with a cough or two made off at full gallop across an open space on the other side of the nullah, about 60 or 70 yards across. Hastily cocking, I managed to get off both barrels, the second just as he was disappearing. Calling up the two men and pursuing the method just described, I gradually worked across the open space and arrived at the spot where the tiger was last seen by me. Here we were brought to a stop by a small hollow having a precipitous drop of some 20 feet. Not seeing anything here we were proceeding along the edge of this hollow at

right-angles to our previous course when one of the men happened to look behind him, and there was the tiger lying fully exposed in the hollow not more than 30 yards away and just able to raise its head, a bullet through which concluded the proceedings. I ought to mention that I had not the slightest idea as to whether my bullets had taken effect or not, but rather inclined to the belief that both shots had missed; still it is always as well to make certain, if possible, and it sometimes, as in this case, pays well to do so.

Just one more instance. In December, 1896, a tiger was wounded in a beat, and, from certain indications, pretty badly. It lay up in a patch of thick bush jungle with grass up to a man's chest. A gurgling moan was distinctly audible for about a quarter of an hour after the animal was wounded and then ceased. Pursuing the same tactics as before, an approach to within 30 yards of where the tiger was supposed to be was gradually achieved without result of any kind. From here a man spotted the body from a tree. Stones having no effect, a nearer examination and more stoning confirmed the native's surmise; for the animal had been dead half an hour or more.

I had intended to have added other instances within my personal knowledge regarding armed beaters walking up a wounded animal as recommended in the Badminton Library, and the question of stopping a charge, but the present article has reached such an unexpected length that these must be deferred to some future occasion.

J. H. VANDERZEE, Lieut.,
Indian Staff Corps.

Sadon, Upper Burma, *July*, 1897.

No. XVI.—FOWLS KILLED BY TICKS.

The serial *Indian Museum Notes*, issued by the Trustees of the Indian Museum, Calcutta, Vol. IV, No. 2, contains the following information regarding the ticks which killed a number of fowls belonging to the late Mr. N. S. Symons, in Bandra, during March and April, 1895 :—

"On the 14th April, 1895, numerous living specimens of a tick were forwarded to the Indian Museum by Mr. H. M. Phipson, with the information that they were infesting fowls to the extent of killing them, in the neighbourhood of Bombay. The ticks proved to be new to the Indian Museum collection, so specimens were submitted to Mr. A. D. Michael for his examination. Mr. Michael, in a letter dated 16th May, 1895, wrote :—'The ticks which you send are the common *Argas reflexus* of Fabricius. I think the *Argas persicus* of Fischer of Waldheim is really the same species; if there be any distinction, probably your specimens would be considered to be *A. persicus*, but I do not believe that there is. The species seems to be distributed practically over all temperate and tropical countries where

the pigeons, fowls, &c., on which it lives are present. It is quite possible that it kills the fowls if it be numerous. The bite is bad, particularly in hot countries; the Persian specimens were once supposed to be capable of killing human beings, which is probably incorrect; still it is quite possible that the bites inflame seriously in great heat.'

"'The *Argas* is a difficult thing to get rid of, as it is most tenacious of life, and it is far from easy to kill it without killing the fowl; probably sulphur or carbolic acid would have the best chance. Those you sent alive were still alive and quite well when I opened them.'"

No. XVII.—THE OCEANIC TEAL (*MARECA GIBBERIFRONS*).

When I arrived at Port Blair in May, these teal where in good-sized flocks, resorting principally, at low tide, to two little rocky islets, up the harbour, known as Bird Island and Oyster Island. I did not go after them at that time myself, not having a boat; a fair, though not large number, were killed by some of the officers stationed here. I believe eleven was the result of four barrels on one occasion! As the monsoon commenced and the harbour became rougher, at the beginning of June, these flocks of teal broke up into smaller parties of 5 or 6 to a dozen or so, and retired to the creeks and dyke-intersected marshes, a little inland, near Bamboo Flat and Port Monatt. Towards the end of June these small parties commenced to break up into pairs; about this time I shot several, and in the paired birds I found the testes of the drakes enlarged, but the ovaries of the females were, as yet, in ordinary condition. In the "Game Birds of India" Mr. Hume mentions a single nest being found in August, and I should think that August or the end of July would be the usual time of laying. I am afraid I am not likely to find a nest, as there are so many hundreds of acres of suitable breeding ground, and the birds are comparatively few.

The Oceanic Teal feed a good deal in the paddy fields at night; under cover of darkness, too, a few birds aften drop into small tanks at Aberdeen within a few yards of bungalows and buildings. When in flocks they are very wild, but in pairs, on the small channels among the marshes, I found them very tame. I have often been able to creep up to the water's edge and watch a pair swimming quietly about within ten yards of me for some time. On one occasion I came right on to a pair under an overhanging bush, and they only fluttered, like waterhens, along the surface for twenty yards or so, then pitched and commenced swimming away, so that I was able to kill one on the water and the other as it rose, from where I stood. Of course birds that have been shot at a bit go clean away at the first alarm. On these creeks they associate with the common Whistling Teal, and I have watched the two species in close company on the water, though the Oceanic Teal separate from the others when put up. The only thing I noticed about them, which I do not think has been recorded, is that they have a "quacking"

note as well as a low whistle. One day a party of 8 or 10, at which some shots had been fired, after wheeling round and round overhead for some time, pitched on a narrow channel, within 30 yards of me, as I stood concealed in the bushes on the bank. I watched them for some minutes, when another pair, frightened by some distant shots, came scurrying over; the birds on the water all twisted their heads up and set up a loud rapid quacking call note which they kept up for some minutes; the new-comers circled round several times, but probably seeing the top of my *topee*, concluded not to join their companions in their fancied security. The flight of this teal is fairly fast: occasionally when they have been kept on the wing for some time a party will stoop down to the surface of a creek as though they meant to pitch, and then change their minds and rise again. When executing this manœuvre they rush past at a tremendous pace. The broad white wing-bar, in this species, is most conspicuous when the bird is on the wing.

Winged birds promptly swim for the nearest cover, into which they scuttle off at a great pace and are generally lost without a dog. One I shot swam steadily along in front of a Pathan convict who was swimming after it, in the capacity of a retriever, and though hard pressed made no attempt to dive till it reached the bank, where it was caught. One of the officers stationed here has a live bird in captivity which was pinioned by a shot some months ago. It thrives well on paddy, but has not become very tame. It spends most of the day asleep, with its head resting in the plumage of the back. The local sportsmen have christened them "Gibberies."

They are rather difficult birds to skin, being very fat, and having, for a duck, rather a tender skin. They seem to average about 15 oz. in weight.

A. L. BUTLER.

PORT BLAIR, *July*, 1897.

No. XVIII.—OCCURRENCE OF THE GARGANY TEAL IN INDIA DURING JULY.

With reference to notes published in various papers this year referring to the late stay of Wild Fowl, I shot a teal which I take to be a female of *Querquedula circia* (Linn.), the "Gargany Teal," here, on the evening of the 24th instant. It was out of a lot of three, consisting of a male and two females, and it was in good condition, but on dissection there were no signs that the bird was breeding. This is, of course, an early teal to return to us, but is not this an unusually early date? At the same time I saw three or four other duck, but in the distance. I was not, unfortunately, able to skin the bird myself, so it has been fearfully mangled, but I am sending sufficient to identify the bird. Please inform me if I am correct in my identification.

R. H. RATTRAY, MAJOR,
22nd Punjab Infantry.

JHELUM, 27*th July*, 1897.

No. XIX.—NESTING OF THE LITTLE FORK-TAIL.
(*MICROCICHLA SCOULERI.*)

I was lucky enough to find two nests of No. 637 (Oates), *Microcichla scouleri* the Little Fork-tail, at Mussoorie this year. The first nest was found in a hole in rock on the bank of the Aglar River, at an elevation of about 3,500 feet, the female bird being shot off the nest. The nest was very loosely made of a little moss and a few skeleton leaves. I took it out, but it fell to pieces in my hand. The nest contained three fresh eggs, large for the size of the bird, long and oval in shape, and a good deal pointed at the small end ; colour white, with a faint pink tinge covered with numerous tiny pale red specks, most numerous at large end ; very little gloss, but fine and satiny to touch ; this nest was found on 17th June. The second nest was found on 21st June, at Kemptee Falls, at about 4,000 feet, and was on a small shelf of rock under a waterfall : nest and eggs exactly similar to first. Hume in "Nests and Eggs" states that Jerdon had nest and eggs brought to him, and describes them as similar to *Henicurus maculatus*, but smaller. I am of opinion that the eggs of some other bird must have been brought to him, as mine are not in any way like a large series of *H. maculatus* in my possession. I am certain of my eggs, as the female was in each case shot off the nest. I am sending one clutch, with skin, for you to show at the next meeting, but please return them to me afterwards.

Size, largest egg..... ·84″ × ·63″
„ smallest „ .... ·79″ × ·58″
Average of six eggs..... ·82″ × ·61″

This is, I believe, the first time authentic eggs have been taken.

R. H. RATTRAY, MAJOR,
22nd Punjab Infantry.

JHELUM, 27*th July*, 1897.

No. XX.—CATS AS A PROTECTION AGAINST SNAKES.

It is well known that the presence of a dog in the house, in this country, constitutes a considerable protection against snakes, as our canine friends appear to have a strong antipathy to all reptiles. Their sight is not particularly good in the dark, but their sense of smell generally enables them to detect the presence of a snake, and one frequently hears of cases in which dogs have rendered very valuable service in this manner. Until lately, however, I should not have included cats as being of much use in the same direction, but the following circumstance shows that their presence is a considerable safeguard.

Last night I was disturbed by the noise made by two cats at the back of the house, just outside the dining-room. They kept rushing across the foot-path and generally attracted attention by their unusual behaviour. One of the servants went to see what was the cause of the disturbance, and he found a Daboia (*Vipera russellii*), which he promptly killed.

This is the second instance, which has lately come to my knowledge, of poisonous snakes being found through the instrumentality of cats.

T. S. WEIR, SURG.-LIEUT.-COL.

BOMBAY, *3rd August*, 1897.

No. XXI.—TUSK MEASUREMENTS OF THE ASIATIC ELEPHANT.

In Blanford's "Mammalia of India" and in Rowland Ward's "Great Game of the World" the record tusk of an Asiatic elephant mentioned is the late Sir Victor Brooke's from Mysore, 8′ long, $16\frac{7}{8}$″ in circumference, and 90 lbs. in weight; therefore the following measurements, which I have taken to-day of the collection of tusks in the Royal Siamese Museum, Bangkok, may be of interest. As far as I can ascertain, these tusks are all from Siam; there are two of 9′ and over, five of 8′ and over, twelve of 7′ and over, six of 6′ and over, ten of 5′ and over, five of 4′ 6″ and over, and numerous shorter ones. The length is measured along the outside curve of the tusk; the large ones being mounted upright in wooden sockets, it is difficult to get the exact length to an inch in many cases, but I have tried to do so, and in case of doubt have taken the smaller measurement. Owing to their being thus mounted I have been unable to ascertain their weight. The thickest tusk is a single one, 7′ 7″ in length and $20\frac{3}{4}$″ in circumference.

The measurements of the four finest pairs are as follows:—

Length.		Circumference.	
7′ $4\frac{1}{2}$″,	7′ $4\frac{3}{4}$″	$16\frac{3}{4}$″, $16\frac{3}{8}$″.	A massive, even pair.
7′ $8\frac{1}{2}$″,	7′ 8″	$13\frac{1}{2}$″, $13\frac{1}{2}$″.	Points of tusks much worn.
8′ 3″,	8′ 4″	$14\frac{1}{2}$″, $14\frac{1}{2}$″.	A slender, symmetrical pair.
9′ 0″,	9′ $10\frac{1}{2}$″	$15\frac{3}{8}$″, $15\frac{1}{2}$″.	

The fourth pair belonged to an elephant, said to have been 90 years old, which died in Bangkok some twenty years ago, and I think they must be the record pair for Asia.

S. S. FLOWER, LIEUT., 5th Fusiliers,
(Temporarily lent to the Siamese Government,
as Scientific Adviser, R.S.M.).

BANGKOK, *17th July*, 1897.

No. XXII.—PLANTS OF A BOMBAY SWAMP.

With reference to Mr. Woodrow's paper in the last number, I am interested in what he says of *Erythrina indica* as appearing in your Bombay swamps and as having more the appearance of a truly wild tree than other examples near Bombay have. The truth is that *Erythrina indica* (The *Pangara*) is one of the commonest of Indian sea-coast trees all round the Andamans, Nicobar and Burmese Coasts, and all along the sea-face of the Sunderbuns it is one of the

very commonest species, but *nobody ever found it truly wild anywhere except on a sea-coast.* There are many species exactly like this, one of the best known being *Dalbergia monosperma*, which is absolutely limited to the coast, and will not even grow elsewhere. I know it is given in Mr. Birdwood's list of Mahableshwar plants, but this is, of course, a slip, though I wonder what the species is that has been mistaken for *Dalbergia monosperma.* What Mr. Woodrow says of *Scoparia dulcis* is also most interesting, but it is very much otherwise on this side of India, for the species has spread throughout both the Shan Hills and the Kachin Hills, and yet, from the fact that Roxburgh omits it, we may safely conclude it was not in Bengal a hundred years ago, although it is one of the commonest and one of the most intractable of our weeds now.

D. PRAIN, SURG.-CAPT.

CALCUTTA, *August*, 1897.

No. XXIII.—THE BLUE ROCK THRUSH (*PETROPHILA SOLITARIA*).

Mr. H. Littledale, in the last number of this Journal, speaks of a Blue Rock Thrush (*P. cyanea*?) tackling a lizard, but he seems to think that the bird only did so through mistaking the lizard's tail for a worm. Probably, however, the thrush knew perfectly well what he was about, for all his kind are most omnivorous feeders, and lizards are not at all out-of-the-way articles of diet for them. I once collected a great number of the birds of this genus with a view to obtaining connecting links between *cyanea* and *solitaria*, and amongst these birds I shot one which had swallowed a lizard so long that at least the final three inches of the tail was still projecting from its mouth although the head was firmly fixed in the gizzard and was rapidly undergoing digestion. I suppose in a short time the whole of the lizard would have been taken in and used, as the bird did not seem at all inconvenienced by its strange meal. The bird looked very queer hopping about with a huge tongue-like affair hanging from its mouth, and a gentleman, Mr. H. Pearson, who was with me, and I also, made the most wild speculations as to what it was until we had shot it.

I have found grain in their stomachs sometimes and also a small fruit or two, but their main diet had always been animal, and I think small snails, slugs and worms were the favourite articles.

E. C. STUART BAKER.

HAFLONG, CACHAR, 12*th July*, 1897.

No. XXIV.—THE MIGRATION OF BUTTERFLIES.

Will you kindly give me space to invite the attention of members of the Society to a subject which has received less attention than it deserves—I mean the migrations of butterflies. *Euplœa core* is not ordinarily a migratory insect. It remains with us all the year, and may be found in the larva state at

all seasons on the oleanders in our gardens. Every year, however, for two days in the beginning of June, it appears in unusual numbers, migrating steadily northwards. The natives have noticed this, and say that the rain will come three days after the butterflies, but I have not found this to be invariably the case. This year the migration began on the 7th of June, the morning after our first thunderstorm, but long before we had any regular monsoon rain. I imagine that the butterflies which migrate are those that are brought out from the pupæ of the previous season by the first heavy fall of rain, and that they migrate to escape the monsoon. In that case it would be very interesting to know where the movement begins and where it ends; also whether there is any return along another route at any other season, or whether the hordes of the south go to increase the population of the north each year. These points might easily be settled if a number of members in different parts of the country would watch these butterflies and make the result of their observations known. It is not necessary that they should know anything about butterflies, for *Euplœa core* cannot be mistaken for any other species. It is a medium-sized, or large butterfly, with rather elongated wings, of a dark brown, or blackish colour, with a border of white spots. When migrating they pass in such numbers that it is impossible to look out of the window without seeing them. With them there are generally a few of *Danais aglœa* and *D. limniace*, taking the same direction.

Another butterfly which certainly migrates, but more erratically, is *Pyrameis cardui*, the "Painted Lady." At different times of the year, but most often, I think, in June, large numbers of this species appear about the rocks on the sea shore, or in other barren situations, and I am inclined to think that they are new arrivals from some other country, for this butterfly is cosmopolitan and apparently a great wanderer. A certain number remain permanently with us and breed on a common species of *Blumea*.

E. H. AITKEN.

RATNAGIRI, *August*, 1897.

No. XXV.—OUR ANNUAL CATERPILLAR PEST AND ITS REMEDY.

I hasten to communicate to the members of the Society a discovery which surely illustrates the economic value of a knowledge of natural history. I daresay most of them have suffered, like myself, during the last month, from those little, hairy, black caterpillars which are the special pestilence of this season. Originating apparently on the doorstep, and feeding on the invisible flora of damp walls, they invade all parts of the house and take up positions on chairs and tables, in your hat, or about your clothes, which make it impossible to avoid coming into contact with them. From such contact they suffer little, but the effect of their hairs on our skins does not pass off in a day. They are the larvæ of a little moth, *Nepita conferta*, and I may refer readers of our Journal to an interesting account of their habits by Mr. H. S. Wise in

the 3rd volume. Till lately I supposed that these pests were secured against the common enemies of insects by their armour of venomous hairs ; but I was mistaken. Last week a portly toad found its way into my verandah, and after eyeing one of them for some time, bowed to it, and it disappeared in that magical way in which insects do disappear when toads are feeding. After this the toad "studied" for a time, as Uncle Remus says, but seemed to be pleased with the result, for it proceeded to make the rest of the caterpillars about it disappear in like manner. So it is evident that the lining of a toad is proof against even the hairs of *Nepita conferta*. Had I known this sooner I would have taken steps to import a regiment of toads.

E. H. AITKEN.

RATNAGIRI, *August*, 1897.

No. XXVI.—NOTES ON "HUME AND MARSHALL."

It seems time for us to try to put together a series of notes on Hume and Marshall's "Game Birds," as McMaster did with Jerdon many years ago. No doubt many men have marginal notes in their copies of the "Game Birds," and though each individual's notes may be few, a considerable body of useful comment might be got together by united action. As a specimen of what I mean, I will take Hume's account of the Sarus (Vol. III, p. 2). Dr. Anderson is quoted in a note as having been of opinion that he saw huge flocks of the Sarus flying overhead in Yunan. It is probable that he was mistaken, and that what he did see was a flock of the Demoiselle cranes. I know that last cold-weather at the Null a friend and I blazed into a flock of Kullum (*A. virgo*) at 25 yards flying, and both selected, for our first barrel, a fine specimen, which turned out to be a Sarus ! ; shows the danger to Sarus of bad company ; also the difficulty of distinguishing the species in a flock.

Hume (p. 4) says he does not believe that Sarus *ever*, in India, rise high in air, and circle round as other cranes do. I have seen the Sarus do this repeatedly at over 100 yards up, in the hot-weather, near Muwal tank north of Baroda. Also at other places, during the middle of the day. Hume says that the Sarus eats frogs. I had a tame pair that would not do so. Their call, Hume says (p. 5), is loud and sonorous. This is true, but it does not bring out the point that it is generally a *duet*, which gives volume to the sound. The male starts off with a scream, and the female chimes in with her staccato notes. The Sarus gather in large flocks near Baroda in March. I once saw 200 in one flock when at Alindra. Generally one can see 50 or so together at Muwal.

Possibly we might be able to get a sufficient body of notes in this way to make a useful supplement to the "Game Birds." Some day I shall continue my own notes, such as they are.

H. LITTLEDALE.

BARODA, *August*, 1897.

No. XXVII.—DECOYING A MONKEY.

Yesterday about 10 a.m. a large male Langur Hanuman Monkey, (*Semnopithecus entellus*) paid a surprise visit to my compound, and it occurred to me that it would be interesting to see whether we could succeed in decoying him by means of two stuffed specimens of the same species which are in my possession. These specimens were mounted by Rowland Ward some years ago and are still exceedingly life-like, so I placed one of them on the branch of a large tree and the other on the grass, close by, and then retired into the house to watch the result.

Within a few minutes the monkey approached the stuffed dummy in the tree, touched it on the shoulder and then withdrew his hand quickly. He looked rather surprised and the expression of his face was most amusing. He then sat down in front of the dummy and leaning forward rubbed his nose against its face. He again withdrew a little, being evidently greatly astonished at the marked coldness with which his friendly advances were received. After a few minutes he descended from the tree and approaching the other stuffed specimen was going through the same pantomime when one of my tame chita cubs which are kept in an enclosure, close by, sprang over the bamboo palings and charged at the performers. The big monkey was high up in a tree before the chita was well over the paling, but when he saw dummy being knocked over, he worked himself up into a fearful state of rage and excitement, shaking the branches violently and uttering harsh cries; in fact at one time he appeared to be on the point of coming down to the rescue, but I ran forward and took the young chita away. I afterwards removed this dummy and put it up in the tree near the other one and within a short time the live monkey was seen quietly sitting beside these unsympathetic companions.

G. S. RODON, MAJOR.

DHARWAR, 1*st September*, 1897.

OBITUARY.

Dr. J. C. Lisboa.

A member of this Society and frequent contributor to these pages, passed over to the majority, at Poona, on 1st May, 1897, aged 75. One of the early disciples at the Grant Medical College, Bombay, Dr. Lisboa had a long and successful career in Medicine, and having retired from practice occupied his well-earned leisure in botanical investigation. He made grasses a special subject of study and with the assistance and sympathy of his amiable and accomplished wife, acquired a truly remarkable knowledge of the structure and affinities of that very difficult group of plants. It is much regretted that his health began to break down soon after he had decided to publish a list of the Bombay Grasses which is at present in the press. In private life he was all that good men wish to be, and his loss is widely deplored.

PROCEEDINGS

OF THE MEETING HELD ON 15TH JULY, 1897.

A meeting of the members took place at the Society's Rooms on Thursday the 15th July.

NEW MEMBERS.

The election of the following new members was announced :—Mr. A. Morgan, (Nilgiris), Mr. Marshall D. Taylor (Alipore), Mr. A. V. Wilkins (Alipore), Rev. C. P. Cory (Theyetmyo), Colonel G. D. F. Sulivan (Rawalpindi), Mr. R. P. Allen (Madras), Surgeon-Lieutenant H. F. Walton, M.B. (Bombay), Mr. Robert Berry, C.E. (Arsekeri), Messrs. R. Friedlander and Son (Berlin), Mr. J. H. Curtis (Calcutta), Lieutenant H. E. Winsloe, R. E. (Burma), Mr. T. N. Hearsey (Kurnool), Major J. F. A. McNair, C. M. G. (England), Lieutenant W. S. Prentis (Burma), Mr. W. O. Hannyngton (Burma), Mr. W. P. Johnson (Bombay), Mr. Marshall F. Reid (Bombay), Mrs. E. Lawrence (Bombay), Mr. H. C. John (Sindh), Mr. E. O. Cholmondeley (Indore), Mr. R. McIntosh, I.F.S. (Cuddapah), Surgeon-Major H. E. Deane (Bombay), Mr. H. Harrison, I.C.S. (Kolahpore), Mr. G. Marshall Woodrow (Poona), Mr. R. M. Powell (Nandyal), Mr. W. A. Talbot (Belgaum), Mr. F. G. Pratt, I.C.S. (Sholapore), Captain C. G. Nurse (Deesa), and B. Standen, I.C.S. (Betul, C.P.)

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged the following contributions to the Society's Museum :—

Contribution.	Description.	Contributor.
Seychelle Leaf Insects (alive).	*Phyllium Scythe*	Mr. McCann.
Skin and Skull of the Lesser Civet Cat.	*Viverricula malaccensis*.....	Mr. R. C. Wroughton.
Scorpions from Ceylon	.....	Col. A. G. Tidy.
1 Lesser Concal from Ceylon.	*Centropus bengalensis*.....	Mr. A. L. Butler.
2 Spotted Owlets (alive) ...	*Athene brama*	Mr. R. Baumbach.
1 Snake	*Dendrophis pictus*	Mr. C. Hudson, I.C.S.
A Four-legged Chicken	.....	Mr. W. J. K. Hunter.
A Number of Scorpions.....	.....	Mr. H. Kemball.
1 Indian Squirrel (New Variety) alive.	*Sciurus indicus var. dealbatus.*	Mrs. Wroughton.
1 Parrot Fish	*Tetrodon patoca*	Mr. G. R. Long.
Land Shells from Nilgiris ...	.....	Mr. L. Morgan.
Beetles.....	.....	Do.
1 Dhaman (alive)	*Zamenis mycosus*	Miss Olive Lyons.
1 Chameleon (alive)	*Chameleon calcarotus*	Mr. D. G. Ommaney.
A Collection of Birds' Eggs.	.....	Miss A. Dickinson.
1 Snake (alive).....	*Dryophis mycterizans*.....	Mr. E. S. Luard.
2 Lizards	*Ophiomorus tridactylus*.. ...	Lieut. C. Woodhouse.
1 Snake (alive).....	*Lycodon aulicus*	Mr. E. H. Elsworthy.
est and Egg of a Megapod.	*Megapodius nicobariensis* ...	Lieut. Wilson, R.I.M.
600 Butterflies and Moths from Assam.	.....	Lieut. G. Warneford.

Contribution.	Description.	Contributor.
1 Snake	*Lycodon aulicus*	Mr. E. O. Cholmondeley.
1 Do.	*Bungarus cæruleus*	Do.
2 Pied Crested Cuckoos (alive)	*Coccystes jacobinus*	Mr. Williamson.
1 Cobra (alive)	*Naga tripudians*	Lt. R. Gillespie, R.E.
A Number of Birds' Eggs	.....	Mr. C. Crommellin.
1 Pied Crested Cuckoo (alive)	*Coccystes jacobinus*	Mr. A. Prentice.
A Collection of Scorpions from Nasik	.....	Mr. G. R. Duxbury.
Do. from Sindh	.....	Mr. P. J. Corbett.
Eggs and Skin of Black-winged Kite	*Elanus cæruleus*	Lieut. C. D. Lester.
Freshwater Shells from Chindwin River	.....	Mr. S. B. Bates, V.Z.S.
1 Snake	*Tropidonotus stolatus*	Mrs. Nicholson.
A Collection of Butterflies	.....	Capt. F. E. Skey, R.E.
Skull of smaller Cashmere Flying Squirrel	*Sciuropterus fimbriatus*	Prof. H. Littledale.
2 Snakes	*Coluber hodgsoni*	Do.
1 Do.	*Ancistrodon himalayanus*	Do.
1 Chinkara Head	*Gazella benetti*	Mr. Merony.
1 Monitor (alive)	*Varanus bengalensis*	Capt. F. Torrens-Griffin.
1 Snake	*Tropidonotus plumbicolor*	Mr. T. Hewitt.
1 Do.	*Bungarus cæruleus*	Do.
A Collection of Reptiles from Cachar	.....	Mr. F. C. S. Baker.
A Number of Beetles and Land Shells	.....	Mr. Lawson Morgan.
Freshwater Fishes from C. P.	.....	Mr. James Martin.
1 Western Green Barbet (alive)	*Megalaima viridis*	Mr. Westbrook.
1 Cobra (alive)	*Naga trepudians*	Mr. Anandrao Dalve.
1 Snake	*Tropidonotus piscator*	Mr. W. M. Bell.

CONTRIBUTIONS TO THE LIBRARY.

The Coccidæ of Ceylon, by E. Ernest Green, from the Author.

Photographs of the Doom Palm (*Hyphœne thebaica*), from Mr. R. G. Webb, "Nature," every week, from Mr. W. F. Sinclair.

PAPERS READ.

The following papers were then read and discussed :—

1. The poisonous properties of the sweet-scented Oleander (*Nerium odorum*), by Surg.-Lieut.-Col. K. R. Kirtikar, I.M.S., F.L.S.

2. Bombay Land and Freshwater Shells, Part II., by Lieut. A. J. Peile, R.A.

3. The Birds of North Cachar, Part VIII., by E. C. S. Baker, F.Z.S.

4. The *Heterocera* of Sikhim and Bhutan, by G. C. Dudgeon, F.E.S.

5. Miscellaneous Notes.—
   (*a*) The Great Indian Hornbill, in the Wild State, by Lieut-Col. C. T. Bingham.
   (*b*) The Great Indian Hornbill, in Captivity, by H. M. Phipson.
   (*c*) Notes on Shooting in Oudh, by S. Eardley-Wilmot.
   (*d*) The Kol Bhalu, by Capt. R. M. Betham.
   (*e*) Notes on Crows, and on the Protective Power of Scent in Animals, by S. Eardley-Wilmot.

PROCEEDINGS

OF THE MEETING HELD ON 30TH SEPTEMBER, 1897.

A meeting of the members took place at the Society Rooms on Thursday. the 30th September, 1897, Mr. L. de Nicéville presiding.

NEW MEMBERS.

The election of the following new members was announced :—Captain W. F. Corbett (Cannanore) ; Mr. G. M. Ryan, I. F.S., (Thana) ; Mr. W. F. Morison, I.C.S., (Sholapore) ; Surgeon-Lieutenant R. F. Standage, I.M.S., (Sholapore) ; Mr. W. F. D. Fisher, I.F.S., (Sholapore) ; Mr D. M. Gordon, (Burma) ; Mr. E. C. B. Acworth (Bombay) ; Captain C. Moss (Bombay) ; Surgeon-Major R. W. S. Lyons (Bombay) ; Mr P. J. MacDonald (Calcutta) ; Veterinary-Lieutenant F. S. H. Baldrey (Bombay) ; Veterinary-Lieutenant A. S. Trydell (Nagpore) ; Veterinary-Captain A. E. Richardson (Allahabad) ; Surgeon-Major C. B. Maitland, I.M.S., (Neemuch) ; Honorable Mr. Justice Strachey (Bombay) ; Mr. W. M. Green, I.F.S., (Kurseong) ; Mr. H. A. Farrington, I. F. S. (Jalpaiguri) ; Mr. W. H. Lovegrove, I. F. S. (Dehra Dun) ; Captain F. G Batten (Burma) ; Mr. C. E. C. Fischer, I. F. S., (Kurnool) ; Surgeon-Captain Edgar J. Morgan (Sialkote) ; Mr. A. B. Jackson, I.F.S. (Nilambur) ; Surgeon-Major A. G. Newland (Burma) ; Mr. B. Coventry, I.F.S., (Lahore) ; Mr. H. H. Forteath, I.F.S., (Burma) ; Mr. A. Wood, I.C.S. (Bombay) ; Mr. W. A. Hasted (Waltair) ; Mr. H. G. Young (Waltair) ; Mr. P. W. Stevens (Gaya) ; Mr. Alex. McIntosh, C. E., (Cachar) ; Mr. G. F. H. Cather (Upper Burma) ; Lieutenant S. Delmè-Radcliffe (Jubbulpur) ; Lieutenant Johnstone Stewart (Tochi Field Force) ; Mr. P. W. Barker (Neschindipur) ; Captain F. I. H. Barton (Lundi Kotal) ; Mr. J. P. Vaughan, I.C.S., (Sind) ; Colonel W. S. Birdwood (Aden) ; Mr. W. D. Cumming (Persian Gulf) ; Mr. F. E. H. Parratt (Chiegmal, Burma) ; Mr. Kenneth Mackenzie (Kurnool) ; Mr. J. W. C. Gardner (Jalpaiguri) ; Lieutenant H. W. Cruddas (Upper Burma) ; Mr. A. H. A. Simcox, I.C.S., (Malegaon) ; Lieutenant A. E. Barnard (Rangoon) ; Surgeon-Lieutenant J. L. Marjoribanks, I.M.S. (Poona).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting:—

Contribution.	Description.	Contributor.
A number of scorpions from Mussoorie.	.....	Major R. H. Rattray.
1 Nightjar (alive)	Caprimulgus asiaticus ...	Col. Gerard Martin.
1 Indian Monitor	Varanus bengalensis... ...	Dr. D'Monte.
Fresh-water Shells from Sawantwadi.	.....	Dr. D. Dalgado.
1 Python (alive)	Python molurus	Mr. Douglas Bennett.
1 Daboia	Vipera russellii	Surg.-Lieut.-Col. T. Weir.
Land and Fresh-water Shells from Madras.	.....	Capt. E. Y. Watson.
1 Indian Monitor	Varanus bengalensis ...	Mr. A. Francke.
Deep Sea Shells	.....	Miss Spragge.
A number of Insects from Darjeeling.	.....	Mr. J. A. Betham.
2 Snakes	Tracbischium fuscum ... Callophis macclellandii ...	Do.
1 Chameleon (alive)... ...	Chameleon calcaratus ...	Mr. A. C. Logan, I.C.S.
Land Shells from Kumargram.	.....	Mr. T. J. Ede.
1 Sand Lizard (alive) ...	Ophiomorus tridactylus ...	Capt. A. Hatch.
1 Snake (alive)	Lycodon aulicus	Mr W. Jardine.
1 Chameleon (alive) ...	Chameleon calcaratus ...	Mr. F. A. Hill.
1 Snake	Homalopsis buccata	Surgeon-Major E. Frenchman.
Skull of Wild Dog	Cyon dukhunensis	Mr. C. B. Brendon.
1 Snake	Tropidonotus plumbicolor ...	Do.
1 Crested Serpent-Eagle ...	Spilornis cheela	Mr. H. Wapshare.
1 Pale Harrier	Circus macrurus	Do.
1 Black-winged Kite ...	Elanus cœruleus	Do.
1 Shikra	Astur badius	Do.
1 Snake	Tropidonotus piscator ...	Mr. E. H. Brock.
A pair of Arakan Silver Pheasants (alive).	Euplocamus cuvieri... ...	Capt. F. T. Williams.
1 Indian Monitor	Varanus bengalensis ...	Dr. C. Rodrigues.
A number of sea shells ...	.....	Mr. E. H. Aitken.
Land shells from Ceylon ...	.....	Mr. E. Ernest Green.
Land shells from Thana ...	.....	Mr. G. M. Ryan.
1 Snake	Callophis maculiceps ...	Mr. John Graham.
1 Snake (alive)	Dipses trigonata	Mr. A. M. Tod.
1 Snake (alive)	Dipsas forstenii	Surgn.-Capt. E. Harold Brown.
Sarus eggs	Grus antigone	Mr. J. M. Gordon.
2 Batrachians	Ichthyophis glinosus ...	Mr. W. Mahon Daly.
1 Snake	Trimeresurus strigatus ...	Mr. A. J. Jardine.
1 Gaur's skull	Bos gaurus	Mr. A. J. A. Jardine.
4 Banting's skulls	Bos sondaicus	Vety.-Maj. G. Evans.
3 Brow-antlered Deers' skulls.	Cervus eldii	Do.
2 Hog-deers' skulls	Cervus porcinus	Do.
1 Burmese Serow's skull ...	Nemorhœdus Sumatrensis ...	Do.
1 Goral's skull	Cemas goral	Do.

Contribution.	Description.	Contributor.
2 Cobras	Naja tripudians	Vety.-Maj. G. Evans.
2 Snakes	Tropidonotus stolatus ...	Do.
1 Golden Tree-Snake ...	Chrysopelea ornata	Do.
1 Snake	Cylindrophis rufus	Do.
Photographs of Game Birds.	.....	Capt. F. T. Williams.
1 Mounted Skin of a Binturong	Arctictis binturong	Le Baron Von Heeckerenez.
1 Malay Palm-Civet... ...	Paradoxurus hermaphroditus.	Do.
1 Wild Cat	Felis minuta	.....
A number of rare beetles from Kurrachee.	.....	Capt. T. G. B. Finny.
1 Clutch of Bustard Quails' Eggs.	Turnix taigoor	Major A. A. Fraser.
A number of Reptiles from Gwalior.	.....	Mr. C. Maries.
Land and Fresh-water Shells from Upper Chindwin ...	.....	Mr. S. B. Bates.
Land Shells from the Nilgiris.	.....	Mr. L. Morgan.

CONTRIBUTIONS TO THE LIBRARY.

Geological Description of Java and Madoura, Vols. I and II, with complete set of maps, from the Dutch Consul. Dr. Koch's reports on Rinderpest, from Veterinary-Major J. Mills. Oceanic Ichthyology (Goode and Bean), 2 vols., in exchange. Life History of the North American Birds, in exchange. The Fishes of North and Middle America, in exchange. Memoirs of the Geological Survey of India for 1896, in exchange. New Indian Coccids (Green). The Coccidæ of Ceylon (Green), and Report on *Orthezia insignis*, an Insect Pest (Green), from E. Ernest Green. Journal of the Marine Biological Association, Vol. IV, No. I, from Mr. W. F. Sinclair. Report on the Government Experimental Farms at Poona and Surat, from Government.

PAPERS READ.

The following papers were then read and discussed:—1. Camp Kit, by John Wallace, C.E. 2. The large Indian Squirrel (*Sciurus in licus*) and its local races or sub-species, by W. T. Blanford, F.R.S. 3. New species of Western Peninsula Plants from North Kanara and Mysore, by W. A. Talbot, F.L.S. 4. On some bats obtained in the Surat and Thana Districts by Mr. R. C. Wroughton, by Oldfield Thomas, British Museum. 5. The Moths of India (supplementary paper to the Volumes in the "Fauna of B. India") by Sir George F. Hampson, Bart., F.L.S., F.E.S. 6. List of the aculeate *Hymenoptera* procured at Aden by Colonel Yerbury, R.A., and Captain Nurse, I.S.C.,

by Lieut.-Colonel C. T. Bingham, F.Z.S., F. E.S. 7. Miscellaneous Notes :— (*a*) The nesting of the white-browed bush bulbul in Guzerat, by Captain R. M. Betham. (*b*) The occurrence of the watercock in Cutch, by Lieut. C. D. Lester. (*c*) Wounded tigers, by Lieut. J. H. Vanderzee, I.S.C. (*d*) The Oceanic Teal, by A. L. Butler. (*e*) Occurrence of the Gargany Teal in India during July, by Major R. H. Rattray. (*f*) Nesting of the little Forktail, by Major R. H. Rattray. (*g*) Rats as a protection against snakes, by Surg.-Lieut.-Col. T. S. Weir. (*h*) Tusk measurements of the Asiatic Elephant, by Lieut. S. S. Flower. (*i*) The Nepal Swan, by W. T. Blanford, F.R.S. (*j*) Plants of a Bombay swamp, by Surg.-Capt. D. Prain. (*k*) The blue rock thrush, by E. C. Stuart Baker. (*l*) The migration of butterflies, by E. H. Aitken. (*m*) Our annual caterpillar pest, by E. H. Aitken. (*n*) Notes on Hume and Marshall, by H. Littledale. (*o*) Decoying a Monkey, by Major G. S. Rodon.

J. G. Keulemans del. Mintern Bros. Chromo lith. London.

THE BARRED-HEADED GOOSE

Anser indicus.

½ Nat. size.

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INDIAN DUCKS AND THEIR ALLIES.

By E. C. Stuart Baker, F.Z.S.

Part III, with Plate III.

(*Continued from page* 198 *of this Vol.*)

Sub-Family Anserinæ.

This Sub-Family contains six genera, but of these the only one represented in India is the familiar *Anser*; we need not therefore trouble about the key to the genera. The distinctive features of the Sub-Family are:—hind toe not lobed and moderate in length, as is the neck, the feet are palmated, and there is no cere.

Key to the Species.

a. Tomia distinctly arched, with indentations of upper mandible quite apparent.

a' Nail of bill white.

a'' Rump french-grey, no white on forehead ... ...A. RUBRIROSTRIS.

b'' Rump dark greyish-brown, white on forehead.

a''' White on the forehead, not reaching a line between the eyes ... ...A. ALBIFRONS.

b''' White on the forehead, reaching a line between the eyes ... ...A. ERYTHROPUS.

b' Nail of the bill dusky or black.
c'' An orange band round the median part of the beak; feet orange ...A. FABILIS.
d'' A pink band round the median part of the beak, feet pink, flesh colour ...A. BRACHYRHYNCHUS.
b. Tomia not very arched. Head with two black bands on the occiput and nape ...A. INDICUS.

Alternative Key.

a. Head with two dark bands ... ...A. INDICUS.
b. Head without any bands.
a' Nail of bill white or nearly so.
a'' No white on forehead, rump grey...A. RUBRIROSTRIS.
b'' White on forehead, rump dark greyish-brown.
a''' Wing over 15"; culmen 2·9"...A. ALBIFRONS.
b''' Wing under 15"; culmen 2·3".A. ERYTHROPUS.
b' Nail of bill blackish.
c'' Feet yellow to orange ... ...A. FABILIS.
d'' Feet always tinged pink... A. BRACHYRHYNCHUS.

10. ANSER RUBRIROSTRIS.

The Indian Grey Lag Goose.

Anser cinereus. Jerdon, "Birds of India," III, p. 779; Hume, "Str. Feath.," I, p. 258; *id*, "Nest and Eggs," p. 635; Butler, "Str. Feath.," IV, p. 26; Scully, *ibid*, p. 199; Hume, "Str. Feath.," VII, p. 491; VIII, p. 114; Hume, Cat., No. 945; Hume and Marshall, "Game Birds," III, p. 50; Hume, "Nests and Eggs," (Oates' ed.), III, p. 279, Barnes, "Birds of Bombay," p. 945.

Anser rubrirostris. Salvadori, "Cat. of Birds British Museum," XXVII, p. 91.

Description: *Adult Male.*—Lower back and rump french-grey, upper tail coverts white, remainder of upper plumage, head and neck, ash-brown, the scapularies edged lighter; a very narrow white rim of feathers at the base of the bill; lower neck in front, breast and abdomen, pale greyish-brown; the abdomen with more or less numerous broad black spots, sometimes almost confluent, at others almost absent; remainder of lower plumage white; flanks brown, tipped pale french-grey, more grey at the bases of the feathers; shoulder of wing and

smaller coverts next it, winglet, primaries at the base and primary coverts, french-grey; remainder of the wings brown, the secondary coverts edged whitish; under wing coverts and axillaries french-grey; two outer pairs of tail feathers white, the central ones brown, tipped white, and the others brownish at the base changing to white at the tip.

"The irides are always brown; the nail of the bill sullied white, generally yellowish, or pinkish-white; the bill, legs and feet vary from creamy-white, with only, in places, a faint tinge of pink, through pale, somewhat livid, fleshy-pink to a dingy-livid, purplish-red, and very often the bill is of one shade, the legs and feet of another. Never in any of the innumerable specimens that I have examined in India have the bills had any orange or yellow tint about them." (Hume). "Length about 33″, wing 18″; tail 6·5″, culmen 2·7″; tarsus 3·2″" (Salvadori).

The female only differs in being smaller. Scully, "Stray Feathers" (*loco citato*), gives the measurements of a female as follows:—Length 31 inches; tail 6 inches; tarsus 3; bill from gape 9·7.

The young are far less marked underneath, and the majority of birds shot in India will be found nearly white underneath. In the same place as that in which he gives the above dimensions for a female, Scully gives others of a young bird:—"Length 30·5; expanse 60·25; wing 16·5; tail 6·3; tarsus 3; bill from gape 2·65; weight 5 lbs. 15 oz."

This bird differs from *Anser ferus*, the common wild goose, with which it was long confounded, in being rather larger, and with proportionately larger bill and feet, and the adult bird is also more marked with black on the underparts, though this last distinction does not hold good with most Indian specimens.

In the British Museum Catalogue the distribution of this goose is given as "Siberia, in winter Northern India and South China;" this, of course, includes all the intervening countries, at all events whilst the birds are on migration.

Hume in "Game Birds" goes into the question as to whether this bird is the same as the one known in Europe as *Anser cinereus*, and he there notes the differences between the two species in his usual accurate manner, and now ornithologists agree, at least the majority do, that the two species are distinct. Hodgson's name of *rubrirostris* stands good

for our Indian farm. Hume's distribution given in "Game Birds" applies, of course, to both species, and has to be greatly curtailed in its limits outside India.

It is found throughout Northern India, but is far more numerous to the west than to the east; it extends right away throughout China, but as most of the birds are recorded as *A. cinereus* it is difficult to say what notes apply to the true *A. cinereus* and what to our *A. rubrirostris*, though the probability is that nearly all the Asiatic birds are the latter. It occurs in some numbers throughout Assam, but certainly is not a very common bird anywhere in that Province, as far as I can ascertain; Mr. Eden, however, says that it occurs in great numbers in Sylhet in a favourable year. Probably it is in great numbers only when compared to the few found of other species. Strange to say there seems to be no record of its having ever appeared in Burma, though it surely must turn up occasionally in the Northern States. Mr. Damant reports it to be common in Manipur, next door to Burma. I have shot one or two pairs in the Sunderbunds, but have seen very few birds indeed in that part of the country, and, I think, east of Calcutta it is decidedly rare; indeed it is not common even in the Calcutta markets, which are a veritable bird mine for the ornithologist in the right season, when the rarest edible birds sometimes put in an appearance. In Assam, except in the Brahmaputra and the larger rivers, such as the Surma, etc., it goes about in only small parties of some ten or a dozen, but Cripps met with it in Dacca on the Megna in a flock numbering about 200. This was the only time he noticed the Grey Lag in Dacca. As one wanders further west the flocks become more and more numerous, until in the Western Provinces sportsmen speak of flocks numbering their hundreds which run into thousands. It is a bird of all elevations and is very common in Cashmere in winter and in other similar suitable places up to six thousand feet or more.

"A Member of the Society" states that no geese are found in the Konkan, Deccan or Khandeish, but he records an *Anser*, by which he must refer to the present species, from Gujurat; here, he says, that it is not common, but others have obtained them in great numbers. Hume mentions having found flocks numbering fully 1,200, and, I believe, refers to the flocks he saw in Sind.

They breed throughout Asiatic Siberia, in Turkistan, Kashgar, probably Northern Persia and on the Yangtse-Kiang, on which river young birds have been taken. I can find no full description of their breeding habits, but they are not likely to differ in any way from those of *Anser cinereus*, the European Grey Lag, which lays from 4 to 6 eggs in a rough, rather loosely built, nest of reeds, rushes and grass, placed in the ground not far from water. Pryevalsky records breeding-places in S.-E. Mongolia, the upper valley of the Huanyho and in Lake Kohonoor, all of which places refer to the Asiatic form of the Grey Lag. All notices referring to Europe and North Africa must be taken as being of the true Grey Lag, *A. cinereus*, and I fancy that the majority of those in Asia Minor, if not all, will be found to be of the same.

They generally arrive in India in October, but do not get far south or east until the end of November; about Calcutta and east of that they appear to come in in early and middle December. Of course everywhere they sometimes come in much earlier, and they have been recorded in the N.-W. in September. In the same way, though they all have left India, as a rule, by the end of March, yet sometimes they stay far later; for instance only lately in our Journal Col. Unwin has reported receiving four "Grey Lag geese (*A. cinereus*)" as late as the 2nd May in Cashmere. It will be interesting, as he says, to see if they do stay and breed, but I am afraid that there is little chance of it as their breeding haunts are not far off; and they are sure to return there. Adams did state that they bred in Ladakh, but his remarks have never been confirmed, and it seems he must have been mistaken.

After Hume's long notes on shooting geese, given in "Game Birds," it is very difficult to say anything more of any interest. As every sportsman knows they are shy, wild birds and difficult to bring to bag, but their wildness varies much according to how much the localities in which they reside are shot over. When many of the natives have guns, and there are also many European sportsmen, the Grey Lag and every other kind of goose is an object as worthy of a stalk as any black buck. In such places it is little use going out to collect a bag of geese unless one has made up his mind to really work the business out properly. If there are young crops of wheat, etc., in the district, the sportsman should be out before daybreak, and he then may, by a careful crawl through grass and wheat, wet with dew and very cold—it can be

cold even in India—get within easy shot of the birds as they feed on the young growth. If wise he will blaze one barrel into the brown as they feed and get what he can with his second barrel as they rise ; if, however, he is very near indeed, it is better to wait and have both barrels into them on the wing. They take some time getting on way after rising, and give lots of time to put in two shots, and more birds will be dropped this way than if the unspread shot had taken them on the ground. Hume also mentions stalking them under a blanket and beguiling the geese into a belief that you are an inoffensive native just out for a prowl ; where, however, the natives have a gun, the geese will undoubtedly " wink the other eye, " and, blanket or no blanket, leave long before that article is brought within shooting distance. A bullock is more useful than a blanket under such circumstances, and from behind the shelter of one much slaughter may be done if the animal is properly worked.

Hume says that they are easily killed during the daytime on all the larger rivers. I have not found this to be the case myself, but as his experience is fully twenty times what mine is, the sportsman had better follow his advice and not mine. He says :—" During the hotter parts of the day, they are, as already mentioned, generally found in larger or smaller parties dozing in the sun on some sandbank, at the water's edge. Directly such a party is sighted, you take a small boat and, with the aid of a couple of experienced men, row or punt noiselessly down to another two or three hundred yards of the birds, when, if the water intervening is shallow enough to allow it (and the boatmen seem to know this by instinct), one man gets quietly out of the boat behind, and, while you and your companion in the boat lie down out of sight, he, stooping so as to be entirely concealed by the boat, pushes it down gently and noiselessly, aided by the stream, towards the flock. In this way you may approach, if all is well managed, to within 20 yards of even cranes ; you make some arrangement at the bows (I had a false gunwale with suitable holes pierced in it) so as to admit of peeping and shooting, without raising your head into view, and when you get to what you consider the right distance, knock over as many as you can sitting, with the first shot, and as many more as you have time for, before they get out of shot, after they rise. Everything depends on judging rightly the distance for the first shot,

with reference to your bore and charge. A little too far you would, perhaps, hit a score without bagging one; a little too near and you kill one or two outright, and though you perhaps get two or three more as they rise, that is all; but if you have a good heavy duckgun, say No. 8 bore, with two ounces of A. A, and fire at about 50 yards, you will rarely get less than eight out of a good large flock of geese (and I have got as many as sixteen) with the first shot, besides a brace or so more, with green cartridge, as they rise."

They are not much of a hand at diving and give more trouble when wounded by fluttering and struggling along out of shot. Of course they do dive, and pretty quickly when hard pressed, but they cannot stay under water for any length of time, nor do they ever hold on to weeds below the surface of the water, as do many ducks, and so avoid the sportsman. They soon rise after diving, and seldom far from where they enter the water, so that they can be easily shot on appearing. Hume says that he has seen one goose taken off by a crocodile; but if he had shot more on the tidal waters on the Bengal side, where the snub-nosed, man-eating brute has his abode, I am sure he would have seen many a fat goose and delicate duck disappear down their wide maws. Any big bird not recovered almost as soon as shot, is just as likely to form a "mugger's" dinner as it is to form that of the person shooting it. Although bad or rather indifferent divers, they are very good swimmers, and a broken-winged bird gets along the surface of the water with great rapidity. On the wing they are very swift when once started, and are very active and graceful as well. They fly, as every one knows, in the form of a V, generally one with a very obtuse point and often with one wing much longer than the other. They are noisy birds and their cacklings and cries and trumpets are, on ordinary occasions, far from soul-stirring, but, as Hume says, when on the wing, high up, their loud trumpeting calls are very sonorous and musical. Especially is this the case, when, late in the evening, or in the very early dawn, the sportsman, crouched low in some ambush, waits eagerly for the welcome sound that tells of the approach of his game. To me this form of sport is very fascinating for an hour or so, though I admit that it requires great patience, as it is often a long wait between the flocks as they come within reach, and often the temper is tried by the persistent way

birds continue, one flock after another, to fly past, either to the right or left, low down, but much too far off to get a shot. When, however, the birds fly kindly, it is very pleasant to hear the constant loud calls, the swish-swish of wings as they pass answered by the crack of your 12-bore, and the thud of the fat birds as they kiss mother Earth for the last time. Of course, in this way, your bag of geese at all events wont take many men to carry it, but there is no end to the variety both of the game killed and the way of killing it. First, perhaps, come a flight of whistlers in no formation of any sort, and you cover them with your gun and let them go after you have made sure you could have dropped a dozen, or, if you want food for your men, you do fire and drop a couple. Then a few noisy, little Cotton-teal fly past in a follow-my-leader fashion, each bird anxious to get in front of the others, and each determined that no other shall pass him. Next a flight of mallard, pin-tail or gadwall may pass, and the loud, dull smacks on the ground that follow the report of the gun, mean so many good-eating ducks. As a rule you will know what you have got by their appearance and flight, but a shoveller will sometimes imitate the gadwall very closely, and the result is disappointing. A flock or two of blue wing or grey teal may now vary the sport, flying lower, but even quicker than the ducks, and, last of all, in the distance, the geese will trumpet forth their approach, and after their arrival flocks of all sorts will pass in increasing numbers until it is too dark to see and, the bag collected, there is nothing left but to go home. In the early morning the routine is reversed, and the geese are the first to be got and the whistlers and Cotton-teal the last.

Geese are almost invariably vegetarians and get their food by grazing, in which way large flocks will do immense damage to young crops in a single night. They are destructive birds also, owing to the fact that they pull so much of what they feed on, up by the roots, and thus destroy what they do not eat.

The eggs mentioned by Hume belonged, I believe, to *A. cinereus* and not to a *A. rubrirostris*, with the exception of those he obtained from Rattan Singh and which were laid by a tame goose. These two eggs were quite pure white, glossless, but compact, though not very fine grained. They measured 3·55″ by 2·45″ and 3·4″ by 2·25″.

11. Anser albifrons.

The White-fronted Goose.

Anser albifrons. Jerdon, "Birds of India," III, page 780; Hume, "Str. Feath.," VIII, page 114; Hume, Cat., No. 947; Hume and Marshall, "Game Birds," III, p. 73, Plate 10; Salvadori, "B. B. M. Cat.," XXVII, p. 92.

Anser erythropus. Hume, "Str. Feath.," I, p. 259.

Description: *Adult Male.*—Forehead and feathers at the base of the upper mandible white, head, neck, back, rump and wings brownish ash-colour; upper tail coverts white, breast and belly pale brownish-white, with patches and broad bars of black; sides and flanks ash-brown with paler edgings, and with a white band on the upper margin; vent and under tail coverts white, upper wing coverts greyish-brown with paler edgings, the greater ones edged with white, forming a conspicuous band, wing primaries bluish-black; secondaries black, tail feathers dark grey, tipped with white, bill orange-yellow, the nail white; irides dark brown; legs, toes and membranes orange, claws whitish colour. Total length 27 inches, wing 16, tail 6, culmen 1·9, tarsus 2·5 (Salvadori). Jerdon gives the wing as 17 inches, on the other hand Hume gives it a 15″ to 15·75″.

Of the soft parts he gives the colours as follows:—Legs and feet bright orange; nails pinky or greyish-white; bill pale, livid fleshy; nail whitish or pale yellowish-white, irides pale brown.

Female.—This only differs from the male in being rather smaller, but I can find no measurements of this goose sexed as females.

Young.—"Bird of the year is more uniform in colour and rather darker, the feathers at the base of the upper mandible are rather deeper brown than the rest of the head; the nail and point of the beak light-brown, the pale brown feathers of the breast are uniform in colour, without any dark patches or bars" (Salvadori).

As the bird grows older the white band on the forehead appears and grows wider and wider, and from what can be gathered from present records, seems to get wider eventually in the adult male than in the female, though Salvadori notes no differences in this respect. As regards the coloration of the underparts it varies very greatly, this not according to age apparently. Some birds are so much marked with

black underneath, that the white is practically absent, only showing through in small patches here and there; in many the black preponderates, whilst in others, the majority, the light colour is much in excess of the dark, in some few there being very little black anywhere. The white on the chin too increases with age and, perhaps, to a greater extent also on the gander than in the goose.

Anser gambeli is accepted as a distinct species, so that the area inhabited by the Indian bird is now curtailed, and it does not extend to Japan though it does to the greater part of China.

Salvadori, however, says that it is the true *A. albifrons* which inhabits Greenland, from which place he excludes *A. gambeli*, so that this must now be accepted as one of its breeding-places.

It is also found right through the Polar-arctic region, from Iceland to Siberia, and in the winter, from the Mediteranean shores, Egypt, away west through Asia Minor, Arabia, Persia and Northern India. Within our limits, comparing it with the way in which the Grey Lag and the Bar-headed goose occurs, the White-fronted goose is a rarity, but a few do come every year to Sind and parts of the Punjab. The Indian specimens in the British Museum come from Lucknow and the river Jhelum, below Shahpur.

Hume says, that during the thirty years he had shot in India, prior to writing "Game Birds," he only once shot this goose; whether he shot others afterwards I do not know. He records in "Stray Feathers," I, p. 259, shooting there three geese in Sind only, he then called them *Anser erythropus*, but gave their dimensions as those of small *A. albifrons*, *viz.*, with wings from 15″ to 15·75″. It is probable, in fact almost certain, however, that many occur which are not distinguished by sportsmen from other geese, and are thus never recorded.

Lieut. C. D. Lester records shooting three White-fronted geese on the 14th Feb., 1890, at a place called Deviria, near Anjan in Cutch.

Hume, writing of these birds in "Stray Feathers," says he twice saw them, once on the Jhelum and once on the Indus; on the first occasion there were three birds, on the second only two, and they were quite by themselves, not associating with other geese as one would have expected to see.

It is not a rare bird in Great Britain, but has only twice been recorded from Heligoland in the last century.

Mr. Pearson (The Ibis, Vol. II, No. 6, p. 721) shot an *Anser albifrons* on June the 24th in Novaya Zembya, and reports that the birds were then moulting, so, presumably, they were also breeding there. The same author and his brother obtained this goose in the Philippine Islands.

Mr. L. Popham found it breeding on the Yenisi river, but says that it was not half so common as the Bean goose. He obtained three eggs and also a gosling in down, but gives no details of how he obtained them.

I have never heard of this goose being obtained anywhere to the east of the Indian Empire, though there seems to be no reason why it should not sometimes enter Assam and Northern Burma. Probably, however, it remains for Western sportsmen to say whether it is fairly common or not, and it is to be hoped that sportsmen will go in more commonly for making notes of the varieties they shoot and recording them for the benefit of others.

12. Anser erythropus.

The Dwarf Goose.

Anser minutus. Hume, "Str. Feathers," VIII, p. 114; Hume, Cat., No. 948.

Anser erythropus. Jerdon, "Birds of India," III, p. 781; Hume and Marshall, "Game Birds," III, p. 78, Plate 77; Salvadori, "Cat. B. B. Mus.," Vol. XXVII, p. 97.

Adult Male.—Differs from the last bird, *Anser albifrons*, in being a good deal smaller and having the white on the forehead far broader reaching a line drawn across the head between the eyes; also in having a decidedly darker rump and a generally darker tint to the plumage. "Total length about 21 inches, wing 15, tail 4·5, culmen 1·27, tarsus 2·4" (Salvadori). "Length 19·5 to 21 inches, wing 13 to 14·1; tail 2·85 to 3·25; tarsus 2·3 to 2·4" (Hume).

The female.—Is yet smaller than the male; wing about 13·3″ (Salvadori). "The colour of the bill is in the young, before the first autumn moult, a reddish-grey; the nail blackish; later this latter becomes a greyish-white, and the bill pale orange-yellow; in old birds the bill is lively reddish-yellow or orange; the nail yellowish-reddish-white. There is never any trace of black upon the bill.

"The naked edges of the eyelids are dirty yellow in the young, orange in the old; the irides are dark brown. The feet are in the

young a pale dirty yellow tending towards orange; in the old a lively orange-yellow or almost orange-red. The claws are pale brown colour, dark brown towards the tips" (Naumaun).

Young.—These are less marked with black on the lower parts, often not at all, and the white on the forehead is absent. This seems to appear first in the spring of the first year and increases gradually with age, probably not reaching its full width until about the third year.

This little goose is found in the greater part of Northern Europe, but not to the west as far as Great Britain, in Lapland eastwards, Siberia and Northern China. In the cold weather it is found in Western Europe, Turkey, Asia Minor, Persia, Afghanistan, Northern India, China and Japan.

In India it has been but rarely recorded, and I can find few notes of its occurrence since the publication of "Game Birds." Blanford in "Eastern Persia," II, p. 303, records *Anser erythropus* from Persia, and in a foot-note he says:—

"One goose at least is very common in Persia. Many couple remain to breed in the reeds round the little lake of Dashtiarjan and the marshes near Shiraj, whence goslings are often brought into the town. I have never seen them in mature plumage, nor been able to shoot an old bird, so cannot say to what species they belong."

I was told by a correspondent in Cashmere that he had shot four geese there this year, which were of this species. Mr. H. E. James in the lecture, part of which was given in No. 2, Vol. VIII of our Journal, says: "A friend at Sukkur, last year, shot the very rare *Anser erythropus*, the White-fronted goose, and ate it." I conclude that *Anser erythropus* is correctly given, and that it is only the trivial name which is not the one by which we generally know the Dwarf goose.

I am afraid a very large number of birds, which should be skinned and preserved, are plucked and eaten. Only two years ago a friend of mine, who knew how very keen I was on ornithology, informed me, with great glee, that he had been having a feed on some "Hill Ptarmigan." He described a bird of that family most minutely, and I thought he must have got hold of something really good, and I offered fabulous prices to any Naga who would produce some of these birds for my inspection. Of course they never came, but eventually my friend, seeing me handling some Imperial pigeons, suddenly exclaimed

"Why there are the Hill Ptarmigan!" I regret to say that his description, as given to me, contained only two points which referred to the pigeons, *i.e.*, their colour and their feathered toes, the rest was the result of a fertile imagination, a desire to please, and the knowledge, he being a good sportsman, of what a Hill Ptarmigan should look like.

The same man ate with relish some fine specimens of the Naga Hills Partridge, *Arboricola rufogularis*, and left me the wings and a few feathers to weep over. However partridges and ptarmigan are not geese, and I must stray no further.

The other recorded Indian specimens are: two shot and one other seen by Captain Irby in Oudh; others seen. Hume does not say how many obtained by Mr. A. Anderson near Hurdui in Oudh and at Futtehpur in the N.-W. Provinces; one procured by Dr. Bonaria near Lucknow, and, finally, three shot by Mr. Chill some 30 miles south of Delhi.

It breeds in Lapland, laying 5 to 8 eggs, in the usual form of nest. The eggs are said to be a dull creamy white in colour, of a broad, regular oval shape, glossless texture, and to measure about 2·9″ by 2″.

ANSER FABILIS.

Anser fabilis.—The Bean goose.

Anser segetum. Hume and Marshall, "Game Birds," III, p. 68; Salvadori, "Cat. B. of B. Museum," XXVII, p. 99. *This must, I fear, be struck out of our list of Indian geese. Since Hume's "Game Birds" came out there has been no confirmation of the numerous rumours of the Bean goose being found in India.* Anser serrirostris, *the larger or Eastern Bean goose, is more likely to be found within our limits than is the true Bean goose,* A. fabilis, *or as it is, and I think will continue to be, better known* A. segetum.

13. ANSER BRACHYRHYNCHUS.

The Pink-footed Goose.

Anser brachyrhynchus. Hume, "Str. Feath.," VIII, p. 114; Hume, No. 946; Hume and Marshall, "Game Birds," III, p. 71; McLeod, "Str. Feath.," X, p. 168; Salvadori, "Cat.B. of B. Museum," XXVII, p. 103.

Adult Male.—Feathers at the base of the upper mandible white, the white very small in extent and not always present. Head and neck greyish-brown; back and scapularies dark greyish-brown with the

feathers margined paler ; rump much darker brown and without the grey tint ; upper tail coverts white ; edge of shoulder of the wing, primary coverts and base of primaries, greyish brown ; remainder of wing brown, the coverts and secondaries all edged with whitish ; under wing coverts greyish-ash colour ; flanks brown, the feathers edged paler; breast pale greyish-brown ; abdomen, vent and under tail coverts white, often, more or less, sullied with brown ; bill with nail, edges and base black, the middle portion pink to carmine ; legs and feet pink. "The legs and feet are fleshy to purplish-pink, again at times with an orange tinge; the claws blackish, paler at base ; irides hazel." (Hume).

A fine male in my own collection measures:—"length 27", wing 16·8", tail 4·8", tarsus 2·44" ; bill at front 1·6", and from gape 1·65".

The female only differs from the male in being smaller. Salvadori (*loco citato*) says regarding the distribution of this goose "Spitzbergen, where it nests, and probably also Franz Joseph Land during the migration, and in winter in N.-W. Europe ; occasionally it strays to Germany, Belgium, and France ; its alleged occurrence in India requires further evidence." In spite of Salvadori's doubts on the subject I think we may take it for granted that the pink-footed bird is not only a regular, but by no means very rare, visitant to East-Northern India. As long ago as 1849 Blyth recorded it from the Punjab and gave it in the "Catalogue of the Birds of the Asiatic Museum." Thirty years then elapsed before there is any notice of this goose in Indian publications, and then Hume again noted its occurrence (in "Str. Feath.," VIII. In 1864 he had, however, shot two birds of this species in the Jumna, and Col. Irby also had recorded having seen a specimen killed near Lucknow in Jan. 1858. Col. Graham assured Mr. Hume that the species is not uncommon in Assam on the Brahmaputra. Again Major-General McLeod says of this goose :—"I shot one of these out of a flock of about twenty on the Kunawan bheel, near Gurdaspur, Punjab, in 1853."

The goose in my collection was shot by one of my collectors on a large bheel in the south of Cachar. He said that it was one of a flock of about a dozen, and that they were extremely wary and wild. He went after them several times without obtaining a shot, and at last got it by a fluke. He was stalking some other ducks when these geese, which had been put up by some one e'se, flew close over his head, and a lucky shot aimed at the front bird knocked over one of the last ones.

As regards its breeding habits there seems to be little on record beyond Dresser's notes, he says :—"Of its breeding habits but little, comparatively speaking, is known, and it is only known to breed with certainty in Iceland and Spitzbergen. Professor Malmgrew, who obtained its eggs in the latter island, says that it is exceedingly wary and shy. In the early summer it is to be seen in small flocks on moss-covered low lands near the sea or on rocky precipices, where there is vegetation here and there; but in the breeding season it is seen in pairs. When moulting, it frequents fresh-water swamps, and later on, when collected in flocks, it is to be met with near the coast."

"Its nest is placed in prominent situations on high rocks, or platforms on steep cliffs, often close to a river, or in some grass-covered place, and sometimes on high cliffs close to the sea on the inner fiords. The nest is so situated that the bird can have an uninterrupted view from it of the country round, and can readily see if an intruder approaches or danger threatens. Hence it is difficult to shoot this shy bird, even at its nest, for the gander is extremely watchful, and directly any one approaches warns his mate by uttering a clear whistling cry. In June the female lays four or five eggs, which are hatched about the 10th or 15th July, and both parents assist in taking care of the young. I possess a single egg of this goose, obtained on the Sweedish Expedition to Spitzbergen, which is pure white, resembling the egg of *Anser cinereus*, but is rather smaller, and the grain of the shell is somewhat smoother."

Morris, "Nests and Eggs of British Birds," says :—"These birds unite about the middle of May; Mr. G. Macquilliriay has remarked that he saw them in pairs about the middle of the month, and that they had the young fully fledged and strong upon the wing about the end of July. They had again collected into flocks by the beginning of August. The eggs are of a pure white colour. Eight were laid by one of these geese, kept in the water in St. James' Park, by the Ornithological Society of London."

Seebhum, "Birds of the Japanese Empire", pp. 236, 237, says :—"The Pink-footed goose was admitted to the Japanese Fauna on the authority of a female obtained in October at Hakodadi by Captain Blakiston (Swinhoe, Ibis, 1875, p. 456). Unfortunately this example cannot be found, and some doubt attaches to the correctness of the identification." He goes on to say : "It is possible that this may be an example of a

Pink-footed goose, but in the absence of the black base to the bill, I am inclined to regard it as the young, in first plumage, of the White-fronted goose."

I may note that the bill of the specimen in my collection, and which has had very rough usage from neglect, rats, and finally, earthquakes and heavy rain, has the bill now of a uniform dirty grey-white. It would seem, therefore, that very little reliance can be placed on the colouring of the bill, in old specimens, as a means to identification.

14. Anser indicus.

The Bar-headed Goose.

Anser indicus. Jerdon, "Birds of India," III, p. 782 ; Hume, " Nests and Eggs, " p. 636 ; Butler, " Str. Feath.," IV, pp. 27, 40 and 99, ed. VI, p. 260 ; Adams, *ibid*, p. 401 ; Hume, *ibid*, VII, p. 491 ; Hume and Marshall, " Game Birds," III, p. 81 ; Hume's " Nests and Eggs," (Oates' ed.), III, p.279; Salvadori, "Cat.B.B. Museum," XXVII, p.105.

Eulabeia indicus. Ball, " Str. Feath.," III, p. 436.

Adult.—" Head white, with two horseshoe blackish bars on the occiput and nape ; hind neck brown-black ; a longitudinal white band on the sides of the neck ; upper plumage very pale ashy, the feathers edged with whitish and tinged with brown on the mantle and scapulars ; sides of the rump and upper tail coverts whitish ; throat white, fore-neck brownish-ashy, passing gradually into cinereous on the breast, whitish on the abdomen ; nest and under tail coverts white ; feathers of the flanks brown, rufous towards the tips with pale edgings, quills grey-dusky towards the tips, and gradually becoming darker towards the secondaries ; tertials brownish-grey ; tail grey, white tipped. " Total length 27″, wing 17″, tail 6″, bill 2″, tarsus 2·75 " (Salvadori). " Length 27·25 to 33·5 ; expanse 50 to 66 ; wing 16·0 to 19·0 ; tail from vent 5·0 to 7·0 ; tarsus 2·5 to 3·3 ; bill from gape 1·8 to 2·3 ; weight 4 lbs. to 6 lbs. 14 oz." (Hume).

" The legs and feet are light orange, some times paler, occasionally only yellow ; claws horny black ; the irides deep brown ; the bill orange-yellow to orange, rarely only pale, lemon-yellow often paler, or greenish towards the nostrils ; the nail black or blackish." (Hume).

Young.—" Forehead brownish-white, a little tinged with rusty; a dusky line through the lores to the eye ; whole crown, occiput and nape sooty or dusky black ; no trace of either the two distinct black

head bars or the conspicuous white neck streaks; back of neck wood-brown; sides and front of the lower part of the neck pale dusky-greyish; mottled with whitish; most of the feathers of the breast and abdomen have a pale rusty tinge towards the tips; the conspicuous dark bandings of the flanks of the adult is almost entirely wanting; tail somewhat browner than in the adult."

Young in down.—" Pale yellowish, top of the head and upper parts pale brown " (Salvadori). Roughly speaking the habitat of this goose is India and Northern Burma, and the Shan States during winter, and in summer Central Asia, due north of these countries up to about latitude 55 N.

The most southern point of which I can find any record is by Jerdon in his " Birds of India." He writes :—" I once saw a couple of these geese in the extreme south of India in August, in a small sequestered tank. This pair may have been breeding there, but perhaps they were wounded or sickly birds." It is quite possible that they were breeding, but it is almost certain that one at least of the pair must have been damaged in some way, sufficient to incapacitate it from migrating. They are very devoted to one another, and probably if either of a pair of geese was injured the other would remain with it. On the other hand they might both have been geese or both ganders, in which case also, of course, both must have been injured. In Southern India it is nowhere a common bird. Major McInroy reported it as common in the Chitaldroog District of Mysore, and Mr. A. Theobold as not common in Coimbatore. In the south of the Central Provinces it is still far from plentiful. In Bengal it is met with in considerable numbers on all the larger rivers, quite down to their mouths. I have seen great flocks of them both in Jessore and Khulna in January. It is also found on the rivers running through Behar, Chota Nagpur, etc., but is not common. In Assam it is rare, but has been met with in Sylhet, Cachar and Manipur, and I have also seen it in Kamrup, and it probably extends all up the Brahmaputra. It is to the west of Bengal, however, that it is found in such vast numbers, and in most parts there outnumbers all the other geese by more than five to one. In Sind, however, the Grey Lag is the more common, and it has not been obtained in Gujurat.

Speaking broadly, this goose is far more of a river than a lake or tank bird, though it is, of course, also often found on the larger lakes

and bheels. In Jessore and Khulna we only saw one flock on the Moolna bheel, and that not a large one, but on the rivers we saw several big flocks. Here I tried Hume's plan of floating down on them in boats, but a good many circumstances combined to prevent my having any success. In the first place the water was almost everywhere too deep to enable a man to wade and push behind the boats, then also the fear of "muggers" was much too strongly felt by the men for them to remain in the water long enough to get near the birds, and finally, these last were exceedingly wide awake and would not allow us to get within distance of anything but the longest shots. I did get one pair eventually, but it was only by an adaptation of Hume's plan. The geese, of which there was a flock of about forty, were on a sand chur, about fifty yards from the bank of the river, which was about two hundred yards wide. I dropped down the river along the bank, furthest from the geese, and then, when below them, worked across the river and got out the same side as the geese. Hiding at once in the rank grass on the bank, I sent the boat back to within a couple of hundred yards of the geese, and when I saw that their attention was fully taken up with it, managed to stalk to the edge of the water nearest where they were; armed with wire cartridges, No. 2 shot, I thought I could do some execution on the flock as they sat on the bank, but after I fired at them only two remained as the rest flew off. The flock, however, seemed to consider that the boat was the aggressor, and sweeping round flew within 20 yards of me, and I knocked over three with my second barrel. Of these three one was snapped up as it touched the water, by a crocodile, and the same fate happened to the second before we got to it, whilst the third flew away again without offering another chance.

In the daytime, according to Hume, Tickell, and nearly all other observers, as well as my own observations, geese, of all kinds nearly, rest during the day on land near the edge of the water; they seem to prefer bare sandy churs, especially when these are surrounded by water, but failing such, they rest on the banks. A few birds always seem to be posted as sentries and they keep a wonderfully keen look-out, and are very hard to approach within reasonable distance for a shot. Mr. Theobold says, that in Coimbatore during the daytime, "they keep floating idly in the centre of some tank or river."

In Bengal, at all events, where the rivers are deep and "muggers" plentiful, I fancy that flighting at night offers the best chances of a bag where they are to be found in weedy lagoons; they can, of course, often be approached by dug-outs with a small screen in front of the boat composed of green branches or reeds, but when the water is open and there is no natural cover, the birds are much too wily to be imposed on by the screen. Of course, if one goes in for shooting them as they fly overhead to and from their feeding-grounds, one cannot expect to obtain large bags, except with unusual luck. Mr. Ried, in "Game Birds," narrates how he has got as many as thirty birds between sunset and 7-30 P.M., but, as a rule, less than half of this would be considered a good bag. Of course the charm of variety is added to the enjoyment of the shoot, for in flighting almost any kind of duck may turn up and join the game bag.

Hume's appeal to Indian sportsmen to try Pryevalski's plan of lying on the ground and waving his hat at the geese in order to induce them to approach, seems to have met with no response; at all events I can find no bags, heavy or otherwise, recorded as having been made thus.

They are, of course, almost entirely vegetable feeders, and it is wonderful what damage a flock can do to young crops even in a single night and where they are numerous, as they are in Upper India, and visit the same feeding-grounds night after night, they take no small percentage of the wretched villagers' winter crops. They will eat almost any young, tender, green stuff, but probably prefer the late rice crops to any other. They feed as a rule during the night-time, but, where they are not interfered with, commence to graze about 4 P.M. and continue on the grounds until an hour or so after sunrise.

Their flight is typically goose-like and in the usual V formation. Mr. Damant notes a very peculiar action of these birds:—"They then appear flying in the form of a wedge, each bird keeping his place with perfect regularity. When they reach the lake they circle round once or twice, and finally, before settling, each bird tumbles over in the air two or three times, precisely like a tumbler pigeon; after they have once settled they preserve no regular formation.'

As a matter of fact each bird does not, as a rule, if ever, keep in his exact place in the V, but all observers have noticed that geese and other birds, which adopt a V-shaped or line formation in flying, constantly

alter their position, each leader retiring after a few minutes to the rear and the second bird taking its place and then giving it up again in a short time to the bird immediately behind. This has been much remarked on in observations on migrating birds passing Heligoland.

I have never seen any geese of this species tame, but Hume says he has seen many, though they do not ever appear to assume the confidential lap-dog familiarity of the Grey Lag. Their call is rather harsher and more shrill than is that of the Grey Lag and very easily distinguishable from it.

They arrive in India in the end of October, but in Bengal and Southern India few put in an appearance before the end of November. In the same way they leave these parts earlier than they do elsewhere, and there is little chance of any being found after the end of February.

Their headquarters for breeding seems to be the numerous lakes in Ladakh, and they also breed throughout Thibet in suitable localities, and probably also north of the Himalayas in many other parts. There has been nothing recorded, as far as I can ascertain, since "Game Birds" was written, concerning the breeding of this goose.

Drew, writing of one of the many islands in the Tso-mourari Lake in Ladakh, says :—

"The island is about half a mile from the shore, near midway in the length of the western side—it may be 100 yards from corner to corner in one direction and 60 yards in another ; it is of gneiss rock, rising only nine or ten feet above the water ; the soundings before given show that there is about 100 feet of water between the island and the near shore. This little place, being ordinarily undisturbed by man, is a great resort of the gull, which in Ladakhi is called *chagharatse;* the surface was nearly all covered with its droppings, and there were hundreds of the young about; most of these must have been hatched near the beginning of July. Having heard that it was a matter of interest with some ornithologists to learn about the nidification of the wild (Barred-headed) goose, I was on the look-out for information concerning it, and I found that this island is one of the places where it lays its eggs. I was told by the Chámpás that they find the eggs there just before the ice breaks up—say the beginning of May ; after that they have no means of reaching the island. I myself found there a broken egg, but at the time I was on the island (the last week in July) the young had

all been hatched. A few days later, I followed the same inquiry in the valley of the Salt Lake, and on an earthy island in the fresh-water lake called Panbuk, I found a nest where the mother was sitting with some goslings and two eggs, one just breaking with the chick; the other egg I measured and found to be 3¼ inches by 2¼, and very nearly elliptical in form. The nest was a slight hollow, lined with, first, a few bits of a soft herb, then with feathers. I was told that these goose eggs are found also at the edge of the Salt Lake itself."

A LIST OF THE BUTTERFLIES OF MUSSOORIE IN THE WESTERN HIMALAYAS AND NEIGHBOURING REGIONS.

By Philip W. Mackinnon, F. E. S., and Lionel de Niceville, C. M. Z. S., F. E. S., etc.

(*With Plates U, V, and W.*)

[*Continued from Vol. XI, page* 221.]

Sub-Family Nymphalinæ.

54. Ergolis merione, Cramer.

Very common in the Dehra Dun, where the food-plant of its bright green spiny larva, the castor-oil plant, *Ricinus communis*, L., Natural Order *Euphorbiaceæ*, grows. Found also occasionally in Mussoorie in August. Mr. Moore described *E. tapestrina* from "Deyra Doon," that species being an occasional aberration only.

55. Euripus consimilis, Westwood.

This lovely insect is very rare. We have seen only two males and six females taken in April, October and December, all from Dehra Dun. There is a pair in the collection of the Indian Museum, Calcutta, which was supposed to have come from Mussoorie, but they were more probably obtained in the low valleys below that station.

56. Cupha erymanthis, Drury.

Common in the Dehra Dun in May and October; a straggler or two is occasionally found in Mussoorie early in May.

57. Melitæa sindura, Moore.

Brought in very rarely by native collectors from the Nilang Pass, Tehri Garhwal, 18,000 feet, in July.

58. Atella sinha, Kollar.

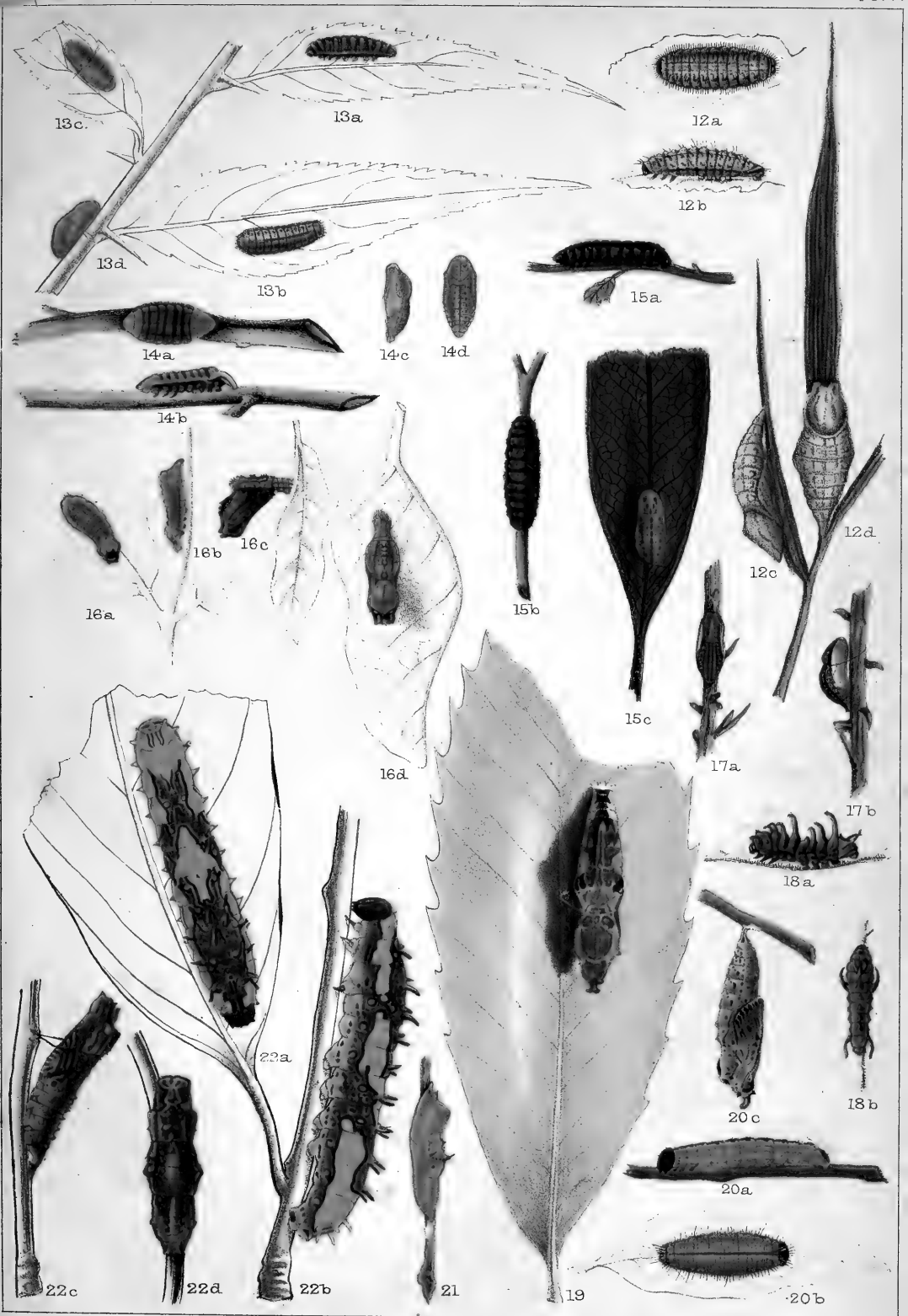
Rare, occurs in the Dun from August to December, and in the valleys to the north of Mussoorie in April and August. We have it also from the Bhilung district of Tehri Garhwal in September.

59. Atella phalantha, Drury.

Very common in Mussoorie and in the Dun, and is on the wing from May to October.

60. Cethosia cyane, Drury.

Recorded from "Massuri" by Kollar as *C. cyane*, Fabricius [*sic*].



West, Newman chromo.

WESTERN HIMALAYAN BUTTERFLIES.

61. SEPHISA DICHROA, Kollar. Plate U, Fig. 6, *pupa.*

Common at Mussoorie in the summer and autumn, the larva feeding on the leaves of the common oak, *Quercus incana*, Roxb., Natural Order *Cupuliferæ*. It is dark green in colour, and greatly resembles the larva of *Apatura ambica*, Kollar, so Mr. Mackinnon notes.

62. DILIPA MORGIANA, Westwood.

Very rare in Mussoorie, the males on hill-tops in April, May and September. One female only seen in September. Collectors bring it from the Upper Ganges Valley.

63. APATURA AMBICA, Kollar. Plate U, Figs. 7*a*, 7*b*, *larva*; 7*c*, *front view of head of larva.*

Males common in Mussoorie in April, May and June, and again in September and October. The females are only occasionally seen ovipositing on the leaves of *Ulmus Wallichiana*, Planch., Natural Order *Urticaceæ*, on which the larva feeds. The pupa is pale greenish-white, covered with a white powdery bloom.

64. HESTINA NAMA, Doubleday.

Taken somewhat rarely in Mussoorie in March, April, July, August and September, at 7,000 feet elevation, and in November as low as 3,000 feet. As female specimens have been taken as early as 1st March, it is possible that the butterfly passes the winter in the imago stage of its life. It is a good mimic both in coloration and habits of *Danais sita*, Kollar.

65. HESTINA (*Parhestina*) PERSIMILIS, Westwood. Plate U, Figs. 8*a*, 8*b*, *pupa.*

Found in Mussoorie and in the interior from 3,000 to 6,000 feet elevation from May to September. The larva, which feeds on the leaves of *Celtis australis*, L., Natural Order *Urticaceæ*, is green with spines on all the segments, those on the head being the longest. Mr. Moore, in Lep. Ind., vol. iii, p. 35, pl. cci, figs. 2, 2*a*, *male*; 2*b*, *female* (1896), keeps *Parhestina zella*, Butler, from the Western Himalayas, as a species distinct from *P. persimilis* from the Eastern Himalayas; but as the combined species occurs all along the Himalayas and no line dividing them can be drawn either geographically or in the specimens themselves, as far as we can see, the species has been given here under its older name.

66. PRECIS IPHITA, Cramer.

Very common in Mussoorie and in the Dun from early spring to late autumn.

67. JUNONIA ALMANA, Linnæus.

The dry-season form, true *J. almana*, is common in the Dun, but comparatively rare in Mussoorie. The wet-season form, *J. asterie*, Linnæus, is less frequently met with.

68. JUNONIA ATLITES, Linnæus.

Very rare in our region, found in the Dun only in the autumn.

69. JUNONIA LEMONIAS, Linnæus.

Rare in Mussoorie, but common in the Aglar Valley, 3,000 feet below the station. Very common in the Dun.

70. JUNONIA HIERTA, Fabricius.

Not common, but more numerous at Mussoorie than in the Dun.

71. JUNONIA ORITHYIA, Linnæus.

Very common in Mussoorie and in the Dun.

72. NEPTIS (*Rahinda*) HORDONIA, Stoll.

Not very common in Dehra Dun only, in April and May, and again in September and October.

73. NEPTIS ANANTA, Moore.

Not common at Mussoorie from 5,000 to 7,000 feet in May and June.

74. NEPTIS ZAIDA, Doubleday and Hewitson.

This beautiful species is not rare on the north side of the shaded ravines about Mussoorie, not below 5,000 feet elevation, in May and June.

75. NEPTIS NARAYANA, Moore.

Very rare, found only in the higher ravines about Mussoorie and Nag Tiba in May and June.

76. NEPTIS SANKARA, Kollar.

Not rare in ravines near water at Mussoorie from April to July.

77. NEPTIS LEUCOTHOË, Cramer.

Not common at Mussoorie in May and June, but is very plentiful at Nag Tiba. Very common in Dehra Dun.

78. NEPTIS ASTOLA, Moore.

Common in Mussoorie from March to June, and in the Dun almost throughout the year.

79. NEPTIS SUSRUTA, Moore.

We have a single specimen taken in Mussoorie on 15th June, 1888.

80. NEPTIS YERBURII, Butler.

Very common at Mussoorie and Nag Tiba from March to June, and again in September; we have a single specimen from Dehra Dun taken in March. The larva feeds in Mussoorie on *Celtis australis*, L., Natural Order *Urticaceæ*.

81. NEPTIS MAHENDRA, Moore.

Rare in Mussoorie at 7,000 feet elevation in April and May; very plentiful at Nag Tiba in May and June.

82. NEPTIS COLUMELLA, Cramer.

The largest species of *Neptis* occurring in our area, and found only in the Dun rarely from March to May. This species was originally described from China, and at last de Nicéville has obtained both sexes from thence (Hongkong). They are, in his opinion, identical with Indian specimens, consequently the *N. ophiana* of Moore, the *N. martabana* of Moore, the *N. ophiana*, var. *nilgirica* of Moore, and *Acca columena* of Hübner, fall as synonyms.

83. PSEUDERGOLIS WEDAH, Kollar. Plate U, Figs. 9*a*, *larva*; 9*b*, *front view of head of larva*; 9*c*, 9*d*, 9*e*, 9*f*, *pupa*.

Very common during the summer in and near Mussoorie, where it is probably triple-brooded, but not found in the Dun. The larva feeds on the leaves of *Debregeasia bicolor*, Wedd., Natural Order *Urticaceæ*, is dark green, with two long diverging branched spines or horns on the head, and two simple upright spines on the subanal segment. Mr. Mackinnon thus describes the larva:—"Found in August on 'Siar,' a very common plant on which the larva of *Pareba vesta*, Fabricius, also feeds. Length one and three-eights inches, bright dark green, all the segments except the head minutely spotted with white, these spots or tubercles are arranged in transverse rows, each segment having two rows; a dorsal protuberance on the fifth segment; two sharp black spines on the eleventh segment, the base of the spines pale greenish-blue; two divergent horns on the head, five-sixteenth of an inch long, yellowish-green, with six shining black lines on each horn, tips of horns shining black; the line dividing the dorsal from the ventral aspect of the body creamy-white. The leaf of *D. bicolor* is much crinkled, as also is the skin of the larva, it so is difficult to see

the latter even in bright sunshine." The pupa is a very beautiful as well as curious object.

84. STIBOCHIONA NICEA, Gray.

Not common, but found in all the ravines to the north and south of Mussoorie from April to June, and in September and October. It does not occur in the Dun.

85. HYPOLIMNAS BOLINA, Linnæus.

Both the large and small forms are very common in the Dun from March to December, but it is most common in the rains. The large form is fairly common in Mussoorie in May, June, September and October.

86. HYPOLIMNAS MISIPPUS, Linnæus.

Very rare in our area, we have a single male from the Upper Ganges Valley taken in July, another from Mussoorie taken in April, two males from the Dun taken in August, and two females of the form *diocippus*, Cramer, taken in the Dun in November. The latter is a wonderful mimic of *Danais chrysippus*, Linnæus.

87. ARGYNNIS NIPHE, Linnæus.

Very common in Mussoorie and the Dun from April to November. The female has a strong superficial likeness to *Danais plexippus*, Linnæus.

88. ARGYNNIS CHILDRENI, Gray.

Rare in Mussoorie, very numerous in the interior from May to September. Not found in the Dun.

89. ARGYNNIS KAMALA, Moore.

Very rare in Mussoorie, but abundant at Nag Tiba, 8,000 feet elevation, from May to September; also further in the interior in August.

90. ARGYNNIS JAINADEVA, Moore.

Found somewhat rarely in the higher valleys of the Upper Ganges from June to August.

91. ARGYNNIS LATONA, Linnæus.

Very common in Mussoorie and adjoining hills from the earliest spring to late autumn.

92. ARGYNNIS (*Brenthis*) CLARA, Blanchard.

A. clara, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. iv, p. 165, n. 4, pl. A, fig. 6, *female* (1889).

At de Nicéville's suggestion Mackinnon sent his collectors in August and September, 1889, to the Nila Valley, an affluent of the Ganges, where they obtained this butterfly in large numbers, that valley apparently being its headquarters in our area. It is quite rare apparently to the west in the Baspa Valley.

93. ARGYNNIS (*Brenthis*) MACKINNONII, de Nicéville.

A. mackinnonii, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vi, p. 346, n. 3, pl. F, figs. 4, *male*; 5, *female* (1891).

Apparently rare, brought in by native collectors from the upper part of the Baspa Valley, an affluent of the Sutlej, 11,000 feet, and from the Gonas Pass in August.

94. DICHORRHAGIA NESIMACHUS, Boisduval.

A single example has been obtained in the valley below the Old Brewery in Mussoorie on 19th April, 1897. This species has an immense range, occurring all along the Himalayas from Kulu to Upper Assam; it is found also in Burma, the Malay Peninsula, Sumatra, Java, Borneo, Celebes, the Philippine Isles, Western China and Japan. Mr. Grose Smith has recently described an allied species, *D. nesseus*, from Onei-shan, N.-W. China, which is said to be "considerably less maculate" than *D. nesimachus* (Ann. and Mag. of Nat. Hist., sixth series, vol. xi, p. 217 (1893). A third species, *D. ninus*, Felder, occurs in Amboyna and Ceram. Herr H. Fruhstorfer has recently named the North Celebesian form as *D. nesimachus pelurius*, and the one from Java, Sumatra and Borneo as *D. nesimachus mannus*. Specimens from Java and Sumatra in de Nicéville's collection are absolutely indistinguishable as far as can be seen from Indian examples.

95. LIMENITIS DANAVA, Moore.

Found at Mussoorie, on Nag Tiba and in Tehri Garhwal, the male never common, the females very rare, in April, May and September.

96. LIMENITIS TRIVENA, Moore.

Very rare, occurs on Nag Tiba only, 8,000 feet elevation, in May and June.

97. LIMENITIS (*Moduza*) PROCRIS, Cramer.

Found rarely in the Dun in March and September.

98. ATHYMA PERIUS, Linnæus.

Common in Mussoorie and in the Dun from March to October.

99. ATHYMA ASURA, Moore.

Rare in wooded ravines near water in Mussoorie only in April, May, August and September.

100. ATHYMA OPALINA, Kollar.

Very common from March to November in Mussoorie. The larva feeds on the leaves of *Berberis nepalensis*, Spreng., *B. aristata*, D. C., and *B. Lycium*, Royle, Natural Order *Berberideæ*. It has been figured by Moore in Proc. Zool. Soc. Lond., 1882, p. 241, pl. xi, fig. 3. Mrs. Robson has described the transformations of this butterfly in Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 338 (1895), and says the larva feeds on *Berberis aristata*, Hook.

101. ATHYMA SELENOPHORA, Kollar.

Very rare, only three male specimens obtained at Mussoorie in May and September.

102. ATHYMA CAMA, Moore.

Male specimens only obtained by us in Mussoorie, in April rarely; Colonel Lang took it in May, and we obtained one from the Bhilung district of Tehri Garhwal in September.

103. EUTHALIA (*Symphædra*) NAIS, Forster.

Seen once only in Mussoorie. Rather rare in the Dun in April and from October to December.

104. EUTHALIA (*Zalapia*) PATALA, Kollar. Plate U, Fig. 10, *pupa*.

This very fine butterfly is very common at Mussoorie and in all the valleys near Nag Tiba. The males emerge early in May, but the females do not appear till June and early in July. The larva feeds on the common hill oak, *Quercus incana*, Roxb., Natural Order *Cupuliferæ*, is light green in colour, and does not differ appreciably from that of *E. garuda*, Moore, except in size.

105. EUTHALIA GARUDA, Moore.

Very common in the Dun from March to November, but not found in Mussoorie.

106. EUTHALIA LUBENTINA, Cramer.

Found in the Aglar Valley below Mussoorie, and a single specimen was captured by Mackinnon on the top of Nag Tiba, 10,000 feet, in May. Taken by Colonel A. M. Lang in Mussoorie in August. Not rare in the Dun in February and March.

107. PYRAMEIS CARDUI, Linnæus.

Very common almost throughout the year in Mussoorie and the Dun. The larva feeds on thistles, and on *Debregeasia bicolor*, Wedd., Natural Order *Urticaceæ*.

108. PYRAMEIS INDICA, Herbst.

More common in Mussoorie than *P. cardui*, Linnæus, but is comparatively rare in the Dun. The larva feeds on different species of *Urticaceæ*, and is gregarious. It flies almost throughout the year.

109. VANESSA CANACE, Linnæus.

Common in Mussoorie and in the interior from May to September; a few taken in the Dun in October.

110. VANESSA CASCHMIRENSIS, Kollar.

Very common in Mussoorie and all over the hills to the north, from May to October. The larva feeds on various species of *Urticaceæ*.

111. VANESSA LADAKENSIS, Moore.

Very rare, two specimens only obtained from the Nilang Pass, 15,000 feet, in July, 1895.

112. VANESSA XANTHOMELAS, Wiener Verzeichniss.

Very rare in Mussoorie; a few hybernated specimens make their appearance in February; in March and April a fresh brood appears, which frequents the Rhododendron flowers. It occurs also on Nag Tiba, 8,000 feet, in May. The larva feeds on *Celtis australis*, L., Natural Order *Urticaceæ*, and on a wild willow.

113. VANESSA (*Grapta*) C-ALBUM, Linnæus.

May be distinguished by the light fulvous colour of the ground of the upperside of both wings, in the forewing the two black spots in the middle of the discoidal cell are conjoined, and the marginal black band is continued prominently to the apex of the wing; on the underside of both wings the ground-colour is also fulvous. It is very rare in our area; we have specimens from Tehri Garhwal, 7,000 feet, taken in March, and probably hybernated; native collectors have brought in fresh specimens from the Upper Ganges Valley in July and August.

114. VANESSA (*Grapta*) AGNICULA, Moore.

Distinguished from *V. c-album*, Linnæus, by the bright fulvous-red (or ferruginous) colour of the ground of the upperside of both

wings, all the black spots are smaller than in that species, in the forewing the two black spots in the middle of the discoidal cell are almost or entirely separated, and the marginal black band is almost obsolete towards the apex of the wing; on the underside of both wings the ground-colour is very dark greyish-brown. In our area it is found with *V. c-album* in Tehri Garhwal. *V. tibetana*, Elwes, which is found in Native Sikkim and Western China, appears also to be distinct; the ground-colour of the upperside of both wings and the black spots are the same as in *V. agnicula*, but in the forewing the marginal black band is as in *V. c-album*; the underside has the ground-colour much as in *V. agnicula*, but there are very characteristic dark metallic green spots towards the margin not found in the other two species.

115. Symbrenthia hippoclus, Cramer.

Occurs somewhat commonly at Mussoorie and in the interior from April to October. The larva, which feeds on *Debregeasia bicolor*, Wedd., Natural Order *Urticaceæ*, is gregarious, and is very like that of *Vanessa caschmirensis*, Kollar. The pupa has two pincer-shaped processes on the head, and the back of the thorax is beautifully marked with gold. The transformations have been figured by Moore in Proc. Zool. Soc. Lond., 1882, p. 243, pl. xi, figs. 4, *larva*; 4*a*, *pupa*, *front* and *side views*.

116. Symbrenthia asthala, Moore.

Rather rare, but flies in Mussoorie from April to September; occurs also in Tehri Garhwal and the Upper Ganges Valley. If *S. brabira*, Moore, is the same species as *S. asthala*, as is probable, then the former name will stand for the species, as it is the older.

117. Cyrestis thyodamas, Boisduval. Plate U, Figs. 11*a*, 11*b*, *larva*; 11*c*, 11*d*, *pupa*.

Very common in Mussoorie and in the interior, and is not rare in the Dun. It flies all through the warmer months. The larva feeds on *Ficus nemoralis*, Wall., in Mussoorie, and on *Ficus glomerata*, Roxb., both Natural Order *Urticaceæ*, in the Dun. The larva is both beautiful and remarkable. It has two long diverging processes on the head, a still longer one directed backwards on the fifth segment, and another upright one on the thirteenth segment.

118. KALLIMA INACHUS, Boisduval.

Very common in Mussoorie in August, and in the Dun in July, August and October.

119. KALLIMA HUEGELII, Kollar.

Also very common in the low valleys and in the Dun in August and September. We have separated our specimens into two species solely on the shade of blue colour on the upperside of both wings, and the length of the apical prolongation of the forewing. The presence or absence of the hyaline spots is absolutely inconstant, and of no specific value whatever. The two species are certainly not seasonal forms, as they occur together both in place and time. Mr. Moore gives *K. buckleyi*, Moore, *K. hügeli* [sic], Kollar, *K. huttoni*, Moore, and *K. boisduvali*, Moore, all from the Western Himalayas.

120. CHARAXES (*Murwareda*) DOLON, Westwood.

Very rare; taken at Nag Tiba in Tehri Garhwal at 8,000 feet elevation in April and May.

121. CHARAXES (*Eulepis*) ATHAMAS, Drury.

Dr. A. G. Butler in his recent revision of the genus records *C. athamas*, var. 2, from Landoor [Landour]. Mr. F. Moore in Lep. Ind., vol. ii, p. 256, records *Eulepis hamata*, Moore, from the Tonse Valley, Gurhwal. We do not consider this species to be distinct from *C. athamas*. The latter in the Himalayas he restricts to the east, while *E. hamata* he gives from both the western and eastern Himalayas. Very common in Mussoorie and in the Dun from April to September. The larva feeds on the leaves of *Albizzia Julibrissin*, Durazz., Natural Order *Leguminosæ*, in Mussoorie, and on *Acacia Catechu*, Wild., Natural Order *Leguminosæ*, in the Dun.

122. *CHARAXES (*Eulepis*) ARJA, Felder.

Recorded by Dr. Butler from Landour. We have never seen a specimen of this species anywhere west of Sikkim, though it probably does occur in Nepal. We think Landour is a doubtful locality for it.

123. CHARAXES FABIUS, Fabricius.

Rare; taken near Mussoorie only in April and September.

124. CHARAXES (*Haridra*) HEMANA, Butler.

Three males and two females only obtained near Mussoorie in September at 4,000 feet elevation. Dr. Butler records it from "Mussuri" and north of "Landoor." Mr. Moore records it from "Massuri" and

the "Uglar" Valley north of Landour, this being probably a misprint for "Aglar."

Family LEMONIIDÆ.

Sub-Family LIBYTHÆINÆ.

125. LIBYTHEA MYRRHA, Godart.

Not rare in Mussoorie from April to September, occurs in Dehra Dun in September and October.

126. LIBYTHEA LEPITA, Moore.

Less common in Mussoorie from April to June than *L. myrrha*, Godart; not found in the Dun.

Sub-Family NEMEOBIINÆ.

127. ZEMEROS FLEGYAS, Cramer.

On the wing from May to September. Rare at Mussoorie, but fairly common in the Dun.

128. DODONA DURGA, Kollar.

Very common in Mussoorie only from April to September.

129. DODONA DIPŒA, Hewitson.

Occurs only in Mussoorie, rarely in April, May and June, but commonly in August and September.

130. DODONA OUIDA, Moore.

Males common at Mussoorie flying about the tops of oaks from March to June; females found only in shady ravines near water from May to July. The larva has been reared on grass, Natural Order *Gramineæ*.

131. DODONA EUGENES, Bates. Plate V, Figs. 12*a*, 12*b*, *larva*; 12*c*, 12*d*, *pupa*.

Not rare in Mussoorie and the interior from April to September. The larva feeds on grasses and hill bamboo, Natural Order *Gramineæ*; is pale emerald-green, with two dorsal blue lines. The pupa is also green.

132. ABISARA FYLLA, Doubleday and Hewitson.

Rare in Mussoorie, especially the female, in April, May, August and September.

133. ABISARA SUFFUSA, Moore.

Rare in Mussoorie and the adjoining low valleys in August, common in the Dun in April, May, August and November.

Family LYCÆNIDÆ.

134. MEGISBA MALAYA, Horsfield.

The tailed form has been taken in the Bhilung District of Tehri Garhwal in September, and in Dehra Dun from February to November.

135. LYCÆNA MEDON, Hufnagel.

Very common in Mussoorie from 3,500 to 7,200 feet elevation from April to July.

136. LYCÆNA ARIANA, Moore.

Very numerous in the Nila and Baspa Valleys in the interior at about 12,000 feet elevation from July to September.

137. LYCÆNA LEHANA, Moore.

Occurs rarely in June and July on the Nilung Pass in the interior at a great elevation.

138. LYCÆNA GALATHEA, Blanchard.

Exceedingly common in the Nila and Baspa Valleys near the snows from July to September, the female as usual rarer than the male.

139. CHILADES TROCHILUS, Freyer.

Occasionally found in Mussoorie in May and July, common in Dehra Dun in December.

140. CYANIRIS VARDHANA, Moore.

Not common in Mussoorie from May to July, and in October, somewhat more plentiful in the interior.

141. CYANIRIS ALBOCÆRULEUS, Moore.

Rare in Mussoorie and double-brooded, flies from April to July, and in September. Mr. Moore recorded it from "Deyra Doon," but that valley is probably too low for it.

142. CYANIRIS PUSPA, Horsfield.

Occurs in great numbers in the low valleys about Mussoorie and in Dehra Dun from April to July, and in August, September and November.

143. CYANIRIS CŒLESTINA, Kollar. Plate V, Figs. 13*a*, 13*b*, *larva*; 13*c*, 13*d*, *pupa*.

Common in Mussoorie from 3,000 to 7,000 feet elevation all through the summer and autumn. The larva feeds on *Prinsepia utilis*, Royle, Natural Order *Rosaceæ*. Dr. A. Forel, of Geneva, has identified the ant which attends this species in Mussoorie as *Acantholepis capensis*, Mayr, var. *lunaris*, Em.

144. Cyaniris huegelii, Moore.

Also very plentiful in Mussoorie throughout the warm months of the year.

145. Zizera maha, Kollar.

Very common in Mussoorie and in Dehra Dun, almost throughout the year.

146. Zizera lysimon, Hübner.

Not rare in Mussoorie in the summer ; occurs in the Dun almost all the year round.

147. Zizera gaika, Trimen.

Occurs in Dehra Dun in December.

148. Azanus ubaldus, Cramer.

Not rare in Mussoorie in May and September, and in the Dun from March to June.

149. Everes argiades, Pallas.

Very common in Mussoorie from April to August ; occurs also in the Dun in August.

150. Nacaduba noreia, Felder.

The tailed form (*N. ardates*, Moore) is not rare in Mussoorie in May, and again from August to December. Both the tailed and tailless forms occur in the Dun commonly almost throughout the year.

151. Nacaduba hampsonii, de Nicéville.

Rare in the Dehra Dun only; male specimens only obtained in May, August and November.

152. Jamides bochus, Cramer.

Very common in the low valleys near Mussoorie and in the Dun in August and September.

153. Lampides celeno, Cramer.

One specimen taken near Mussoorie in August ; very common in the Dun in April and May, and again in August, September, November and December. The seasonal forms are very strongly marked.

154. Catochrysops strabo, Fabricius.

A few specimens have been caught in the low valleys to the north of Mussoorie ; exceedingly common in Dehra Dun from August to December.

155. CATOCHRYSOPS CNEJUS, Fabricius.

Not common in our area ; occurs in the Dun only in October.

156. CATOCHRYSOPS PANDAVA, Horsfield.

The rains' form, true *C. pandava*, occurs in Mussoorie in August and September ; the rains' form flies in the Dun in August, and the dry-season form, *C. bengalia*, de Nicéville, in October and November.

157. TARUCUS THEOPHRASTUS, Fabricius.

Very rare in Mussoorie in September, very common in the Dun in May and from July to November, and is highly seasonably dimorphic, the dry-season form found in May being the *T. alteratus* of Moore.

158. TARUCUS TELICANUS, Lang.

Not common in Mussoorie in May and August; more numerous in the Dun from April to December. It is better known in India as *T. plinius*, Fabricius, but Lang's name has four years' priority.

159. CASTALIUS ROSIMON, Fabricius.

Found in Dehra Dun only ; commonly in April and May, and in October and November.

160. POLYOMMATUS BŒTICUS, Linnæus.

Occurs in Mussoorie and the adjoining districts in vast numbers from March to June, apparently migrating in March to the north-westward. The Mussoorie specimens vary greatly in size. Found also commonly in the Dun.

161. IRAOTA TIMOLEON, Stoll.

Not rare in Mussoorie from April to September, and in the Dun in the latter month in large numbers on pomegranate bushes, *Punica Granatum*, L., Natural Order *Lythraceæ*. In Kanara the larva has been found to feed only on the bark of *Ficus glomerata*, Roxb.

162. SURENDRA QUERCETORUM, Moore.

Decidedly rare in Mussoorie in August, but in the Dun it is very common all the year round, in sál forests especially. The female has been observed ovipositing on a thorny bush, a species of *Acacia*, Natural Order *Leguminosæ*.

163. ARRHOPALA AMANTES, Hewitson.

Very rare in Mussoorie, but found in great numbers in the Dun almost all the year round, most plentiful in April and May in the vicinity of water.

164. ARRHOPALA ATRAX, Hewitson.

Rare in Mussoorie in September ; common in the Dun from April to June and in August.

165. ARRHOPALA RAMA, Kollar. Plate V, Figs. 14*a*, 14*b*, *larva* ; 14*c*, 14*d*, *pupa*.

Common in Mussoorie and triple-brooded at least, the May brood being generally the largest. The larva feeds on the young leaves of the common oak, *Quercus incana*, Roxb., Natural Order *Cupuliferæ*, is of the usual lycænid shape, pink, almost hairless, and attended by ants. Pupa brown, with a pink tinge. Mr. Mackinnon, on 21st July, 1892, wrote as follows :—"The larvæ are of the colour of milk-and-water till about half grown, when they become a little greenish-blue ; just before they turn into pupæ, they become of a pink colour. The only marking is the dorsal stripe, which begins on the third segment, becoming wider to about the seventh segment, when it narrows gradually to the eleventh, on which it ends. The new leaves of the hill-oak are covered with a white tomentum, and these larvæ lie on the underside of the leaves, and being exactly the same colour as the fluff on the leaves, they are very difficult to see. The attending ant is always single, and seemed to be occupied stroking the posterior end of the larva." Mrs. Robson in May, 1894, wrote as follows :— "The larva in Mussoorie is palest whitey-green, of the exact shade of the leaves of the oak on which the larva exists. It is always attended by black ants. The larvæ double down both edges of the leaf, station themselves on the midrib, and eat from the tip backwards. So far as I have observed, there is no difference between the larvæ of *A. rama*, *A. dodonæa*, Moore, and *A. ganesa*, Moore, except in size."

166. ARRHOPALA DODONÆA, Moore.

As common in Mussoorie and in the interior as *A. rama*, Kollar, from April to June, and again in September. The larva feeds on the common hill-oak, *Quercus incana*, Roxb., Natural Order *Cupuliferæ*, is attended by ants, is almost exactly like that of *A. rama*, but generally

larger and a shade lighter in colour. The opposite sexes in this species are coloured and marked almost exactly alike—an unusual feature in the genus.

167. ARRHOPALA GANESA, Moore.

The commonest species of the genus found in Mussoorie, flying in shady ravines near running water in May and June. The larva, as in the case of the two species which precede, feeds on the young leaves of *Quercus incana*, Roxb., Natural Order *Cupuliferæ*, is of a very beautiful pinkish-white colour, covered with very fine and soft white hairs, extending all round beyond the body. The larvæ of *A. rama*, Kollar, *A. dodonœa*, Moore, and *A. ganesa*, when nearly full-grown, remain in a shelter made by fastening the edges of a leaf together. The ants which attends the larva of this species are much larger than those which pervade the larvæ of the other two species. All these species have a honey-gland on the eleventh segment.

168. CURETIS ANGULATA, Moore.

Very rare in the valleys about Mussoorie in August and September ; occurs in Dehra Dun in September.

169. CURETIS DENTATA, Moore.

Found in Mussoorie and Dehra Dun (from whence it was originally described) with the species which precedes and follows.

170. CURETIS BULIS, Doubleday and Hewitson.

Found in the low valleys about Mussoorie from June to September; not rare in the Dun in April, July, August and September. It is unfortunate that no fresh evidence is forthcoming of the distinctness or otherwise of the various species of this genus which have been described.

171. THECLA SASSANIDES, Kollar.

Brought in by native collectors in July and August from the Nila Valley, close to the Ganges, at an elevation of about 8,000 feet.

172. ZEPHYRUS ATAXUS, Doubleday and Hewitson.

Excessively rare in Mussoorie and in a valley near Nag Tiba, and flies from May to July. *Z. ataxus* is the male, and *Z. katura*, Hewitson, the female of one and the same species.

173. ZEPHYRUS SYLA, Kollar.

Found in Mussoorie and the hills to the northwards, very common in seasons following a dry winter. It flies in May, June, and August.

174. ZEPHYRUS BIRUPA, Moore. Plate V, Fig. 15*a*, 15*b*, *larva* ; 15*c*, *pupa*.

Exceedingly common in Mussoorie, double-brooded, the first from May to July, the second in September. The earlier brood is found in shady woody ravines only, the later brood on the tops of hills. Mrs. Robson has bred it at Mussoorie in May. The larva feeds on *Rhododendron arborum*, Sm., Natural Order *Ericaceæ*.

175. ZEPHYRUS ICANA, Moore.

Very rare in Mussoorie, more common at Nag Tiba ; it flies in May and June.

176. ZEPHYRUS DOHERTYI, de Nicéville.

Found in a ravine near Nag Tiba, 8,500 feet elevation, in May and June ; also in the Nila Valley in July, and the Pabur Valley in Jaunsar in August; the two last-named localities are in the interior towards the snows.

177. ZEPHYRUS ZINA, Hewitson.

Found in Mussoorie only from May to July, some years it is common, in others very rare.

178. EUASPA MILIONIA, Hewitson.

Found commonly in Mussoorie only in shady ravines near running water from May to July.

179. CHÆTOPROCTA ODATA, Hewitson.

Occurs in great numbers in Mussoorie in May and June, and the Ganges Valley in July, in fact, wherever walnut trees grow (*Juglans regia*, L., Natural Order *Juglandeæ*), and is a perfect pest in places, as the larvæ literally strip the trees of their leaves. Although the larva spins a flimsy sort of web beneath which it hides, it is not of much protection, as birds pick them out without any difficulty and with great rapidity. The butterfly is most active at sunset, and is single-brooded. The winter is passed in the egg state.

180. CHRYSOPHANUS PHLÆAS, Linnæus.

Common at Mussoorie and in the interior from 5,000 to 8,000 feet elevation from March to September. The larva feeds on the leaves of the common "dock," *Rumex nepalensis*, Spreng., Natural Order *Polygonaceæ*.

181. CHRYSOPHANUS PAVANA, Kollar.

Found commonly throughout the year except in the winter in Mussoorie, on Nag Tiba, and in the Ganges Valley.

182. CHRYSOPHANUS KASYAPA, Moore.

Occurs only in the interior somewhat rarely in July and August in the Baspa Valley and on the passes in its vicinity, at about 12,000 feet elevation.

183. ILERDA SENA, Kollar.

Very common in Mussoorie from 3,000 to 7,000 feet elevation in every month of the year, even in the depths of winter if the sun shines and the ground is free from snow. Mr. Mackinnon once found a female in the Dun in February flying round a sorrel plant which had been swept down by a torrent in the rains, but it is not usually found below the foot of the hills. The larva feeds on *Rumex hastatus*, Don., Natural Order *Polygonaceæ*.

184. ILERDA TAMU, Kollar.

Occurs at Mussoorie and on Nag Tiba only on bare spots in April, May, and October.

185. ILERDA ANDROCLES, Doubleday and Hewitson.

Common at Mussoorie, on Nag Tiba, and in the Upper Ganges Valley, from 5,000 to 9,000 feet elevation, from April to October. The females of all *Ilerdas* seem to be rarer than the males.

186. CAMENA DEVA, Moore. Plate V, Figs. 16*a*, 16*b*, *larva*; 16*c*, 16*d*, *pupa*.

Not rare at Mussoorie in May, July, and September, and in the Dun in February, July, August, and September. The larva feeds on the leaves of *Loranthus longiflorus*, Desr., Natural Order *Loranthaceæ*.

187. CAMENA ICETAS, Hewitson.

Not common in Mussoorie at 5,000 feet elevation from April to July.

188. Creon cleobis, Godart.

Two specimens only obtained in Mussoorie in July and September, and a few in the Dun in February, April, and August.

189. Aphnæus vulcanus, Fabricius.

Found somewhat rarely in the Dun only from February to April, and in June and August.

190. Aphnæus lohita, Horsfield.

Not rare in the low valleys below Mussoorie from July to September, and found in the Dun in August.

191. Aphnæus ictis, Hewitson.

Found in the low valleys about Mussoorie in August, and in the Dun in March, April, June, and August. It is very variable as usual; some males from Mussoorie altogether lack the triangular yellow black-spotted area on the upperside of the forewing which is characteristic of typical *A. ictis*. The *A. lunulifera* of Moore is certainly only a varietal form of *A. ictis*. It flies in the Dun in March.

192. Aphnæus elima, Moore.

Found rarely in March and April in Dehra Dun only. It is almost certainly the dry-season form of *A. ictis*, Hewitson.

193. Aphnæus zaffra, de Nicéville.

Found from April to June in shady ravines near water in Mussoorie only, never commonly.

194. Tajuria illurgis, Hewitson.

Rare in shady ravines near water from April to June at Mussoorie and on Nag Tiba, found also in Dehra Dun in August. Two females only obtained in the Dun.

195. Tajuria longinus, Fabricius.

Mussoorie in May, July, August, and September, in Tehri Garhwal in April, and in Dehra Dun in February, May, and August.

196. Tajuria jehana, Moore.

Not rare in Mussoorie and in the valleys in the vicinity in May and September; found occasionally in the Dun also.

197. TAJURIA DIÆUS, Hewitson.

Very rare, two male specimens obtained in March, 1887, in Mussoorie. In Mr. Mackinnon's collection is another male bred in Mussoorie from a larva found by Mrs. Robson on *Loranthus bicolor*, L., Natural Order *Loranthaceæ*, the transformations of which she described in Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 339 (1895), in error as those of *Camena* [*Creon*] *cleobis*, Godart.

198. TAJURIA ISTROIDEA, de Nicéville.

There is a single specimen of this species in Mr. A. E. Ryve's collection taken in a valley near Mussoorie.

199. CHLIARIA OTHONA, Hewitson.

Rare in Mussoorie, one pair obtained in June; occurs in Dehra Dun in July.

200. CHLIARIA KINA, Hewitson. Plate V, Figs. 17*a*, 17*b*, *pupa*.

Rare in Mussoorie from April to June, and in Dehra Dun from July to September. The larva in the Dun feeds on the flowers of an orchid, *Rhynchostylis retusa*, Blume, Natural Order *Orchideæ*. Head pale yellowish-brown, body pale bright green, covered with scattered pink hairs, a dorsal reddish-pink stripe wider at both ends than in the middle, two stripes of the same colour on either side between the dorsal and abdominal stripe; these stripes all converge towards either extremity, giving the impression that the larva is entirely pink at either end, but under a magnifying glass the lines are seen to be separate; a small black spiracular dot on each segment along the abdominal line, while the latter is of the same colour as the other stripes. As the flowers of the orchid are also pink, the larva is not easy to see. The pupa is green.

201. HORAGA ONYX, Moore. Plate V, Figs. 18*a*, 18*b*, *larva*.

Not rare in Mussoorie from April to June, in August and September, and in the Dun in August, September, November and December. The larva feeds on the leaves of *Coriaria nepalensis*, Wall., Natural Order *Coriariecæ*, is shaped exactly like that of *H. viola*, Moore, and is furnished with the same number of processes, but the colour is different, some parts being green, and the others brown. The pupa,

attached by the tail only with no median girth, is short and very thick for its length, anteriorly light green, the wing-cases dark brown, the abdominal segments also brown, on the back and the sides of the body green.

202. Horaga viola, Moore.

A single specimen bred from a larva found feeding in Mussoorie on the leaves of *Coriaria nepalensis*, Wall., Natural Order *Coriarieæ*. It is a most curious looking creature, about half an inch long, of a reddish-brown colour, of the usual lycænid shape, but furnished with eleven tentacular processes, two on the third segment, one each on the fourth, seventh, eighth, and ninth segments, all dorsal, the fifth has three, two lateral and one dorsal, the eleventh has two lateral ones.

203. Catopœcilma elegans, Druce.

Rare in Mussoorie from March to May, in July and August; also in Dehra Dun in August and September.

204. Loxura atymnus, Cramer.

Rare in Mussoorie in August and September, common in the Dun almost all the year round.

205. Deudorix epijarbas, Moore.

Common at Mussoorie from July to September, and in the Dun from February to September. The larva feeds on the fruit of the horse-chestnut, *Æsculus indica*, Colebr., Natural Order *Sapindaceæ*, in Mussoorie, and on the fruit of the pomegranate, *Punica Granatum*, L., Natural Order *Lythraceæ*, in the Dun and adjoining low valleys.

206. Hysudra selira, Moore.

Not rare in Mussoorie from April to June, and again in September. The female butterfly has been observed ovipositing on the leaves of the wild Indigo, *Indigofera atropurpurea*, Hamilt., Natural Order *Leguminosæ*.

207. Rapala schistacea, Moore.

Not rare in Mussoorie in May, June, and September, in the Giri Valley in Sirmoor in November, and common in the Dun from March to November. Mrs. Robson has bred the larva in Mussoorie on *Spiræa sorbifolia*, L., Natural Order *Rosaceæ*, and described its transformations in Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 337 (1895).

208. Rapala varuna, Horsfield.

Mr. Moore has described this species from the "Deyra Doon" as *R. grisea*. We have a single male from the Dun captured in September. Mr. Hamilton H. Druce in Proc. Zool. Soc. Lond., 1895, p. 622, has recently shown that "*Deudorix*" *orseis*, Hewitson="*Thecla*" *varuna*, Horsfield.

209. Rapala nissa, Kollar.

Very common in Mussoorie from March to October, and in the Dun in the rainy season. The larva feeds on the flowers of *Astilbe rivularis*, Ham., Natural Order *Saxifragaceæ*. It is very like the larva of *R. schistacea*, Moore, except that the fourth segment is bright red.

210. Rapala melampus, Cramer.

Rare in Mussoorie in May and September, exceedingly common in the Dun from March to May, in July, September, and November.

211. Virachola isocrates, Fabricius.

Occurs at low elevations near Mussoorie (about 4,000 feet) from July to September; common in the Dun almost throughout the year wherever the pomegranate (*Punica Granatum*, L., Natural Order *Lythraceæ*) grows, on the fruit of which the larva feeds. In a fairly large garden near the town of Dehra this fruit never comes to perfection owing to the borings of this larva.

212. Virachola perse, Hewitson.

Found in the low valleys near Mussoorie in July, and in the Dun in March, and from June to September. The larva feeds on the fruit of *Randia dumetorum*, Lamk., Natural Order *Rubiaceæ*. It is almost impossible to get good specimens of this butterfly except by breeding. It is less common in our area than *V. isocrates*, Fabricius.

213. Sinthusa nasaka, Horsfield.

Rare in the low valleys near Mussoorie from May to July, found in the Dun in September.

214. Sinthusa chandrana, Moore.

Rare in Mussoorie from June to August, and in the Dun in July and September.

(*To be continued.*)

THE BIRDS OF NORTH CACHAR.

Part IX.

By E. C. Stuart Baker, f.z.s., m.b.o.u.

(*Continued from page 233 of this Vol.*)

Order XI—Accipitres.

Family *Pandionidæ*.

(501) Pandion haliaetus.—The Osprey.

Hume, No. 40 ; *Blanford, No.* 1189.

There are but few of these birds to be met with within the limits of Cachar, though on the vast bheels in the adjoining district of Sylhet it may be more often seen. During the last seven or eight years a pair of Ospreys have made their nest every year in a large swamp called the Chutta bheel, situated in about the centre of Cachar. In February, 1896, one of my collectors shot a fine male which was fishing with its mate in a still larger piece of water further south; these and perhaps three or four others, seen but not obtained, are all that I have come across within the district.

The pair of Ospreys, which I have already mentioned as annually breeding in the Chutta bheel, are practically resident birds, as I am informed that they are repeatedly seen until the end of December or beginning of January when the drying up of the water forces them to make what is, probably, a local migration to some other place where there is a suitable food-supply. The earliest rains commence in Cachar in March or April and with their advent back come the birds to their nest and set about repairs as soon as ever they arrive. The site is a large solitary tree, standing on a small piece of high ground which, when the rains are at their highest, is surrounded on all sides by a vast sheet of water, dotted here and there where similar little islands show their heads.

The birds which are seen in the cold weather are, in all likelihood, only casual visitors, though it is possible that one or two other eyries exist in the less frequented backwaters of the Barak and Surrma rivers where, even in the driest seasons, there is always plenty of water containing an inexhaustible quantity of fish.

It is probable that Blanford has laid rather too much stress on the outer toe of the Osprey being reversible. Col. Bingham, writing of

Poliaetus ichthyœtus in a most interesting article in this journal (Vol. IX, p. 478), says that he "*can state positively*" that "the outer toe of these fishing eagles is reversible like that of the Osprey." I have myself examined the feet of *P. ichthyœtus* and *P. humilis* (*vel plumbus*) and undoubtedly in *both* these the outer toe is reversible, though I do not think I should have said "like that of the Osprey," for, whereas the *normal* position of the outer toe of the Osprey is pointing backwards with the hullux, the *normal* position of the same toe in the fishing eagles is pointing forwards with the second and third toes, but it appears to be reversible at will when required to give additional power in grasping.

A very interesting feature in the leg of the Osprey is the curious spinal development of the scales at the back of the tarsus next the joint. The use of these rough projections may be seen at once if the bird is watched in the act of carrying off a fish. In grasping the first and fourth toes are considerably separated and when the prey is drawn up close to the body it is pressed against the tarsus which fits in between the toes and so forms no inconsiderable addition to the purchase obtained. Again the beauty of the arrangement is still further enhanced when it is noticed that it is the *upper* edge of the scales which are thus prolonged ; if it were the lower edges which formed the spines, every time the bird seized a fish and contracted its leg until these were brought into play the expanding again would force out the scales and so cause the bird pain if not actual injury. As it is, Nature has so ordained that contraction and expansion force in and release these spines at such an angle that there *can* be no way by which they can be caught in the flesh of the object held.

Family *Vulturidæ*.

(502) VULTUR MONARCHUS.—The Cinereus Vulture.

Hume, No. 1 ; *Blanford, No.* 1190.

I believe that a nest from which, for two years running, I obtained eggs, is the only one recorded found actually within Indian limits. Near the village of Hungrum and overhanging the Jiri Valley, there is a lofty hill, something over 6,000 feet high, the north-eastern side of which runs almost sheer down into the valley below. The greater part of this is covered with dense, but rather stunted, evergreen forest interspersed with wide bare patches where slips have occurred, or

where the sides are too precipitous to maintain anything but the most scanty bush jungle. On one of these places a pair of Cinereus Vultures had made their nests upon a ledge of rock, partly protected by overhanging bushes, and still further by large boulders. Although from a distance the place appeared to be almost inaccessible, it was not so hard to get at as it seemed to be. In the first place trees grew in great numbers up to within some ten yards or so of it, and it was easy enough to pass from one to another of these and from where the trees ceased to grow ; a light Naga boy found it equally easy, with the help of numerous stout creepers, to get on the ledge where the nest was. On the first occasion I visited it we found a single egg which was very hard set. The parent birds made no demonstration but sailed slowly round and round, now and then venturing within twenty or thirty yards of our heads, and finally, in order to make absolutely sure of the identity of the eggs, I shot the female.

The following year I again visited Hungrum and was much surprised to find that the widower had remarried and again occupied the same nest. I again took the solitary egg which it contained and this last robbery was too much for the birds, for from that day to this, now some years or more, I have not seen a vulture of this species.

Judging from the appearance of the nest it must have been in use for a very long time. The mass of sticks extended fully twelve feet along the ledge and occupied the whole of the breadth, which varied from three to six feet. In depth it averaged fully four feet, as at the edge it came up to the waist of the boy who took the egg, and it was far deeper in the centre where there was a depression in the rock. The Nagas of Hungrum told me that it had been built some fifteen or twenty years previous to the one on which I first robbed it.

One egg is almost white and the other only very faintly blotched with dirty cream colour and brownish-red. Numerous remains of small animals lay about the rocks near, and though these were but bones, for the most part left from former years, the stench which arose from the vicinity of the nest was almost overpowering.

(503) Otogyps calvus.—The Black Vulture.

Hume, No. 2 ; *Blanford, No.* 1191.

Comparatively common throughout both hills and plains portions of the district.

(504) GYPS INDICUS.—The Long-billed Vulture.

Hume, No. 4; *Blanford, No.* 1194.

Hume mentions, in "Stray Feathers," *G. indicus* as one of the vultures to be found in Cachar, but the few birds I have examined seem rather to belong to the next species.

(505) GYPS TENUIROSTRIS.—The Himalayan Long-billed Vulture.

Hume, No. 4 *ter*; *Blanford, No.* 1195.

This is, as far as I know, the common form everywhere. It is possible that both *G. himalayensis* and *G. indicus* may enter the district, but vultures are not commonly seen in North Cachar and I have devoted very little attention to them, besides which, it is not easy to discriminate between some of the species without having good series for comparison. In the plains, of course, one can obtain any number, but native collectors are not keen on getting them as their brethren laugh at them for shooting the foul bird.

(506) PSEUDOGYPS BENGALENSIS.—The White-backed Vulture.

Hume, No. 5; *Blanford, No.* 1196.

This vulture seems seldom to wander to any of the heights above 3,000 feet, and is rare even as high as that. I have known carcases of gour and gayal to lie out in the open on the top of a peak hardly over 3,000 feet for days together without attracting a single vulture.

Family FALCONIDÆ.

Sub-family *Falconinæ*.

(507) AQUILA BIFASCIATA.—The Steppe Eagle.

Hume, No. 27 *bis*; *Blanford, No.* 1202.

A very rare winter visitor. I have as yet only seen it twice, and have not yet succeeded in obtaining a specimen.

(508) LOPHOTRIORCHIS KIENERI.—The Rufous-bellied Hawk Eagle.

Hume, No. 37; *Blanford, No.* 1209.

Recorded from Cachar; I have never yet met with it.

(509) ICTINÆTUS MALAYENSIS.—The Black Eagle.

Hume, No. 32; *Blanford, No.* 1210.

Not a very rare bird in North Cachar, though I have not yet met with it in the plains. I have seen this eagle stoop at jungle fowl and, though I have not myself seen it strike, the natives tell me that it does sometimes seize them, and I once saw one in the act of feeding on a

jungle hen. I had no gun with me so could not shoot it, but it was perched on a tree within thirty yards of me and its intensely dark plumage rendered it easily recognisable at that short distance. When disturbed in forest it displays great activity in the way it dodges in and out between the trees, seldom getting above them into the open, until it thinks it has reached a safe distance. I have seen it haunting small streams and ravines in heavy forests at high elevations, probably in search of small animals and reptiles which abound in such places.

(510) SPIZÆTUS CIRRHATUS.—The Crested Hawk Eagle.

Hume, Nos. 35, 35 *bis and* 35 *quat* ; *Blanford, No.* 1211.

An eagle undoubtedly of this species was shot by some Nagas on the 14th July and brought in to me. The crest is fully 3″ long or rather more. It is very remarkable obtaining this bird so far North.

(511) SPISÆTUS LIMNÆTUS.—The Changeable Hawk Eagle.

Hume, Nos. 34, 34 *A and* 34 *bis; Blanford, No.* 1212.

I have seen no adults of this bird in Cachar, but had two young birds brought to me once which, I believe, were of this species. Hume records it from North-east Cachar.

(512) SPILORNIS CHEELA.—The Crested Serpent Eagle.

Hume, Nos. 39, 39 *bis*, 39*a bis, and* 39 *ter*; *Blanford, No.* 1217.

The most common eagle in North Cachar. On all the larger streams it is found in very large numbers; and many of the villages at low elevations, up to some 2,500 feet, are haunted by one or more pairs, who levy a toll on the fowls and ducks, sometimes even venturing to attack young kids. For a long time—three years at least—a pair of them persecuted the tenants of my fowl-run, doing very heavy damage, more especially amongst the guinea-fowls. Finally, owing to the persistance with which they kept up the slaughter of these birds, I was driven to shooting the male and hanging up his skin as a warning to his mate. She, however, refused to be driven away, and having married again continued to frequent the place, though she became much less bold in her depredations and never ventured within shot.

They are extremely bold birds, and I have seen them stoop at and kill jungle fowl and pheasants, and once saw a pair attack a heron which, however, escaped into some adjacent forest. Their principal food consits of lizards, frogs, and fish, and it is not necessary that these should have been killed by the bird itself.

I have taken these birds as nestlings and brought them up, when they have evinced considerable affection and, though always at large, never flew away for more than an hour or so. They very soon learnt to come when called, and would follow me about my garden stalking along in a most grave and sedate manner a yard or two behind me. They ate worms, caterpillars, grasshoppers or any other small odds and ends in the insect line which I offered them. Amongst other delicacies for which they showed more than ordinary greediness were the large, fat, white grubs of the stag-beetles. These larvæ used to get into the roots and the lower parts of the trunks of the orange trees, which died in a very short time if not relieved from their unwelcome visitors. The eagles used to watch me extracting these with the greatest interest, their heads on one side and their beautiful eyes watching every movement of my fingers. When they were at last extracted their excitement was intense, they raised and lowered their crests rapidly and gave vent to hoarse croaks of impatience. They never utter their wild screaming cry except when circling round and round high up in the air. Their sight was most wonderfully keen, and though they were quite invisible to me they would often discover my approach and pay me sudden visits on the road when I was returning to headquarters from camp. They would never follow me more than three or four miles from Gunjong, and never ventured after me on foot except in immediate vicinity of the house.

They never attempted to molest any of my other pets, and at night retired to roost in perfect amity with the fowls or occasionally with a number of the Eastern red-footed kestrel (*T. amurensis*) who lived in a large aviary by themselves. The kestrel did not, however, care for the companionship of the eagles, and it was only under pressure that the eagles visited them. They were very early risers, the first glimmer of dawn seeing them on the wing, and also retired very early to bed, being asleep in the fowl-house some time before the last of the fowls went to roost.

In North Cachar *Spilornis chiela* seems to breed earlier than in most places, as few eggs are to be found after the middle of March. Their nests are sometimes placed far in the interior of forest and a long way from water, but more often they build them on trees on the banks of

streams. They return to the same nest for many years in succession. I have a young bird now in captivity, a *Spilornis* of kinds, but with the whole lower plumage deep fulvous with broad drops of blackish-brown on the breast and glands. I shall await anxiously to see what this turns out, as none of my young birds of this genus which I have had have at all resembled this one.

(513) BUTASTUR TEESA.—The White-eyed Buzzard Eagle.

Hume, No. 48; *Blanford, No.* 1220.

A rather rare bird in Cachar, even more so in the hills than in the plains.

(514) HALIAETUS LEUCORYPHUS.—Pallas's Fishing Eagle.

Hume, No. 42; *Blanford, No.* 1223.

This is not a common bird in Cachar where the rivers are not of any size, but in the adjoining district of Sylhet where the rivers widen out and the swamps and lakes are of far greater extent, it may be rather more frequently met with.

(515) POLIAETUS ICHTHYAETUS.—The Large Grey-headed Fishing Eagle.

Hume, No. 41; *Blanford, No.* 1226.

Extremely common all over the district, both on the larger rivers and on every open body of water. It ascends the hill-streams to a considerable height, and I once with right and left shots got a bird of this species and one of the smaller kind *P. humilis.*

Its huge nest of sticks may be seen in many places all along the banks of the river Barak, invariably placed on large trees in most conspicuous positions, not seldom on the highest tree available in the very centre of a village. One nest I know of is placed in a mango tree which grows within a few yards of one of the regular calling places of the river steamers, but the birds appear to take no notice of the noise of the boats and the constant crowds of people passing backwards and forwards just below them.

They eat carrion freely and may be often seen seated on the dead carcases of animals floating down the stream, enjoying a meal as they sail along. They will not, however, eat in company, and no vulture is allowed to approach anywhere near until they have fully gorged themselves, when they flap lazily away to sun themselves on some high tree or bamboo.

(516) POLIAETUS HUMILIS.—Hodgson's Fishing Eagle.

Hume, Nos. 41 *bis and* 41 *ter*; *Blanford, No.* 1227.

Very common on all the larger streams throughout these hills, but less so on the lower reaches and but seldom seen on the plains. These birds often rob the fishing basket-traps of the Cacharies, whenever these are partly exposed above water. With their strong beaks and claws they tear open the bamboo fastenings and, thrusting their heads into the aperture so made, steal the contents. They breed principally in February and March in the same manner as the last bird but in less exposed situations, sometimes a good distance from the stream and well inside the forest.

(517) HALIASTUR INDUS.—The Brahminy Kite.

Hume, No. 55; *Blanford, No.* 1228.

As a rule extend only a very short way up the bigger rivers into the hills, but is of course very common in the plains. It is a very noticeable fact that both this kite and *Milrus govinda* have increased very considerably in numbers as the Assam-Bengal Railway has advanced into the hills and brought large numbers of coolies into the district. Of late I have several times noticed Brahminy Kites hovering about over these hills, at some height over 2,000 feet, whereas in former days it was but seldom they were seen over 500 feet or so. All the birds I have examined have been young birds, still with many brown feathers about them. They do not wander any distance from the line itself, but haunt the Pathan camps where offal is nearly always plentiful.

I have taken five eggs from a nest of this species once, and more than once have taken four.

(518) MILVUS GOVINDA.—The Common Pariah Kite.

Hume, Nos. 50 *and* 56 *ter*; *Blanford, No.* 1229.

In the hills and higher extensive forests is to a great extent replaced by the next species.

Five years ago it used to be quite an unusual sight to see *M. govinda* in these hills, but now all along the railway line every camp is frequented by at least a pair of these kites, and at Haflang some three or four pairs have commenced to breed.

(519) MILVUS MELANOTIS.—The Large Indian Kite.

Hume, No. 50 *bis*; *Blanford, No.* 1230.

This kite is fairly common in all the wilder parts of the district, especially in the mountainous portions. I once shot a gaur at a place

called Guilang, some 4,000 feet high, which was cut up by the Nagas of the nearest village who took it home and hung it up in long strips to dry in the sun. In a very short space of time some two or three hundred kites appeared on the scene and hovered round and round the meat, which was guarded by two small Naga boys. I found the kites very wild and it was not easy to obtain shots, as each time I fired they would fly away and not return for an hour or so. Eventually I secured four, they all proved to be females of *Milvus melanotis*. They were very fine specimens, the largest measuring no less than 29·5″ with a wing of 27·2″. The wing patch in these birds was not only very large but also very conspicuous, the white contrasting vividly with the dark colour of the surrounding parts. I could not, of course, see whether all these kites were of the larger kind, *M. melanotis*, but I am strongly inclined to think they were, as on the wing they appeared more than usually large and at the same time were comparatively slow in their movements, although much more wild than the normal pariah kite.

(520) ELANUS CŒRULEUS.—The Black-winged Kite.

Hume, *No.* 59 ; *Blanford*, *No.* 1232.

Very common in the plains, though I very seldom see it in the hills. It is not nearly so often to be met with during the breeding season, and I think that the majority of birds go elsewhere at this period. I am told, however, that they are extremely plentiful in Sylhet during the early part of the rains, and it is possible that their migration is but a local one from Cachar to Sylhet.

I have often noticed that these birds keep in small parties, presumably the last lot of young ones and the two old birds. They are not wild in this part of the world, a shot being very easily obtained. They are inclined to be rather crepuscular in their habits, and during the heat of the day they retire to rest in some tree, often in the open, and not always a shady one.

(521) CIRCUS MACRURUS.—The Pale Harrier.

Hume, *No.* 51 ; *Blanford*, *No.* 1233.

Not a very common form in Cachar, but a few are to be met with every year.

(522) CIRCUS CINERACEUS.—Montagu's Harrier.

Hume, *No.* 52 ; *Blanford*, *No.* 1234.

I have only one specimen of this bird in my collection, a young male. This bird has, of course, the short tarsus of *C. cineraceus*, but the notch

on the first primary is actually concealed by the greater coverts. I have not seen sufficient birds of this species to say whether it is often placed thus, but it is evident that care must be taken not to make too free a use of this characteristic in distinguishing between *C. macrurus* and *C. cineraceus*.

I think this Harrier is fairly plentiful in the plains of Cachar.

(523) Circus cyaneus.—The Hen-Harrier.

Hume, No. 50 ; *Blanford, No.* 1235.

A rare bird in Cachar. I have only one specimen and have not seen half a dozen others in Cachar.

(524) Circus melanoleucus.—The Pied Harrier.

Hume, No. 53 ; *Blanford, No.* 1236.

A common bird all over the plains and extending well into the hills, where a few birds breed every year. The Mikirs in the North-East assure me that every year they find one or two nests in the terraces in which they cultivate rice. They say that this Harrier breeds in July and August, more nests being found in the latter than in the former month, and the nests are placed on the small banks at the edges of the terraces which retain a small amount of water in each tier.

I have seen birds hawking over these fields in June and July and have no doubt that what the Mikirs assert is perfectly correct. For every adult male in the full-pied plumage some ten to twenty females and young birds in non-adult plumage may be seen in Cachar, immature males being especially numerous. The number seen in different years varies greatly. Last year (1896) I saw very few birds indeed, whilst three years previously, when there was much water remaining throughout the cold weather in many places, some of these Harriers might have been seen any day during the course of a very short walk.

(525) Circus cauruginosus.—The Marsh Harrier.

Hume, No. 54 ; *Blanford, No.* 1237.

The commonest form of Harrier all over Assam and the Surrma Valley.

A nest of the Marsh Harrier, together with the female and the eggs, was once brought to me by a Mikir. He had been working in his rice-field when he saw a hawk, as he called it, fly out of some dense ekra and grass growing just at the edge of his field in some swampy

ground. He went to inspect the place, thinking the bird might have killed and left something which he could eat, but instead found a nest composed of grass, weeds and a few sticks, placed on a tangle of reeds about a foot above the swamp. The eggs were of the usual dull white, without any markings.

(526) ASTUR PALUMBARIUS.—The Gos-hawk.

Hume, No. 21 ; *Blanford, No.* 1243.

I have one small bird, a young male, in my collection, which was procured by one of my collectors in the Laisung Valley. I have seen no other specimen from Cachar.

(527) ASTUR BADIUS.—The Shikra.

Hume, Nos. 23 *and* 23 *bis* ; *Blanford, No.* 1244.

An exceedingly common bird, ascending sometimes to the tops of the highest hills. Males seem to be far more common than females, and I get at least two of the former to every one of the latter; but why this should be I cannot even guess. The Cachar type of bird comes between the normal *A. badius* and Hume's *A. poliopsis*, but leans rather to the former than the latter.

(528) LOPHOSPIZIAS TRIVIRGATUS.—The Crested Gos-hawk.

Hume, No. 22 ; *Blanford, No.* 1246.

Rather a rare bird and from its forest-hunting habits not often noticed. I found its nest in N. Cachar, but it was empty, and on another occasion a young bird and an addled egg was brought to me. The young one I kept some time in captivity, and it became very tame and sociable. The egg is of the usual type, a dull, almost bluish-white, of rather a chalky texture and of a broad regular oval shape, measuring 1·71″×1·43″. Both nests were large, but rather well-finished structures of sticks and twigs, and were placed high up in lofty trees. That, with the egg in it, was taken on the 1st of May. Two eggs sent me by Mr. Davidson from Kanara measure 1·82″×1·5″ and 1·86″×1·52″ ; these were taken by him on the 15th of April.

(529) ACCIPETER NISUS.—The Sparrow-hawk.

Hume, Nos. 24 *and* 24 *bis* ; *Blanford, No.* 1247.

Rare in Cachar, its place being taken by the next on the list. I have one fine specimen of the form Hume called *A. melanoschistus*, a female with the head almost black, and with that part very distinct from the back. It is an old bird in magnificent condition.

(530) ACCIPETER VIRGATUS.—The Besra Sparrow-hawk.

Hume, No. 25; *Blanford, No.* 1248.

This is the common Sparrow-hawk in Cachar; is found everywhere from the plains to the tops of the highest hills. It breeds everywhere where there is suitable forest, and its nidification differs in no way from that of the common Sparrow-hawk. The eggs average rather smaller, about 1·6″ × 1·2″, and they are, on the whole, less richly coloured than are those of *A. nisus*. I have one clutch of eggs totally devoid of all markings, and had they not been taken by myself and the old bird shot off the nest, I could not have believed them to be anything else but the eggs of some Gos-hawk.

(531) PERNIS CRISTATUS.—The Crested Honey Buzzard.

Hume, Nos. 57 *and* 57 *bis*; *Blanford, No.* 1249.

In Vol. IX of "Stray Feathers," p. 245, Inglis records this bird as being "Not uncommon; generally seen near heavy forest." I have not yet managed to secure a single specimen and have only seen some half dozen, at the most, during the ten years I have been in and about Cachar. I should call it a decidedly rare bird. I have observed one or two birds in the high valleys to the East, but have never had the chance of a shot, as they keep amongst the trees, and on anyone's approach dodge away amongst the tops, and a shot, when fired, usually expends itself on leaves and branches instead of the body of the bird.

(532) BAZA LOPHOTES.—The Black-crested Baza.

Hume, No. 58; *Blanford, No.* 1251.

I have found this a very decidedly rare bird in Cachar. I am told that they are seen every now and then, but very seldom, in Hailakandy, to the south of the district, and I have seen a few in the extreme north of the North Cachar Hills, where the hills almost cease and the valley of the Brahmaputra commences. I also saw one bird in the Mahar Valley, but this is the only one I have met with any distance inside the hills.

I saw three of these birds once flying round and round my rest-house at Diyungmukh, and was much struck by their resemblance to crows in flight as they continually indulged in a heavy flapping, such as is not at all the form of flight usually associated in one's mind with a bird of prey. Their cry was kite-like in sound, yet utterly distinct from any kite's cry that I have ever heard. It was much softer than that of

Milvus, but of the same quivering, plaintive character and of about the same pitch, perhaps rather higher. In the same place I saw continually for some four or five days a flock of five birds ; these generally flew a good deal higher and sailed more round and round rather than flapped about. They were very wild. It was with difficulty I at last obtained one shot and succeeded in killing a fine male.

(533) FALCO PERIGRINUS.—The Perigrine Falcon.

Hume, No. 8 ; *Blanford, No.* 1254.

A few birds of this species are to be met with every cold weather, but it is never really common. I have one magnificent female with a wing measuring 14·75″, one of the largest birds I have seen.

(534) FALCO PERIGRINATOR.—The Shahin Falcon.

Hume, Nos. 9 *and* 9 *bis* ; *Blanford, No.* 1255.

About as often seen as the previous Perigrine. These two falcons are exceedingly hard to discriminate. I have now before me two birds, one the fine Perigrine already alluded to and the other a very small female *F. perigrinator* with a wing of only 12·25″. The lower plumage of these two birds is almost identical, though the rufous central blotches to the feathers *may* be rather smaller in the Shahin than in the Perigrine. The latter has eleven bars on the tail and the former twelve. Above the only difference I can note is the decidedly darker crown in the Shahin. Both birds are in the young brown plumage. The most notable difference in the birds is not one of plumage at all but consists in the smallness of the Shahin's feet when compared with those of the other bird, not so much that they are shorter as that they are thinner and weaker. This feature is almost equally remarkable in an adult male *F. perigrinator* a very typical bird, except for the fact that its under-plumage is almost pure white. I do not consider the differences in these two birds to be of more than sub-specific value, but I have so small a series to work on that I cannot advance this theory with much confidence, and the sub-specific relationship would have to be substantiated by a number of intermediate forms being obtained.

(535) FALCO JUGGER.—The Laggar Falcon.

Hume, No. 11 ; *Blanford, No.* 1257.

This Falcon has been reported from Cachar by Inglis and others, but it must be a very rare bird, as I have never seen one, nor have any of my collectors managed to get me one.

(536) FALCO SUBBUTEO.—The Hobby.

Hume, No. 13 ; *Blanford, No.* 1260.

Rather rare everywhere but ascends the hills to a considerable height ; and I have seen a Hobby, I think of this species, at Guilang, over 4,000 feet high.

(537.) FALCO SEVERUS.—The Indian Hobby.

Hume, No. 14 ; *Blanford, No.* 1261.

I have seen a good many Indian Hobbys, but have only collected one specimen, a perfectly typical male in full plumage. This bird was shot at Kurrungma, the loftiest peak to the north-west of North Cachar, and was one of a pair which had their nest close to my camp. I did not know when I shot the bird that it had its mate and nest close by, so shot it, but in the evening I came across the female, and followed her to a small tree overhanging a very steep precipice. On getting close to this tree I saw there was a nest in it, and the boy with me attempted to get at it, but the tree was too weak and rotten. I then climbed a tree higher above on the cliff and looked into the nest. For some time the Hobby sat there, but I eventually dislodged her with a twig and saw that it contained four eggs coloured very richly and darkly. She returned to the nest again in about five minutes, and I left her in peace to rear the young as it was quite impossible to take the eggs. The nest was a big structure of twigs about a foot in diameter.

(538) ERYTHROPUS AMURENSIS.—The Eastern Red-legged Falcon.

Hume, Nos. 19 *and* 19 *bis* ; *Blanford, No.* 1262.

Every year this small kestrel appears about October in countless numbers migrating south into Burma. The 15th of October and the 15th of November are the two dates between which their first appearance may be expected, and of this period the last ten days of October are those in which the first few birds generally come. The Jetinga Valley seems to be a meeting place where all the different routes join, again to diverge as the plains are reached, for nowhere else have I seen any approach to the myriads of these birds which there swarm like white ants. When I first saw and obtained these birds I offered a rupee a head for any the natives might get, and the next morning some sixty were brought in and I found that short of thousands there would be no limit to the supply. The Cacharies go out at night to the roosting-place—generally a stretch of country covered with the small solitary bamboo—with lanterns, torches

etc., shake the bamboos and catch the flustered and frightened birds as they fall to the ground. Each bamboo forms a resting-place for twenty birds and upwards, and out of these some half-dozen or so are captured and thrust into baskets prepared for the purpose. These are then sent to market and sold as pigeons for two pice. Hindus and all eat these birds and seem quite happy about their being pigeons. I should think adult birds probably take some time to arrive at their complete mature plumage. When they come through these hills a few males are still in the female garb, but the majority have put on that of the male with the exception of a few wing-quills which are still barred like those of the female ; again the younger birds have the striæ on the lower plumage much more marked in the older birds, these shaft streaks being almost invisible. One young bird, obtained in October, 1892, has the shaft streaks on the flanks, widened out considerably and developed at the end into narrow drops ; there is a wide subterminal bar of dull black on the tail, and the light edgings to the under-tail coverts are very conspicuous. The coloration of these feathers varies considerably, but the depth of the rufous seems to have no connection with the age of the bird. A party of five of these birds were seen in early May and one which was obtained turned out to be a young male, the whole of the lower plumage like that of the adult male, but the feathers with broad striæ ending in drops.

(539) TINNUNCULUS ALAUDARIUS.—The Kestrel.

Hume, Nos. 17 *and* 17 *bis.* ; *Blanford, No.* 1265.

Common at all heights and in the plains. Breeds in Cachar.

(540) TINNUNCULUS CENCHRIS.—The Lesser Kestrel.

Hume, No. 18, 18 *bi.*, 18 *ter.* ; *Blanford, No.* 1266.

A rare bird here, and I have seen but few specimens.

(541) MICROHIERAX MELANOLEUCUS.—The White-legged Falconet.

Hume, No. 20 *bis.* ; *Blanford, No.* 1268.

This fine little Falcon is rather a rare bird in Cachar, and does not sit about in flocks as it appears to do in the Dibrughur Gardens (*vide* Cripps on "Stray Feathers"). The few I have noticed have been in pairs, and of these I have secured but three. One of these last was obtained in a rather unusual manner.

The bird had tackled and killed a Scimitar-Babbler, and, finding it too heavy to carry off, commenced to eat it on the ground. It

had hardly begun before it was noticed by one of my Postal runners, and it then attempted to fly away; its feet had, however, somehow caught in the stomach feathers of the babbler, and it could only flutter along dragging its dinner along with it. The runner succeeded in catching it with his *puggree* and brought it to me. It was a fierce little bird and bit savagely at anyone who approached the cage in which we placed it, flying at the bars to get at them and making no attempt to get further away. Its overhanging eyebrows, caused by the prominence of the frontal bones, gives these tiny Falcons the look of a true eagle, heightened by its game, carriage and aspect. I once found its nest, fortunately containing an egg. The parent birds had appropriated a hole made by a Barbet (*Cyanops asiatica*) in a horizontal branch of a tree. The egg, instead of being like that of a hawk, was just like one of *Taccocua* or *Centrococcyx* in texture and in shape, though longer than those of the latter genus. It measures 1·12″×·87″. It was all white.

Another egg brought to me by Nagas and said to be that of this bird was quite different, a regular pygmy Sparrow-hawk's egg, white ground with bold reddish blotches, irregularly distributed over its surface. It was of a soft chalky texture outside, but I did not believe in its authenticity and tried to take off the markings. I failed in this, but left the inner harder shell exposed. This egg measures 1·1″×·9″, and is also in shape more like what one would expect the hawk tribe to produce. The Nagas said they took it from an abandoned Barbet's hole, and it is just barely possible that these Falconets may sometimes lay blotched eggs.

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F.E.S.

With Notes by H. J. Elwes, F.Z.S., F.E.S., &c.,

and

Additions by Sir George F. Hampson, Bart., B.A., F.E.S., &c.

Part II.

(*Continued from page* 251 *of this Vol.*)

Family SPHINGIDÆ.

Subfamily Acherontiinæ.

Genus Acherontia, Ochsen.

88. *A. styx*, Westw.

Sikhim; Bhutan, up to 6,000 feet, April to June.

89. *A. lachesis*, Fabr.

Sikhim and Bhutan, up to 5,000 feet, March, August and October. The female from Sikhim and Bhutan has the "skull-mark" pale buff, and the postmedial line of the forewing distinctly white. The larva feeds on tomato and potato plants, and some become brown in the last moult, while others simply change to a yellow colour just before pupating.

Subfamily Smerinthinæ.

Genus Polyptichus, Hübn.

90. *P. dentatus*, Cram.

Sikhim, 1,800 feet, August. I have only one specimen from this locality which belongs to the variety *timesius*.

91. *P. dyras*, Wlk.

Sikhim and Bhutan up to 3,500 feet, May—August. Extremely variable in the proximity of the two lines on either side of the discocellular spot, which may meet just below the cell or be widely separated as far as the inner margin.

92. *P. spectabilis*, Butl.

Sikhim. I have not seen this species.

Genus DEGMAPTERA, Hampson.

92*a*. *D. mirabilis*, Roths.

Sikhim (*Pilcher*).

Genus CYPA, Wlk.

93. *C. decorata*, Moore.

Sikhim. I have not seen a specimen.

94. *C. decolor*, Wlk.

Sikhim, 4,500 feet, September. Does not appear to be common.

96. *C. floralis*, Butl.

Sikhim. Not received by me. (Very rare in Sikhim.—*H. J. E.*)

Genus DAPHNUSA, Wlk.

98. *D. porphyria*, Butl.

Sikhim, 1,800 feet. I have taken this species at light in the Balasun Valley.

Genus LANGIA, Moore.

99. *L. zenzeroides*, Moore.

Sikhim, 5,000 feet, April. I once took a pair *in copulâ* at Tukvar. (According to Mr. Knyvett the larva of this is common at Kurseong in some seasons about July, and feeds on wild cherry; some of the imagines appear in September and some in the spring from the same brood. The larva is green with a very rough skin, and hisses when touched. I may say that I never saw a specimen of this species until Mr. Knyvett found it, and it must be very local or occurs sparingly.—*H. J. E.*)

Genus LEUCOPHLEBIA, Westw.

101. *L. emittens*, Wlk.

Sikhim. Not procured by me. (I think Sir G. Hampson has wrongly identified the Sikhim insect, which I think is *L. lineata*, Westw., with this species. The latter, the larger species, occurs in Sikhim rarely.—*H. J. E.*)

Subfamily AMBULYCINÆ.

Genus CALYMNIA, Wlk.

102. *C. panopus*, Cram.

Sikhim and Bhutan. This is not an uncommon species at medium elevations. The larva is grey and granulose.

Genus AMBULYX, Westw.

103. *A. substrigilis*, Westw.

Sikhim. A very common and extremely variable species, both in colour and markings. The abdomen may be with or without the olive blotches on the fifth and seventh segments, and in some specimens a dorsal line is present.

104. *A. semifervens*, Wlk.

Sikhim. I have not obtained this species. (This is also a variable species, but the subbasal markings, I think, suffice to separate it from the last.—*H. J. E.*)

106. *A. rubricosa*, Wlk.

Sikhim, July. I have only received one pair of this species taken *in copulâ* at 3,000 feet.

107. *A. junonia*, Butl.

Bhutan. I have not seen this species which, however, seems to differ from *A. rubricosa* by the presence of a large ocellus on the hindwing.

108. *A. elwesi*, Druce.

Sikhim. This must be a very rare species, I have never received it.

109. *A. phalaris*, Cram.

Sikhim. I have not seen a specimen. (This is a very rare species in Sikhim. What Sir George Hampson identifies with *A. phalaris*, Cram. [though it is very unlike the plate of that insect, which came from the Coromandel Coast] seems to me more probably a variety of *A. bilineata*, Wlk., but I cannot tell without seeing the types by which name it ought to be called.—*H. J. E.*)

110. *A. bilineata*, Wlk.

Sikhim. Occurs in June and August. One female in my collection differs from the rest in having a whitish lunule before the apex of the forewing, the hindwing much darker, and with a crenulate fuscous postmedial line. This specimen expands 175 millimetres. The streak of black hairs on the underside of the forewing below the median nervure is not a sexual character.

112. *A. pagana*, Fabr.

Sikhim. I do not know this species. It is said to differ from *A. bilineata* in the absence of the black patch at the base of the hindwing, and the black streak on the underside of the forewing. Sir George Hampson, although separating these three latter species, remarks that they may all be varieties of one species.

Subfamily CHÆROCAMPINÆ.

Genus ACOSMERYX, Boisd.

115. *A. ancea*, Cram.

Sikhim and Bhutan, 2,000 feet. The form *ancea* occurs in August, *A. sericea* in June and August, *A. cinerea* in March, and *A. pseudonaga* in June, July and September. My specimens of *A. ancea* and *A. cinerea* have the outer margin of the forewing crenulate throughout, while that of *A. sericea* and *A. pseudonaga* are not so. All my specimens of *A. pseudonaga* are females. All four forms seem very constant, but I can only judge by Sikhim specimens. I should be inclined to think that there are more than one species (probably two). Mr. Elwes says that his specimens fall into four if not five groups, and thinks that if they are united, *A. naga* should be also included. I consider, however, that *A. naga* shows more definite characters than any of the forms placed by Hampson under *A. ancea*.

116. *A. naga*, Moore.

Sikhim, 3,000 feet. A common species and not apparently variable. I have had over a hundred specimens brought to me which show no variation. It is distinguished from *A. ancea* chiefly by the postmedial streak being more oblique, and reaching to the submarginal pale line which is well defined, whitish and straight from vein 7 to the outer angle.

Genus AMPELOPHAGA, Bremer and Grey.

117. *A. rubiginosa*, Bremer and Grey.

Sikhim, July. I have two specimens of what I believe to be this species; the markings on the forewing are very distinct. The thorax, abdomen and forewing are purplish-brown; the first two with a pale dorsal line; the last with subbasal, antemedial, medial and postmedial parallel, oblique, brown bands, the medial being broad; a brown mark on the disco-cellulars, and a triangular patch at the apex. Hindwing

fuscous, with the cilia pale. Underside pink, with the markings indistinct and narrow, basal half of forewing suffused with fuscous. The other specimen is slightly browner than the one described here, and was marked "AMPELOPHAGA, sp." by Mr. Moore. (I have a single specimen from Sikhim which agrees very fairly with the typical insect of Bremer from Amurland.—*H. J. E.*)

118. *A. dolichoides*, Feld.

Sikhim, 1,800 feet. Two specimens taken in July and August. (Of this also I have only one specimen which came from Mandelli's collection.—*H. J. E.*)

Genus CHÆROCAMPA, Dup.

122. *C. theylia*, Linn.

Sikhim and Bhutan, up to 5,000 feet. Throughout the year specimens may be obtained at light, especially at low elevations, where it is probably the commonest species of the genus. The only type of larva which I have reared in Sikhim is that of the form *C. rafflesi*, and my description agrees with Sir George Hampson's, except that my larvæ were sooty-black with yellow and white spots on the thoracic somites in the subdorsal row, and had the centres of the ocelli ashy-grey, the first one with a yellow line on the upper circumference. The food-plant is *Colocasia*. *C. elpenor*, Linn., *C. eson*, Cramer, and *C. vigil*, Guér., although recorded from "Throughout India" do not appear to have been taken within the limits specified for this catalogue.

123. *C. celerio*, Linn.

Sikhim and Bhutan, up to 5,000 feet. July to December. This species appears to be more plentiful at light during the cold weather than in the rains.

129. *C. busiris*, Wlk.

Sikhim., 1,800 feet. I have only seen three specimens. (One specimen only taken in November.—*H. J. E.*)

130. *C. variolosa*, Wlk.

Sikhim and Bhutan. I have not received this species.

131. *C. metallica*, Butl.

Sikhim, 4,000 feet. May. (Occurs not uncommonly in Darjeeling in some seasons.—*H. J. E.*)

132. *C. antomedon*, Wlk.

Sikhim. I have only seen one specimen. It must be very rare. Mr. Elwes has a single specimen taken in May.

133. *C. mydon*, Wlk.

Sikhim and Bhutan, up to 4,000 feet. Occurs in March, May, June, July and August. The larva from Bhutan is pale green; the thoracial somites increasing rapidly toward the fourth and slightly depressed, striated with clear white dorsally; a dorsal and lateral suffused purplish line, the latter surrounding a dark purplish ocellus with a white ring and black pupil on the fourth somite. Anterior legs pinkish-brown with brown patches at their bases. All somites striated laterally with purplish, which is more apparent as the larva becomes full-fed. Head small and with the prolegs concolorous with the body. Horn of moderate length, pinkish-brown. No dorsal markings in the Bhutan specimens. Food-plant different species of *Arum* or allied plants. Pupa formed in a light cocoon of dried leaves on the surface of the ground; earthy-brown striated with darker, proboscis in a projecting sheath not separated from the body.

135. *C. gloriosa*, Butl.

Sikhim. This must be very scarce. I have never seen a specimen. (Seems local. My specimens were all taken in July.—*H. J. E.*)

136. *C. castor*, Wlk.

Sikhim. This species was formerly known as *C. olivacea*, Moore. My specimens, which I thought identical with it, must be distinct, as they have the orifice in the basal joint of the palpus, and therefore belong to the genus *Theretra*.

130*a*. *C. griseomarginata*, Hampson.

Sikhim, 1,800 feet (*Dudgeon*). The type and only specimen of this very distinct species was taken by me at light at Punkabaree. It is in the British Museum.

Genus THERETRA, Hübn.

This genus is separated from *Chœrocampa* by having the basal joint of the palpus hollowed out, with an orifice towards the exterior beset with (?) sensory setæ. I do not think this is at all a good generic character, some species having the orifice largely developed, and others very slightly. *T. lineosa*, Wlk., which Sir George Hampson leaves in the genus *Chœrocampa*, has the orifice distinct, although small; it should therefore be placed in *Theretra*.

120. *T. alecto*, Linn.

Sikhim and Bhutan, up to 8,000 feet. Occurs from May to October, and is extremely common at the lower elevations. The orifice in the palpus is round, and the setæ are very distinct, almost filling the same.

141. *T. butus*, Cram.

Sikhim and Bhutan, up to 4,000 feet. Occurs from June to October. The female is almost indistinguishable from one form of *T. lineosa*, Wlk., except in the form of the palpus. The orifice in the palpus is deeper than that of *T. alecto*, and the setæ are not visible externally; the palpus itself is similar in shape. The larva, which I have found on *Cissea*, the under surface of the leaves of which are crimson, is itself crimson striated with brown; there is a pink ocellus on the fourth somite edged with yellowish-white above, and traces of oblique lateral lines; the horn is purple-brown.

124. *T. lycetus*, Cram.

Sikhim, 1,800 feet. I have eight specimens of this species taken in April, June, August and October. The orifice in the palpus is not very apparent, being closely filled with long setæ.

125. *T. oldenlandiæ*, Fabr.

Sikhim, 1,800 feet; Bhutan, 2,500 to 3,000 feet. Occurs from June to September and is commoner than the last; the orifice is slightly more apparent, and the setæ fill up all except a minute pit on the outside, which is conspicuous.

126. *T. silhetensis*, Wlk.

Throughout India (*Hampson*). Neither Mr. Elwes nor I have ever seen a specimen from Sikhim.

137. *T. velata*, Wlk.

Sikhim and Bhutan. On examining the forms placed under this species I find that three different species can be separated on the form of the palpus alone, and I am also inclined to think that the forms *T. velata* and *T. aurifera*, as figured by Butler, may be separable on account of their markings, although the palpi are similar. It is possible, however, that they may be seasonal forms. The following key applies to all the specimens in my collection.

A. Palpus with the basal joint distinctly hollowed out, second joint quadrate and not excised.

(*a*) *Forewing dark olive with the markings black and suffused; abdomen with scarcely a trace of the lateral golden marks (generally altogether wanting). Underside of the forewing with the submarginal band not connected by a bar with the fuscous basal suffusion. T. velata.* Sikhim and Bhutan, May and June, up to 4,000 feet. *Exp.* 67-76 millimetres.

(*b*) *Forewing greenish-olive generally suffused with reddish at the base, and with pale patches more or less developed at the apex and outer angle; abdomen with golden lateral bands. Underside of forewing with the markings well defined, the submarginal band connected to the basal suffusion by a dark bar between veins* 4 *and* 5. *T. aurifera,* Butl. Sikhim and Bhutan, July and October, up to 7,000 feet, *Exp.* ♂ 75-80, ♀ 93 millimetres.

B. Palpus with the orifice reduced to a narrow slit, second joint rising to above the centre of the eye, quadrate and not excised.

(*a*) *Forewing greenish-yellow or green with no fuscous markings; inner margin narrowly white, with a white streak above it and below vein* 1, *rising from the margin at* $\frac{1}{3}$ *from the base and reaching halfway to the base; three subbasal indistinct green lines; a round pale-centred spot in the cell; three postmedial parallel waved red lines; a silvery-bluish streak from the apex to the outer postmedial line meeting it at vein* 5, *and continued as a lunulate line from below vein* 4 *to the angle; a marginal row of seven silvery-bluish quadrate spots. Underside ochreous, with the outer margins purplish; the submarginal band not connected to the basal fuscous suffusion. T. aurifera* (*id. Hampson*). Sikhim and Bhutan, 3,000 feet, July. *Exp.* 81-84. This is a rare species, which I considered to be *C.* (*olivacea*) *castor,* Wlk., but Sir George Hampson identified it as *aurifera,* from which I think it is widely distinct. He has not moved *C. castor* into the genus *Theretra,* so that I suppose the type has no orifice in the palpus. This species I therefore consider requires a new name.

C. Palpus with the orifice extended by the second joint being excised and triangular. Shape of the whole palpus similar to that of *T. actea,* Cram.

(*a*) *Markings on the upperside similar to T. aurifera, Butler; yellowish submarginal band of the hindwing sometimes traceable to the costa. Underside of the forewing with the submarginal band not connected with the basal suffusion. T. sp.* Sikhim and Bhutan, up to 4,000 feet. Occurs from May to August, and is not uncommon. *Exp.* 58-78 millimetres. This species also requires a new name, unless the type of *T. acuta*, Wlk., has a similarly-formed palpus.

139. *T. helops*, Wlk.

Sikhim (*Hampson*). I do not know this species.

140. *T. lucasi*, Wlk.

Throughout India (*Hampson*). Neither Mr. Elwes nor myself have seen this species from Sikhim or Bhutan.

143. *T. lineosa*, Wlk.

Sikhim and Bhutan, 3,000 to 9,000 feet. The variety generally procured at the high elevation is *T. lineosa*, and that from the lower *T. major*. It occurs from May to August. The orifice in the palpus narrow and small.

157. *T. nessus*, Drury.

Sikhim and Bhutan, 2,000 feet. It occurs in June, July, and August. I have taken the larvæ on several occasions at 2,500 feet. It is green, with oblique lateral white stripes tinged throughout with violaceous; there is a blind white ocellu on the fourth and a smaller one on each of the fifth and sixth somites. Horn brownish. Head green. Anterior legs buff. Food-plant *Convolvulaceæ*. Pupa is brownish variegated with reddish-buff, a frontal line of pale red extending from the head to the tail; some whitish lateral marks on the first three abdominal segments.

158. *T. actea*, Cram.

Sikhim and Bhutan, up to 6,000 feet. All my specimens were taken between July and September. They do not seem to show any variation except in the extent of the flesh-coloured markings on the hindwing. The larva before the last moult is pale green with a large bright green oval ocellus on the fourth somite, pupilled and ringed with black; the fifth to tenth somites each with a smaller paler green oval ocellus, surrounded with pale blue; horn reddish-brown; head and legs green. After the final moult the larva is chocolate-brown with slight oblique lateral striations. The ocellus on the fourth somite

is black-pupilled, ringed with yellowish-green and again with black and with pale brown ; the other ocelli are pale blue centred with pale green and bordered narrowly with indigo ; there is a darker brown dorsal line, and two pale subdorsal lines from the fourth somite converging towards the head; horn shorter, reddish. Food-plant *Colocasia*. Pupa, formed in a network of dry leaves, is brown variegated with ochreous ; proboscis in a separate sheath forming a ring attached to the front of the body. The proboscis of the perfect insect is enclosed in this sheath and bent double at its lower juncture, returning again to the first entrance and continued from there in the usual way down to the extremity of the forewings between the legs.

144. *T. pallicosta*, Wlk.

Sikhim (*Hampson*). I have not seen this species.

Genus Daphnis, Hübn.

146. *D. nerii*, Linn.

Throughout India (*Hampson*). I have never seen this species from Sikhim.

147. *D. hypothous*, Cram.

Sikhim and Bhutan, up to 6,000 feet. (According to Knyvett it is very common at Kurseong, the larva feeding on *Cinchona* plants.—*H. J. E.*)

151. *D. bhaga*, Moore.

Sikhim and Bhutan. This is a common species at low elevations and up to about 3,000 feet. It occurs from May to July.

Genus Dilephila, Ochs.

155. *D. galii*, Roth.

Yatung (Chumbi Valley), 13,000 feet (*Bingham*). It is quite possible that this insect may be received from this side of the passes also.

Genus Elibia, Wlk.

159. *E. dolichus*, Westw.

Sikhim and Bhutan, up to 4,000 feet. It occurs in May and December, and is attracted to light. It is not uncommon at 2,000 feet in the Balasun Valley.

Subfamily SPHINGINÆ.

Genus PROTOPARCE, Burmeister.

162. *P. convolvuli,* Linn.

Sikhim and Bhutan, up to 7,000 feet. It is a common insect attracted to light in June, July and August. The female differs from the male by the dark markings on the forewing and thorax being obsolete, and the antennæ being much thinner and shorter; that of the male being contained under $2\frac{1}{2}$ times in the length of the forewing, and that of the female over three times.

Genus PSEUDOSPHINX, Burmeister.

166. *P. fo,* Wlk.

Sikhim. I have never received this species.

169. *P. discistriga,* Wlk.

Sikhim and Bhutan, up to 3,000 feet. It is found from May to August, never commonly. The second form (*P. melanomera*) is the only one I have seen from the locality. (I took a pair of this species *in copulâ* sitting on the hot rocks in the Teesta Valley in August at 1,000 feet elevation. So far as my experience goes, however, *Sphingidæ* are not nearly so numerous in Sikhim as the number of species which occur would lead one to suppose. Out of the 60 species recorded I do not think I have seen more than ten in life during my four visits there.—*H. J. E.*)

Genus APOCALYPSIS, Butl.

171. *A. velox,* Butl.

Sikhim. Neither Mr. Elwes nor I have seen a specimen from Sikhim.

Genus NEPHELE, Hübn.

172. *N. hespera,* Fabr.

Sikhim. The only specimens I have seen of this species were taken by me, one flying over a bed of *Petunia* in March, and the other at light in April, at 1,800 feet elevation. The forewing of one is green, and the double white spot at the end of the cell is conspicuous; the other is purplish-brown with the spot minute. Mr. Elwes has specimens from as high as 9,000 feet in Kashmir.

Subfamily MACROGLOSSINÆ.

Genus GURELCA, KIRBY.

173. *G. hyas*, Wlk.

This is a very common species in Sikhim and Bhutan occurring up to at least 5,000 feet. It is found chiefly at the lower elevations from May to July, and again in November and December. The figure of *G. hyas* in the "Fauna of British India, Moths," vol. i, more resembles the next species. All my specimens of *G. hyas* have the marginal band on the hindwing almost even in width throughout, and the forewing is broader.

174. *G. masuriensis*, Butl.

Sikhim. Occurs at 1,800 feet and upwards. My specimens were obtained in May and July. It is not nearly so common as the last.

175. *G. macroglossoides*, Wlk.

Sikhim. I have never seen this species. Mr. Elwes doubts it being a good species, and remarks that Sir George Hampson does not seem to know it except from Walker's description.

Genus RHOPALOPSYCHE, Butl.

177. *R. nycteris*, Koll.

Sikhim and Bhutan. Occurs from 5,000 to 10,000 feet. I have taken it commonly at the first elevation on the Tukvar spur, where it may be found sucking up honey from flowers in May and July. The yellow band on the hindwing is very pale.

Genus MACROGLOSSA, Scop.

181. *M. gyrans*, Wlk.

Throughout India (*Hampson*). I have never seen it from Sikhim or Bhutan. (I do not think this occurs in the Hills.—*H. J. E.*)

184. *M. belis*, Cram.

Sikhim and Bhutan, up to 3,000 feet. Occurs in June, July and November. The distinctive characters appear to be the reddish-orange band of the hindwing, and the postmedial band being brown, not blackish.

186. *M. proxima*, Butl.

Sikhim and Bhutan, up to 2,000 feet. Occurs in July, but is less common than *M. belis*, from which it differs in the discal band of the hindwing being yellow, and the postmedial band blackish.

189. *M. sitiene*, Wlk.

Sikhim, October. I have only obtained one specimen of this species. The upperside is most like *M. gilia*, but the head, thorax and abdomen are olive ; the underside is like that of *M. belis*.

191. *M. walkeri*, Butl.

Sikhim, 3,000 to 7,000 feet. It is found in April and throughout the rains. I have often taken it at Tukvar at flowers in the middle of the day. The hindwing is often almost completely fuscous, with the exception of the inner margin ; the pectus is white below.

194. *M. insipida*, Butl.

Sikhim and Bhutan, up to 4,000 feet. I have reared this species from larvæ, and the perfect insect emerged in October.

The larva is brown minutely speckled with paler dorsally ; a dorsal dark line throughout ; the fourth to tenth somites each with an oblique lateral indistinct line ; a flesh-coloured sublateral line unbroken on the thoracial somites but broken on all the others converging to the base of the horn ; horn black tipped with flesh-colour. There is also a green form of larva which has the flesh-coloured markings replaced by yellow ones, and the minute specks on the back white. The young larvæ have the yellow markings replaced by white ones. The pupa, with proboscis in a projecting beak-like cover, is brownish-grey, with a dark line on the back of the thorax and head, and another down the front. I agree with Mr. Elwes in thinking that this species is probably not separable from *M. gilia*.

195. *M. gilia*, Herr.-Schäff.

Sikhim and Bhutan. It occurs with the last, from which it is possibly not distinct. I cannot separate the two on the characters given by Hampson. It is found commonly along the banks of roads at 2,000 to 5,000 feet, and may be seen during the heat of the day in June and July as well as at dusk.

197. *M. imperator*, Butl.

Sikhim. I have taken this species on two occasions at 5,000 feet on the Tukvar spur (Rungeet valley). It is well-marked and easily recognisable ; the ante- and postmedial dark patches are separated by a conspicuous pale erect band.

201. *M. interrupta*, Butl.

Sikhim, 1,800 feet. My only specimen of this was obtained in September on a flower bed at dusk. There is a glossy black patch on the base of the forewing. The underside is red-brown, the palpi, pectus and centre of the first three abdominal segments are white; there are also prominent lateral white tufts on three segments. The costa of the hindwing has a black subbasal lobe which is not found in any other of the species.

Genus CEPHNODES, Hübn.

205. *C. hylas*, Linn.

Sikhim and Bhutan. This species I have chiefly seen flying over dark pools of small streams; it constantly dashes into the water, and will hover over the same place for a whole day I believe. It occurs in July and August.

Genus SATASPES, Moore.

206. *S. infernalis*, Westw.

Sikhim and Bhutan, up to 4,000 feet. This has the same habits as *C. hylas*, except that the pools of water which it frequents are often open and in the larger rivers. I have only seen it on the wing in March, but it probably occurs during the rains also.

207. *S. ventralis*, Butl.

Sikhim. I have never received this species. Mr. Elwes has several specimens from Sikhim. It is probably local.

Genus RHODOSOMA, Butl.

208. *R. triopus*, Westw.

Sikhim and Bhutan. I have seen this alive several times on a small stream called the Jebi-kolah, between Singla and Badamtam. It has the same habits as *C. hylas*.

(To be continued.)

THE FLORA OF WESTERN INDIA.

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Part III.

(*Continued from page* 273 *of this Vol.*)

XLIX.—Connaraceæ.

2. *Rourea.*

R. santaloides, *Woa.*, F.B.I.—II-47. *Vardhârâ.* Castle Rock, Yellapur, Meradongar, Pen. Oct.

4. *Connarus.*

C. monocarpus, *Linn.*, F.B.I.—II-50. *Sundara.* Amboli Ghat, Marmagoa. Dec.-Jan.

C. Wightii, *Hook. f.*, F.B.I.—II-51. Potolli, N. Canara, *Talbot.* Feb.

L.—Leguminosæ.

3. *Rothia.*

R. trifoliata, *Pers.*, F.B.I.—II-63. Burhanpur, Badami, S. M. Ry. Aug.-Oct.

5. *Lotononis.*

L. Leobordea, *Benth.*, F.B.I.—II-64. Sehwan, Sind. Dec.

6. *Heylandia.*

H. latebrosa, *DC.*, F.B.I.—II-65. *Godhadi.* Deccan, widely. Feb.-June.

8. *Crotalaria.*

C. Burhia, *Ham.*, F.B.I.—II-66. *Ghâgari.* Ahmedabad, Mirpur Khas, Sind. Dec.-Feb.

C. filipes, *Benth.*, F.B.I.—II-66. Ahmednagar. Oct.-Dec.

C. Stocksii, *Benth.*, F.B.I.—II-67. Jambulpada, Colaba District. Oct.

C. vestita, *Baker*, F.B.I.—II-67. Khandalla, Mahableshwar. Aug.

C. prostrata, *Roxb.*, F.B.I.—II-67. Yellapur, *Talbot.* Oct.

C. bifaria, *Linn.*, F.B.I.—II-69. Badami. November.

C. pusilla, *Heyne*, F.B.I.—II-70. Badami, Dharwar. Oct.

C. mysorense, *Roth.*, F.B.I.—II-70. Dakor, Guzerat. Dec.

C. triquetra, *Dalz.*, F.B.I.—II-71. Vingurla. Oct.

C. albida, *Heyne*, F.B.I.—II-71. Hoosungada, Konkan. Dec.-Feb.

C. nana, *Burm.*, T.B.I.—II-71. Mahableshwar. Sep.-Oct.

C. linifolia, *Linn.*, F.B.I.—II-72. Poona. Sep.

C. calycina, *Schrank*, F.B.I.—II-73. Poona. Oct.

C. lutescens, *Dalz.*, F.B.I.—II-74. Castle Rock, W. Ghats. Oct.

C. retusa, *Linn.*, F.B.I.—II-75. *Culcula.* Jeur. Dec.-Jan.

C. sericea, *Retz.*, F.B.I.—II-75. Gund, N. Kanara. Jan.

C. Leschenaultii, *DC.*, F.B.I.—II-75. *Dinglâ.* W. Ghats, widely. Sep.-Jan.

C. verrucosa, *Linn.*, F.B.I.—II-77. Vingurla. Nov.

C. leptostachya, *Benth.*, F.B.I.—II-78. Khandala. Oct.

C. juncea, *Linn.*, F.B.I.—II-79. *Tâg.* Cultivated widely. Sep.-Jan.

C. madurensis, *Wight*, F.B.I.—II-79. Kumta-Sirsi Road. Dec.
C. fulva, *Roxb.*, F.B.I.—II-80. Kumta-Sirsi Road. Feb.
C. ramosissima, *Roxb.*, F.B.I.—II-80. Badami. Dec.
C. medicaginea, *Lamk.*, F.B.I.—II-81. Baroda.
C. orixensis, *Rottl.*, F.B.I.—II-83. *Andabail, Jensrue.* Poona. Oct.
C. striata, *DC.*, F.B I.—II-84. Poona. Nov.

12. *Trigonella.*

T. occulta, *Del.*, F.B.I.—II-87. Lanauli. Jan.
T. Foenum-Graecum, *Linn.*, F.B.I.—II-87. *Methî.* Fennugreek. Cultivated.

13. *Melilotus.*

M. parviflora, *Desf.*, F.B.I.—II-89. *Ranmethi.* Poona, weed in fields. Jan.

14. *Medicago.*

M. lupulina, *Linn.*, F.B.I.—II-90. Sehwan, Sind. March.
M. denticulata, *Willd.*, F.B.I.—II-90. Sehwan, Sind. March.
M. sativa, *Linn. Lucerne* (vilaiti ghâs). Cultivated.

15. *Lotus.*

L. corniculatus, *Linn.*, F.B.I.—II-91. Sind. March.
L. Garcini, *DC.*, F.B.I.—II-91. Porebunder. Dec.

16. *Cyamopsis.*

C. psoralioides, *DC.*, F.B.I.—II-92. *Gawâr.* Cultivated.

17. *Indigofera.*

I. echinata, *Willd.*, F.B.I.—II-92. [Aug.-Dec.
I. linifolia, *Retz.*, F.B.I.—II-92. *Pandarfali*, Deccan, Guzerat, Sind, widely.
I. cordifolia, *Heyne.*, F.B.I.—II-93. *Godadi. Bechka*, Poona, Puran, Sind. Aug.-Dec.
I. triquetra, *Dalz.*, F.B.I.—II-93. Panchgani. Aug.-Sep.
I. glandulosa, *Willd.*, F.B.I.—I-94. *Barbadâ.* Deccan. Aug-Dec.
I. trigonelloides, *Jaub. & Spach.*, F.B.I.—II-94. Sind.
I. enneaphylla, *Linn.*, F.B.I.—II-94. *Bhuiguli.* Bijapur, Badami. Oct.
I. uniflora, *Hamilt.*, F.B.I.—II-94.
I. pentaphylla, *Linn.*, F.B.I.—II-95. Badami. Aug.
I. tenuifolia, *Rottler.*, F.B.I.—II-96. Sind, Badami. Oct.
I. trifoliata, *Linn.*, F.B.I.—II-96. Parel, Chiplun. Sep.-Oct.
I. sp. Jowada, Dang, in ripe fruit. Feb.
I. trita, *Linn. f.*, F.B.I.—II-96. Poona. March.
I. paucifolia, *Del.*, F.B.I.—II-97. Baroda, Dakor, Sind. Dec.
I. endecaphylla, *Jacq.*, F.B.I.—II-98. Panchgani. Oct.
I. hirsuta, *Linn.*, F.B.I.—II-98. Badami. Nov.
I. argentea, *Linn.*, F.B.I.—II-98. *Karunili.* Poona, Sind. Nov.-Dec.
I. tinctoria, *Linn.*, F.B.I.—II-99. *Nil, guli.* Cultivated. Nov.-Dec
I. pulchella, *Roxb.*, F.B.I.—II-101. *Baroli, kalkathi.* Near Mahableshwar. Aug.-Dec.
I. anabaptista, *Steud.*, F.B.I.—II-102. Mulier, Sind. Feb.
I. constricta, *Trin.* N. Kanara. Nov.

18. *Psoralea.*

P. corylifolia, *Linn.*, F.B.I.—II-103. *Bavchi.* Deccan, widely. Aug.-Dec.

20. *Milletia.*

M. racemosa, *Benth.*, F.B.I.—II-105. Planted, Poona. Dasgaon, Konkan, in fruit. Oct.

21. *Mundulleæ.*

M. suberosa, *Benth.*, F.B.I.—II-110. *Supti.* Gokak. Oct.

22. *Tephrosiæ.*

T. tenuis, *Wall.*, F.B.I.—II-111. Konkan, widely. Oct.

T. tinctoria, *Pers.*, F.B.I.—II-111. Konkan, widely. Oct.

T. senticosa, *Pers.*, F.B.I.—II-112. Jeur. Feb.

T. purpurea, *Pers.*, F.B.I.—II-112. *Unhali. Sarpunkha.* Deccan, Guzerat. Oct.-Jan.

T. villosa, *Pers.*, F.B.I.—II-113. Badami. Aug.

T. pauciflora, *Grah.*, F.B.I.—II-114. Hills at the Hub river, Karachi. Jan.

23. *Sesbania.*

S. aegyptiaca, *Pers.*, F.B.I.—II-114. *Shevri.* Cultivated.

S. aculeata, *Pers.*, F.B.I.—II-114. *Ranshevri.* Deccan, Konkan, widely, in wet places. Sep.-Oct.

S. grandiflora, *Pers.*, F.B.I.—II-115. *Agastâ, Hadgâ.* Cultivated generally.

26. *Astragalus.*

A. contortuplicatus, *Linn.*, F.B.I.—II-122. Hyderabad, Sind. May.

A. Stocksii. *Benth.* Boiss. Fl. Or.—II-492. Kirthar Mountains, J. E.M. James.

28. *Taverniera.*

T. nummularia, *DC.*, F.B.I.—II-140. *Jethmad, Jeshthamadh.* Chatarsinghi near Poona. Dec.

30. *Geissapsis.*

G. cristata, *W. & A.*, F.B.I.—II-141. Khandalla. Oct.

Arachis.

A. hypogea, *Linn.*, *DC.*, Prod.—II-471. *Bhui mug.* Earth Nut, Cult.

33. *Alhagi.*

A. maurorum, *Lour.*, F.B.I.—II-145. *Javasâ, Yavasâ.* Sind, widely. March.

36. *Zornia.*

Z. diphylla, *Pers.*, F.B.I.—II-147. *Lândgû.* Poona. Aug.-Sep.

38. *Smithia.*

S. sensitiva, *Ait.*, F.B.I.—II-148. *Kavlâ.* Matheran, W. Ghats, Bombay. Sep.-Oct.

S. geminiflora, *Roth.*, F.B.I.—II-149. Malwan. Dec.

S. purpurea, *Hook.*, F.B.I.—II-149. *Burkar.* Lanauli. Sep.-Dec.

S. setulosa, *Dalz.*, F.B.I.—II-149. Mahableshwar. Sep.-Dec.

S. bigemina, *Dalz.*, F.B.I.—II-149. *Burkee.* Mahableshwar. Sep.-Dec.

S. capitata, *Dalz.*, F.B.I.—II-150. Siddu Gandi. Sep.

S. pycnantha, *Benth.*, F.B.I.—II-150 Kanara.

S. blanda, *Wall.*, F.B.I.—II-151. Mahableshwar. Sep.-Oct.
S. ,, racemosa, F.B.I.—II-151. Sirsi, N. Kanara. Sep.

39. *Æschynomene.*

Æ. indica, *Linn.*, F.B.I.—II-151. Kolhapur, Poona. Aug.-Dec.
Æ. aspera, *Linn.*, F.B.I.—II-152. *Bhend.* Hangal, Dharwar.

40. *Ormocarpum.*

O. sennoides, *DC.*, F.B.I.—II-152. *Kadunugge*, Marshy fields, Marmagoa. Dec.

42. *Eleiotis.*

E. sororia, *DC.*, F.B.I.—II-153. Badami, Dharwar. Oct.

43. *Pycnospora.*

P. tredysaroides, R.Br., F.B.I.—II-153. Vingurla. *Dalzell.* Dec.

44. *Pseudarthria.*

P. viscida, *W. & A.*, F.B.I.—II-153. Vingurla. Nov.

46. *Uraria.*

U. picta, *Desv.*, F.B.I.—II-155. *Prishniparni Pithvan.* Bombay. Sep.

47. *Alysicarpus.*

A. monilifer, *DC.*, F.B.I.—II-157. Badami, Bhanapur, Dharwar. Oct.
A. hamosus, *Edgw.*, F.B.I.—II-157. Badami. Oct.
A. vaginalis, *DC.*, F.B.I.—II-158. Konkan, Deccan, Guzerat. Oct.
A. bupleurifolius, *DC.*, F.B.I.—II-158. Near Matheran, Bombay. May-Sep.
A. longifolius, *W. & A.*, F.B.I.—II-159. *Shevra Ghamli.* Poona, Matoonga. Sep.
A. rugosus, *DC.*, F.B.I.—II-159. Dakor, Poona. Oct.-Nov.
A. tetragonolobus, *Edgw.*, F.B.I.—II-159. Poona, Nagar. Aug.
A. pubescens, *Law.*, F.B.I.—II-159. Hill near Poona. Birchy. Sep.-Nov.
A. belgaumensis, *Wight*, F.B.I.—II-159. Belgaum district. Mahableshwar. Sep.

49. *Ougeinia.*

O. dalbergioides, *Benth.*, F.B.I.—II-161. *Tivas.* Hills near Poona. Feb.

50. *Desmodium.*

D. umbellatum, *Dec.*, F.B.I.—II-161.
D. cephalotes, *Wall.*, F.B.I.—II-161. Near Matheran. Sep.
D. pulchellum, *Benth.*, F.B.I.—II-162. N. Kanara. Oct.
D. triquetrum, *DC.*, F.B.I.—II-163. *Mand.* Castle Rock, W. Ghats. Nov.
D. laxiflorum, *DC.*, F.B.I.—II-164. Koosgaon, near Poona. Oct.
D. gangeticum, *DC.*, F.B.I.—II-168. *Salvan.* Bhowdhan, Poona. Aug.
D. latifolium, *DC.*, F.B.I.—II-168. Kerawati, Dharwar. Oct.
D. diffusum, *DC.*, F.B.I.—II-169. *Chikta.* Poona. Sep.
D. polycarpum, *DC.*, F.B.I.—II-171. Castle Rock, Yellapur, N. Kanara. Oct.
D. rotundifolium, *Baker.*, F.B.I.—II-172. Mahableshwar. Nov.
D. parviflorum, *Baker.*, F.B.I.—II-172. W. Ghats. Oct.
D. triflorum, *DC.*, F.B.I.—II-173. *Ranmethi.* Deccan, widely. Oct.

51. *Abrus.*

A. precatorius, *Linn.*, F.B.I.—II-175. *Gunj.* Guzerat, Konkan, Deccan hills. Oct.

52. *Cicer.*

C. arietinum, *Linn.*, F.B.I.—II-176. *Harbara.* Gram. Cultivated. Dec.

53. *Vicia.*

V. sativa, *Linn.*, F.B.I.—II-178. *Mutaree.* Poona, in gardens. Feb.

54. *Lathyrus.*

L. sativus, *Linn.*, F.B.I.—II-179. *Lakh.* Cultivated.

Pisum.

P. sativum, *Linn.*, *Matar.* Garden Pea. Cultivated.

P. arvense, *Linn.*, *Kalavatana.* Field Pea. Cultivated.

56. *Shuteria.*

S. vestita, *W. & A.*, F.B.I.—II-181. Poona, Dharwar. Oct.

57. *Dumasia.*

D. villosa, *DC.*, F.B.I.—II-183. Mahableshwar. Nov.

58. *Glycine.*

G. javanica, *Linn.*, F.B.I.—II-183. Pala, N. Kanara. Nov.

G. pentaphylla, *Dalz.*, F.B.I.—II-184. Yellapur. Aug.

59. *Teramnus.*

T. labialis, *Spreng.*, F.B.I.—II-184. Deccan, widely. Aug.-Nov.

60. *Mucuna.*

M. monosperma, *DC.*, F.B.I.—II-185. Kanara. Feb.

M. pruriens, *DC.*, F.B.I.—II-187. *Khaj-Kuiri.* W. Ghats, widely. Aug.-Dec.

62. *Erythrina.*

E. indica, *Lam.*, F.B.I.—II-188. *Pangara.* Sea coast. Planted widely. March.

E. stricta, *Roxb.*, F.B.I.—II-189. Singhur, Hills Poona, Elephanta. Feb.

E. suberosa, *Roxb.*, F.B.I.—II-189. Chakan, Poona District. April.

E. crista-galli, *Linn.*, *DC.*, *Prod.*—II-413. In gardens. March.

E. aborescens, *Roxb.*, F.B.I.—II-190. Planted, Poona, Feb.-March.

64. *Grona.*

G. Dalzellii, *Baker*, F.B.I.—II-191. Panchgani, Mahableshwar. Oct.

65. *Galactea.*

G. tenuiflora, *W. & A.*, F.B.I.—II-192. Deccan hills, widely. June-Oct.

67. *Spatholobus.*

S. purpureus, *Benth.*, F.B.I.—II-194. Diggi, N. Kanara. May.

S. Roxburghii, *Benth.*, F.B.I.—II-193. *Palas wel.* Pulsan, Peint. Feb.

68. *Butea.*

B. frondosa, *Roxb.*, F.B.I.—II-194. *Palas.* Guzerat, Konkan, widely. Feb. March.

B. superba, *Roxb.*, F.B.I.—II-195. N. Kanara. Feb.

70. *Canavalia.*

C. ensiformis, *DC.*, F.B.I.—II-195. *Abai.* Deccan hills, widely. Aug.-Oct.

C. Stocksii, *Dalz.*, F.B.I.—II-106. Mahableshwar. Sep.

72. *Pueraria.*

P. tuberosa, *DC.*, F.B.I.—II-197. *Böicoila, Bendarcoil,* Konkan, Dang. Feb.

73. *Phaseolus.*

P. lunatus, *Linn.*, F.B.I.—II-200. *Lobiya.* Cultivated.

P. vulgaris, *Linn.*, F.B.I.—II-200. *Loba.* The Kidney Bean. Cultivated.

P. semierectus, *Linn.*, F.B.I.—II-201. Hyderabad Sind, Wild ? Oct.

P. trilobus, *Ait.*, F.B.I.—II-201. *Mukni.* Deccan, Guzerat. Oct.

P. aconitifolius, *Jacq.*—F.B.I.—II-202. *Math, Matki.* Cultivated.

P. grandis, *Dalz. & Gibs.*, F.B.I.—II-202. Panchgani. Sep.

P. pauciflorus, *Dalz.*, F.B.I.—II-202. S. Konkan, *Dalz.*

P. mungo, *Linn.*, F.B.I.—II-203. *Múg.* Cultivated.

P. trinervius, *Heyne*, F.B.I.—II-203. W. Ghats, Mahableshwar. Sep.

74. *Vigna.*

P. catiang, *Endl.*, F.B.I.—II-205. *Chauli.* Cultivated.

V. vexillata, *Bentts.*, F.B.I —II-206. Halaunda, M'war, Panchgani, W. Ghats. Oct.

75. *Pachyrhizus.*

V. angulatus, *Rich.*, F.B.I.—II-207. The Yam Bean. In gardens rarely.

76. *Clitoria.*

C. ternatea, *Linn.*, F.B.I.—II-208. *Gokran, Gokarnî.* June-Jan.

C. biflora, *Dalz.*, F.B.I.—II-208. Konkan. Sept.

77. *Dolichos.*

D. Lablab, *Linn.*, F.B.I.—II-209. *Wâl pâpadî, Pâvtâ.* Cultivated.

D. bracteatus, *Baker*, F.B.I.—II-210. Konkan, *Stocks.*

D. biflorus, *Linn.*, F.B.I.—II-210. *Kulith, Hulga.* Cultivated.

78. *Psophocarpus.*

P. tetragonolobus, *DC.*, F.B.I.—II-211. *Chaudhari, Ghevda.* Cultivated.

79. *Atylosia.*

A. geminiflora, *Dalz.* F.B.I.—II-212. Tulsi Dam. In fruit. May.

A. lineata, *W. & A.*, F.B.I.—II-213. *Rantûr.* Matheran. Dec.

A. sericea, *Benth.*, F.B.I.—II-213. Mahableshwar. Oct.-Jan.

A. mollis, *Benth.*, F.B.I.—II-213 . Konkan, *Stocks, Dalzell.*

A. kulnensis, *Dalz.*, F.B.I.—II-214. Potolli, *Talbot.* Kulnawari. Jan.

A. scarabæoides, *Benth.*, F.B.I.—II-215. Poona, Goa. June-Oct.

A. rostrata, *Baker*, F.B.I.—II-216. Konkan. *Stocks.*

80. *Cajanus.*

C. indicus, *Spreng.*, F.B.I.—II-217. *Tûr.* Cultivated.

82. *Cylista.*

C. scariosa, *Ait.*, F.B.I.—II-219. *Ranghevda.* Western India, widely. Feb.

84. *Rhynchosia.*

R. aurea, *DC.*, F.B.I.—II-221. Badami. Nov.

R. cyanosperma, *Benth.*, F.B.I.—II-222. Hirdosee Anmode, N. Kanara. Oct.-Jan.

R. minima, *DC.*, F.B.I.—II-223. Deccan, Guzerat, widely. Sep.-Jan.

R. minima, *D.C. var* F.B.I.—II-223 *laxiflora.* Badami. Aug.
R. Memnonia, *DC.*, F.B.I —II-224. Karachi. Oct.

85. *Flemingia.*

F. strobilifera, *R. Br.*, F.B.I.—II-227. *Ranganja.* Matheran. Jan.
F. congesta, *Roxb.*, F.B.I.—II-228. *Dowdowla.* Vingurla. Dec.
F. Wallichii, *W. & A.*, F.B.I.—II-229. Kanara. Feb.
F. involucrata, *Benth.*, F.B.I.—II-229. Dandeli, N. Kanara. Jan.
F. vestita, *Benth*, F.B.I.—II-230. Bababooden Hill, *Talbot.* Oct.
F. tuberosa, *Dalz.*, F.B.I.—II-230. Konkan, *Stocks, Dalzell.*

86. *Dalbergia.*

D. sissoo, *Roxb.*, F.B.I.—II-231. *Shisvi.* Planted. April-May.
D. latifolia, *Roxb.*, F.B.I.—II-231. *Sisu, Sisham.* Deccan hills. Waghai Dang. Aug.
D. Stocksii, *Benth*, F.B.I.—II-234. Konkan, *Stocks.*
D. sympathetica, *Nimmo*, F.B.I —II-234. *Petgûl.* Yakambi. Feb.
D. tamarindifolia, *Roxb*, F.B.I. - II-234. Nilkand, N. Kanara. March.
D. lanceolaria, *Linn.*, F.B.I.—II-235. *Dandus.* Alandi, Mundgode. April.
D. volubilis, *Roxb.*, F.B.I.—II-235. *Alai.* Khandalla. Feb.
D. paniculata, *Roxb.*, F.B.I.—II-236. *Phansa.* Pasaringi Kalghatgi Taluka. *Talbot.* April.
D. monosperma, *Dalz.*, F.B.I.—II-237. Malvan. *Dalz.* June.

87. *Pterocarpus.*

P. indicus, *Willd.*, F.B.I.—II-238. Khatriz Ghat, near Poona. Oct.
P. marsupium, *Roxb.*, F.B.I.—II-239. *Bibla.* Yellapur, N. Kanara. Nov.

88. *Pongamia.*

P. glabra, *Vent.*, F.B.I.—II-240. *Karanj.* Konkan, widely planted. April.

89. *Derris.*

D. scandens, *Benth.*, F.B.I.—II-240. *Mota sirili.* Karwar. July.
D. ulginosa, *Benth.*, F.B.I.—II-241. *Kajarvel.* Mumbra, near Bombay. Feb.
D. oblonga, *Benth.*, F.B.I.—II-242. Konkan. *Stocks.*
D. brevipes, *Baker*, F.B.I.—II-244. Konkan. *Stocks.*
D. Heyneana, F.B.I.—II-244. Konkan. *Stocks, Law.*
D. canarensis, F.B.I.—II-246. Konkan, near Garsuppa, *Dalzell.*

92. *Sophora.*

S. tomentosa, *Linn.*, F.B.I.—II-249. Gardens, Poona.

96. *Caesalpinia.*

C. Bonducella, *Flem.*, F.B.I.—II-254. *Sagargota. Kaski*, Deccan hills. July-Sep.
C. Nuga, *Ait.*, F.B.I.—II-255. Rutnagiri. Jan.
C. Sappan, *Linn.*, F.B.I.—II-255. *Patang.* Planted. Poona. Sep.
C. pulcherrima, *Swartz*, F.B.I.—II-255. *Sankâsûr.* Gardens, all the year.
C. sepiaria, *Roxb.*, F.B.I.—II-256. *Chilhar.* Poona, Nasik. April-Dec.
C. mimosoides, F.B.I.—II-256. Castle Rock, W. Ghats. Nov.-Dec.
C. coriaria, *Willd., DC.*, Prod.—II-483. *Libi Dibi.* Planted. Poona, Dharwar. Oct.

Hæmatoxylon. (Central America.)

H. Campeachianum, *Linn.*, *D.C*, Prod.—II-485. *Logwood. Planted.*

98. *Mezoneurum.*

M. cucullatum, *W. & A.*, F.B.I.—II-258. *Raghi.* Lanauli. March.

100. *Poinciana.*

P. elata, *Linn.*, F.B.I.—II-260. *Sankesvar.* Planted, Poona, Bijapur, near Mohamedan tombs.

P. regia, *Bojer*, F.B.I.—II-260. *Gul mohor.* Planted. April-June.

101. *Parkinsonia.* (Central America.)

P. aculeata, *Linn.*, F.B.I.—II-260. *Vedi Babul.* Poona. Naturalized. Jan.-Mar.

102. *Wagatea.*

W. spicata, *Dalz.*, F.B.I.—II-261. *Vagati.* Fitzgerald Ghat. Jan.

103. *Cassia.*

C. fistula, *Linn.*, F.B.I.—II-261. *Bhava, Bahva.* W. Ghats, Deccan hills. Widely planted. March.

C. marginata, *Roxb.*, F.B.I.—II-262. *Urimedi, Uskiamen.* Planted. Poona. July-Aug.

C. grandis, *Linn. f. DC.*, Prod.—II-489. Planted. Poona. April-May.

C. occidentalis, *Linn.*, F.B.I.—II-262. *Kashinda.* Poona. Jan.-Mar.

C. sophera, *Linn.*, F.B.I.—II-262. *Jungli Takla.* Bassein. Nov.-Jan.

C. Tora, *Linn.*, F.B.I.—II-263. *Takla.* Deccan. Nov.-Dec.

C. tomentosa, *Linn*, F.B.I.—II-263. Gardens. Jan.-Mar.

C. auriculata, *Linn.*, F.B.I.—II-263. *Tarvad. Awal.* Deccan widely. Jan.-July.

C. obovata, *Collad.*, F.B.I.—II-264. *Bhui-tarvad.* Hyderabad, Sind, Bijapur, Poona. Nov.-Feb.

C. alata, *Linn.*, F.B.I.—II-264. *Simay Agasay.* Gardens, Poona. Oct.

C. siamea, *Linn.*, F.B.I.—II-264. *Kasid.* Planted. Aug.-May.

C. montana, *Heyne*, F.B.I.—II-264. Ghat between Collem and Castle Rock. Oct.

C. glauca, *Lam.*, F.B.I.—II-265. *Motha Tarvad.* Poona. Aug.-Mar.

C. Absus, *Linn.*. F.B.I.—II-265. Parel, Konkan, Poona. Sep.

C. pumila, *Lam.*, F.B.I.—II-265. Dhulia, Badami. Aug.

C. Kleinii, *W. & A.*, F.B.I.—II-265. Jambholpada, Colaba. Oct.

C. mimosoides, *Linn.*, F.B.I.—II-265. Poona, Poladpur, Konkan. Sep.

104. *Cyanometra.*

C. ramiflora, *Linn.*, F.B.I.—II-267. N. Kanara. *Talbot.*

107. *Hardwickea.*

H. binata, *Roxb.*, F.B.I.—II-270. *Anjan.* Lulling Pass, Dhulia.

109. *Saraca.*

S. indica, *Linn.*, F.B.I.—II-271. *Ashok.* W. Ghats; widely. Oct.-Mar.

111.—*Tamarindus.*

T. indicus, *Linn.*, F.B.I.—II-273. *Chinch. Amli.* Peint Taluk. Deccan. May-June.

T. siliqua, *Linn.*, *DC.* Prod.—II-486. *Meccani Amli.* The Locust Tree. In gardens.

114. *Bauhinia.*

B. tomentosa, *Linn.*, F.B.I.—II-275. Indig. ? Widely planted. Jan.-Dec.

B. acuminata, *Linn.*, F.B.I.—II-276. Planted. July.

B. racemosa, *Linn.*, F.B.I.—II-267. *Apta.* Deccan ; widely. May.

B. malabarica, *Roxb.*, F.B.I.—II-277. Bansda, in fruit. Feb.

B. Lawii, *Benth.*, F.B.I.—II-277. *Chamolee.* A tree near 3rd mile stone Narel, Matheran Road. Pulsan, Peint taluka. Legume woody, 9″ × 1″ × ¼″ twisted green or red tomentose.

B. diphylla, *Hamilt.*, F.B.I—II-278. Planted. Poona, Konkan *Stocks.*

B. Vahlii, *W. & A.*, F.B.I.—II-279. *Chambul.* Konkan Ghats. April.

B. purpurea, *Linn.*, F.B.I.—II-284. *Rukta Kanchin.* Deccan forests.

B. variegata, *Linn.*, F.B.I.—II-284. *Kanchin.* Planted widely.

B. ep. inc. *Boot chamail.* Pient taluk.

115. *Neptunia.*

N. oleracea, *Lowr.*, F.B.I.—II-286. Halial, N. Kanara, *Talbot.* Oct.

N. triquetra, *Benth.*, F.B.I.—II-286. Ahmednagar, Surat. Oct.

116. *Xylia.*

X. dolabriformis, *Benth.*, F.B.I.—II-286. *Jamba.* N. Kanara.

117. *Entada.*

E. scandens, *Benth.*, F.B.I.—II-287. *Garambi.* Lanauli wood. Sirsi-Kuma Road, N. Kanara. Apr.-May.

118. *Adenanthera.*

A. pavonina, *Linn.*, F.B.I—II-287. *Ratangunj.* Planted. May.

119. *Prosopis.*

P. spicigera, *Linn.*, F.B.I.—II-228. *Shami, Saundad, Sumari.* Poona, Deccan, Guzerat. Dec.-Feb.

P. Stephaniana, *Kunth.*, F.B.I.—II-288. Goga.

120. *Dichrostachys.*

D. cinerea, *W. & A.*, F.B.I.—II-288. *Sigum Kati,* Poona, Badami. Jeur. Sep.-Oct.

122. *Parkia.*

P. biglandulosa, *W. & A.*, F.B.I.—II-289. *Chenduphul.* Planted. Dec.

123. *Desmanthus.*

D. virgatus, *Willd.*, F.B.I.—II-290. In gardens. Naturalized. June-July.

124. *Leucœna.*

L. glauca, *Benth.*, F.B.I.—II-290. *Kubabhal,* Poona; widely, in gardens. Sep.-Oct.

125. *Mimosa.*

M. pudica, *Linn.*, F.B.I.—II-291. *Lajalu.* Kumta Roadsides. Oct.

M. rubicaulis, *Lam.*, F.B.I.—II-291. *Arai.* Gardens. Aug.

M. hamata, *Willd.*, F.B.I.—II-291. *Arkar, Arati.* Deccan widely. Sep.

127. *Acácia.*

A. Farnesiana, *Willd.*, F.B.I.—II-292. *Devbabhal, Kankri.* Indig.? Occurs widely. August-March.

A. planifrons, *W. & A.*, F.B.I.—II-293. *Salé.* The Umbrella Thorn. Planted. Poona. Nov.

A. arabica, *Willd.*, F.B.I.—II-293. *Babhal.* Deccan, Guzerat. Widely. June-Jan.

A. arabica, *Willd.*, F.B.I.—II-293. var. *Ramkanta.* Deccan, Guzerat. Widely. June-Jan.

A. arabica, *Willd.*, F.B.I.—II-293. var. *Eree Babhal.* Deccan, Guzerat. June-Jan.

A. eburnea, *Willd.*, F.B.I.—II-294. *Marmati.* Deccan, S. M. Country. Nov.-Feb.

A. Jacquemontii, *Benth.*, F.B.I.—*Ratobauli.* Ahmedabad. Feb.-May.

A. tomentosa, *Willd.*, F.B.I.—II-294. *Khairi.* Dangs. Dec.

A. leucophlæa, *Willd.*, F.B.I.—II-294. *Hivar. Hewar.* Deccan; widely Jan.-Feb.

A. suma, *Kurz.*, F.B.I.—II-294. *Sonkairi.* Konkan, Deccan; widely. May-July.

A. Catechu, *Willd.*, F.B I.—II-295. *Khair.* Deccan, S. M. Country, Guzerat. Aug.-Sep.

A. Sundra, *DC.*, F.B.I.—II-225. Deccan. August.

A. ferruginea, *DC.*, *Jehan Karikara.* Pulsan, Peint Taluka. Dang.

A. Senegal, *Willd.*, F.B.I.—II-295. Sind. *Stocks.* April.

A. Latronum, *Willd.*, F.B.I.—II-296. *Devbhabal.* Deccan ; widely. Sept. Nov.

A. concinna, *DC.*, F.B.I.—II-296. *Shik kâi.* Deccan hills, N. Kanara. March. July.

A. intsia, *Willd.*, F.B.I.—II-296. *Chilari.* Deccan hills. Aug.

A. pennata, *Willd.*, F.B.I.—II-297. *Semba.* Deccan Konkan hills. Feb.

A. Burkei, *Benth.* Anna tree of Damaraland. Planted. Poona. Jan.

A. Balfourii, *Woodrow*, sp. nova. A middle-sized tree resembling the *bhabul* raised from seed collected in Socotra by Dr. Balfour of Edinburgh and naturalized at Poona. Bark, rugged, brown; *lenticels*, prominent on young branches.

Internodes.—Shorter than leaves.

Leaves.—$1\frac{1}{2}''$ to $2'' \times \frac{3}{4}''$ to $1''$; *leaflets* 10 pairs; *petiole* $\frac{1}{4}''$, rachis with a gland below lowest and highest pair of leaflets; *pinnules* 16 pair, $\frac{1}{12}''$ mucronulate.

Flowers.—Yellow ; *capitulæ* with $\frac{1}{2}''$ to $1''$ peduncles, axillary, fasiculate.

Stipullary thorns.—$\frac{1}{2}''$ to $1''$, strict, slender, white.

Fruit.—$2'' \times 1\frac{1}{4}''$ subglobose, crustaceous, brown, glabrous, tardily dehiscent, with much pith and 6 to 12 seeds.

Seeds.—$\frac{1}{3}''$ × $\frac{1}{4}''$ × $\frac{1}{8}''$ each side with prominent channelled line, following outline interrupted at base enclosing foveolate area.

This tree is closely allied to A. Farnesiana, *Willd.*, in the structure of its crustaceous pithy pod.

128. *Albizzia.*

A. lebbek, *Benth.*, F.B.I.—II-298. *Shiras.* Deccan hills. Planted widely. February-March.

A. odoratissima, *Benth.*, F.B.I.—II-299. *Siris.* Chinchada. Poona. Sirsi. April-May.

A. procera, *Benth.*, F.B.I.—II-299. *Kinhai. Godhunchi* Poona. June.

A. lucida, *Benth.*, F.B.I.—II-299. Matheran.

A. stipulata, *Boiv.*, F.B.I.—II-300. *Udal-Phalari.* Fitzgerald Ghat. April-May.

A. amara, *Boiv.*, F.B.I.—II-301. *Lalai.* Poona. May.

131. *Pithecolobium.*

P. dulce, *Benth.*, F.B.I.—II-302. *Walayeti Amli.* Planted widely.

P. bigeminum, *Benth.*, F.B.I.—II-303. *Kachlor.* Divimana N. Kanara. Feb.

P. saman, *Benth.*, Lon. Jour. Bot.—II-423. Rain Tree. Planted. Thana, Poona.

(*To be continued.*)

ON SOME EARTHWORMS FROM INDIA.

By Sophie M. Fedarb.

(*With two Plates.*)

(*Read before the Bombay Natural History Society on* 16*th April*, 1896.)

These worms have been collected by Messrs. H. Ferguson, A. Gleadow and R. C. Wroughton in Travancore, Poona, and North Konkan, and sent through the kindness of Mr. E. H. Aitken. By the generosity of Mr. F. E. Beddard, M.A., F.R.S., I have been allowed to examine them in his laboratory at the Zoological Society's Gardens. The collection contains *Eudrilus eugeniæ*, a *Perichæta*, a *Megascolex* and some species of *Benhamia*. These last coming from India are extremely interesting. Hitherto the genus *Benhamia* has been restricted to Africa, though introduced forms have occurred in India, and also some small species have been discovered in the Malay Archipelago. But Dr. Michaelsen is of opinion, that for several reasons—their size among other things—they are artificially located. The specimens under consideration may, of course, be in the same position; but the existence of modified organs, not similar to those found in any from African renders it possible that they may be indigenous, and some even belong to a new genus.

1. *Benhamia aitkeni*, n. sp. (Plate I, Figs. 1, 2, 3, 4, 5, 7).

This worm is 119 mm. long and 3 mm. broad, and has 180 segments.

The clitellum extends from XIII to XVII. The setæ appear through to some extent.

There are eight setæ in each segment. The dorsal space is of considerable size, while the ventral is very small. The setæ are paired, but not at all closely. The ventral pair are closer together than the dorsal, which latter are as far from the ventral pair as their two setæ are apart. Between the four ventral setæ, a pilose line is developed. There are no ventral pairs on segments XVII, XVIII, and XIX, though XVIII has the dorsal pairs.

The oviducal pore is single and appears on a marked area in the clitellum.

The male pores are very small and close together on XVIII.

The spermiducal pores on XVII and XIX are furnished with setæ. They are smooth and much resemble the others in shape, except that

they are about three times as long, and have the greatest circumference at the third instead of the half of their length.

The dorsal pores commence at XIX.

The nephridia are diffuse.

The pharynx is large.

There is a pair of floculent mucous glands with three lobes each in segment III.

The gizzard is single, of considerable size, and lies in VII, while in VIII, there is a soft crop-like portion joined by a distinct line.

In segment XV are well marked calciferous glands, which, viewed from the head, radiate from the œsophagus in a fan-like manner. Each is divided into two distinct lobes, the dorsal cut up again into two smaller lobes, and the ventral lobe in three parts.

The intestine begins in XVI.

There are no cæca, and apparently no typhlosole.

The dorsal vessel is single, and the hearts are in XI, XII and XIII.

There are two pairs of spermathecæ in VIII and IX.

They are very small, possibly a young specimen.

They open very close together, and consist of an oval pouch with a short duct bearing a small tubular diverticulum.

The sperm-sacs are not well developed, but seem to occur in IX and XII.

The spermiducal glands in XVII and XIX are tubular. They are twisted regularly and present a sort of sausage-like appearance.

The exact position of this worm is uncertain. It can hardly belong to *Acanthodrilus*, as its nephridia are entirely diffuse. Though having some affinities with Mr. Beddard's genus *Octochætus*, it probably does not belong to it, as the dorsal vessel is not double, the male pores are not borne on papillæ, and the calciferous glands are very distinct indeed.

For the present it had better remain in *Benhamia*, from the general type of which it differs in several respects.

The setæ are not closely paired, but *B. mexicana* has the dorsal pair further apart.

The clitellum only extends to XVII; in *B. curta* it goes no further than a part of XVIII.

There is only one gizzard, but *B. schlegelii* is stated to only have one.

The oviducal pore is single, which is also the case with *B. bolavi* and *B. gracilis*.

The calciferous glands of this species are peculiar, occurring only in segment XV, and not being simple pouches on the side of the œsophagus but more elaborate lobed structures. No other *Benhamia* has glands like this.

HABITAT: Travancore.

2. *Benhamia travancorensis*, n. sp. (Pl. I., Figs. 6, 8, 9, 11, 12.)

It is 75 mm. in length and 2 mm. in breadth. It has 131 segments.

The clitellum extends from XIV to XXI. It is saddle-shaped, having a ventral line not thickened.

The setæ are in pairs very close together.

The dorsal pores commence posteriorly.

The pharynx is very large.

There are two gizzards in VIII and IX. They are more or less cylindrical, the posterior one is somewhat flattened ventrally.

There are calciferous glands in XIV, XV and XVI.

They are pouch-shaped, somewhat corrugated, the anterior being the smallest.

The intestine commences in XVII and has no cæca.

The last hearts occur in XIII.

The nephridia are diffuse.

There are two pairs of spermathecæ in VIII and IX. Each has a constriction dividing the pouch from the pouch-like duct which bear the diverticulum.

The sperm-sacs in XI and XII are very minute.

The spermiducal glands in XVIII and XIX are within the clitellum; they are tubular and fusiform.

They have a bunch of penial setæ at the mouth.

These are about four times as long as the ordinary ones, and terminate in a fine whip-like end frequently bent into a hook.

No ventral pairs of setæ occur on XVII, XVIII, or XIX.

In many respects this worm resembles *Benhamia kafuruensis*.

Septa IX to XIV are thickened.

HABITAT: Travancore.

3. *Benhamia poonensis*, n. sp. (Pl. I, Fig. 10; Pl. II, Figs. 3, 4, and 9).

It is 134 mm. long and 3 broad. It has 157 segments, the last of which are very small.

The clitellum is very ill-marked. It appears to end at segment XVI dorsally, but to be continued to XX ventrally.

The setæ are closely paired, the four pairs occupying rather less than the ventral half of the body.

The apertures of the spermiducal glands on segments XVII and XIX are in a line with the ventral setæ. There are no penial setæ, but small papillæ in a line with pores, at the edges bordering segment XVIII, occur on XVII and XIX. There are no ventral setæ on these three segments, but those on XX are placed on a pagilla.

The pharynx is very large and pouch-like.

There are two gizzards in V and VI. They are connected by a narrow junction. They are more or less globular, the anterior being the larger.

There are globular calciferous glands in XI and XII.

The intestine begins in segment XIV.

In segments IX, X, XI and XII are four pairs of hearts. They are very large indeed, the walls being transparent and altogether much more delicate than those of the dorsal vessel.

There are two pairs of spermathecæ in segments VIII and IX.

The pouch is oval with a duct of about the same length which becomes sinuous near the mouth. At the junction with the pouch is the diverticulum, which is very characteristic in form. It is a much-complicated structure, almost having the appearance of a complicated gland.

In the neighbourhood of the opening are long setæ with notched ends. They are about three or four times as long as an ordinary seta.

There is a pair of bent tongue-shaped sperm-sacs in XII.

The spermiducal glands are tubular. There is a long straight duct; the glandular end is very twisted, almost forming a knot, and is pigmented.

HABITAT: Poona.

4. *Megascolex konkanensis*, n. sp. (Pl. II, Figs. 1, 6, 7, 8, and 10.)

It is 200 mm. long and 2 broad, having 222 segments.

Externally this worm much resembles a *Perichæta*, having a short clitellum, a well-marked area round the median oviducal pore, tumid male pores, and the lines of setæ quite distinct.

The setæ are not continuous. There is a ventral gap of about the space of three setæ, while the dorsal space is much less. But quite at the tail end of the animal—segment 170th—this arrangement is obliterated, where there are 24 setæ equidistant.

The clitellum obviously extends from XIV—XVI, and the setæ show through. There is a large area on XIV, in a line with the setæ, bearing the oviducal pore. The modified tissue of the clitellum, which can only be distinguished with the microscope, extends as far forward as to just in front of segment X and backwards to XX.

The male pores are borne on two large papillæ, the width of the segment, with no setæ between.

The dorsal pores commence IV—V.

The pharynx is large. There are a pair of mucous glands in V.

There is a large gizzard in VI.

There are no calciferous glands.

The œsophagus is small till segment XVI.

The intestine commences in XVI in two large pouches.

There are hearts in XII and XIII.

In segments VIII and XI are two pairs of spermathecæ.

The pouch is pear-shaped with a very delicate duct about the same length. A club-shaped diverticulum, the length of the duct, joins near the aperture.

Segments XI and XII each possess a very well developed pair of sperm-sacs. They are very racemose indeed, the divisions being almost globular.

The spermiducal glands are very peculiar and have a mop-like appearance. The duct is straight and has no muscular sac. The distal end seems dilated into a sac from which arise numerous simple filiform processes. In a younger specimen the gland appeared like a tube with many transverse branches at the end.

HABITAT: North Konkan and Travancore.

5. *Perichæta travancorensis*, n. sp. (Pl. II, Figs. 2, 5.)

This worm has 94 segments. It is 70 mm. long and 4 broad.

Its anterior dorsal surface is purplish, which colour behind the clitellum narrows to a strip.

The clitellum extends from XIV—XVI. The area round the female pore is much marked.

The male pores are rather tumid, but have no papillæ. They are separated by 10 setæ.

The gizzard lies in VII and IX.

The intestine commences in XV. It has cacæ which arise in XXVI and continue forward into XXV, where the end is slightly curled round.

There are hearts in XI, XII, XIII.

In segments VII, VIII, and IX are three pairs of spermathecæ. As there is no intervening septum between the last two, they lie very close together. They are long pear-shaped bodies, gradually narrowing to the duct which bears near the opening a small diverticulum on a long duct which in some cases is arranged in a zigzag.

Small sperm-sacs are found in XI, XII, and XIII.

The spermiducal glands have a sac and a coiled duct ; the lobes of the glands extend through three segments, *viz.*, XVII—XIX ; they are loose and comparatively thin.

The dorsal pores are not very obvious, but do not commence till XVI—XVII.

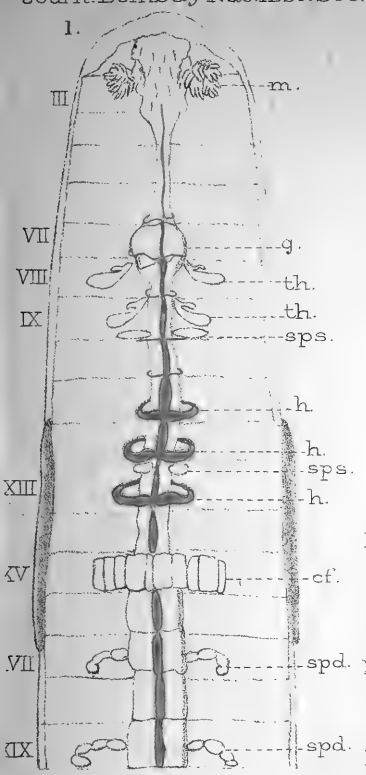
HABITAT: Travancore.

EXPLANATION OF PLATES.

PLATE I.

Fig.

1. *Benhamia aitkeni.* Dissection : *m*, mucous gland ; *g*, gizzard, *th* spermatheca ; *sps*, sperm-sac ; *h*, heart; *cf*, calciferous gland; *spd*, spermiducal gland. The figures denote the number of the segment.
2. Spermiducal glands of *Benhamia aitkeni.*
3. Spermatheca of *Benhamia aitkeni—dv*, diverticulum.
4. Calciferous gland of *Benhamia aitkeni* belonging to the right side viewed from the head end.
5. Arrangement of setæ in *Benhamia aitkeni—s*, left dorsal pair.
6. Interior of *Benhamia travancorensis.*
7. Penial seta of *Benhamia aitkeni.*
8. Penial seta of *Benhamia travancorensis.*
9. Calciferous gland of *Benhamia travancorensis.*
10. Interior of *Benhamia poonensis.*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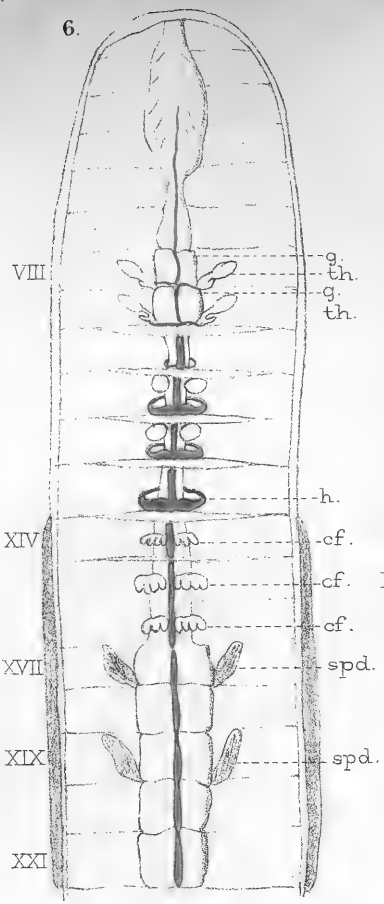
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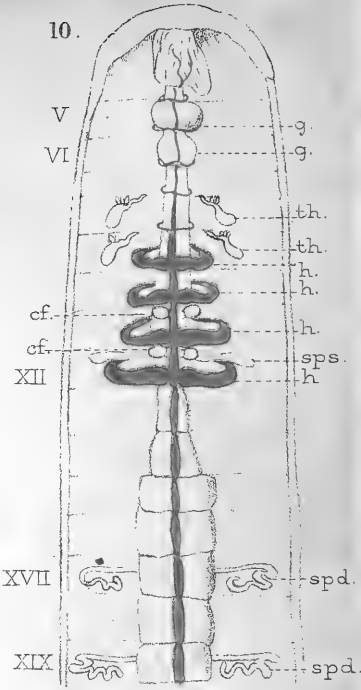
XXI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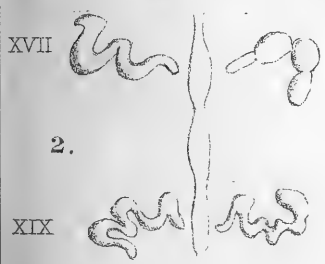
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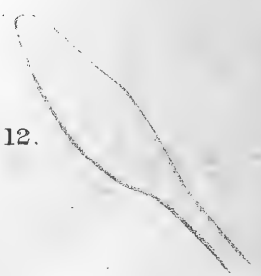
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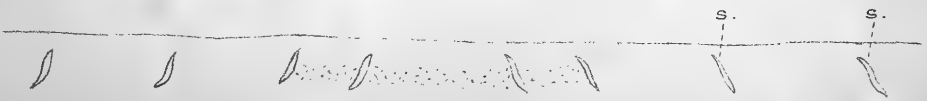
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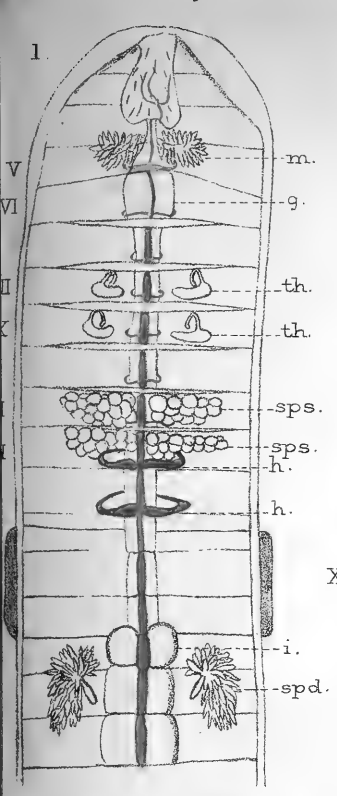
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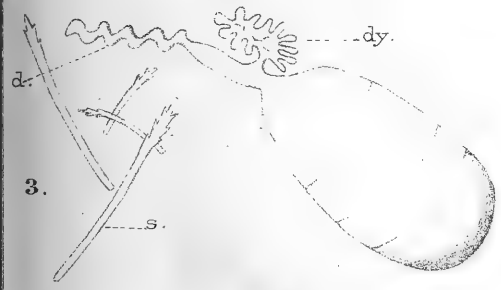
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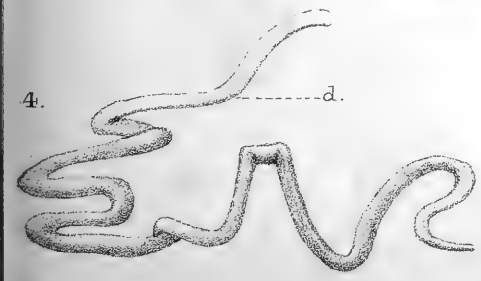
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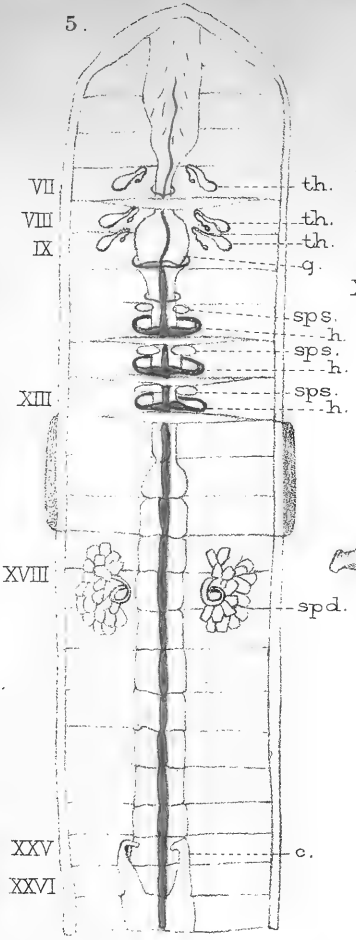
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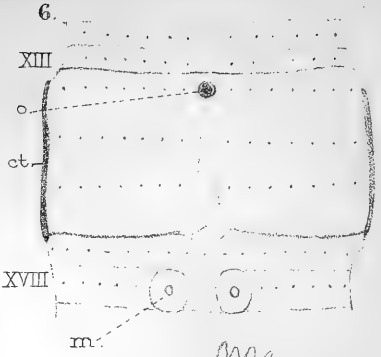
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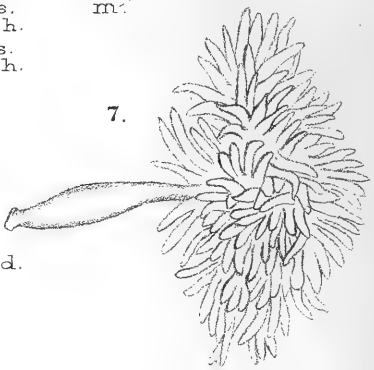
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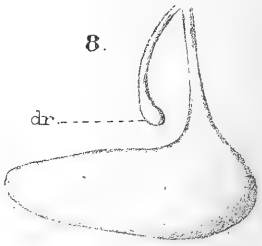
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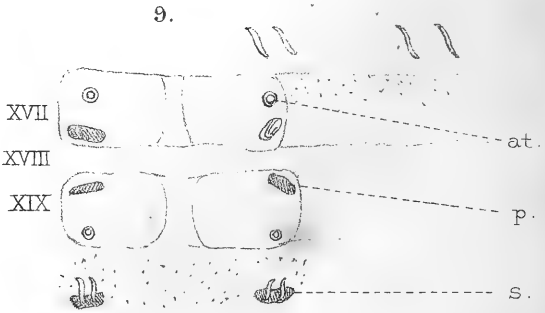
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10.

11. Spermatheca of *Benhamia travancorensis.*
12. Spermiducal gland of *Benhamia travancorensis.*

Plate II.

Fig.

1. Interior of *Megascolex konkanensis*—*i*, intestine.
2. Spermatheca of *Perichæta travancorensis*—*dv*, diverticulum.
3. Spermatheca of *Benhamia poonensis*—*d*, duct; *dv*, diverticulum; *s*, copulatory setæ.
4. Spermiducal gland of *Benhamia poonensis.*
5. Interior of *Perichæta travancorensis*—*c*, cæcum.
6. Ventral view of clitellum of *Megascolex konkanensis*—*o*, oviducal pore; *ct*, clitellum; *m*, male pore.
7. Spermiducal gland of *Megascolex konkanensis.*
8. Spermatheca of *Megascolex konkanensis.*
9. Portion of ventral surface of *Benhamia poonensis*—*p*, papilla; *at*, atrial pore; *s*, setæ.
10. A *sperm*-sac from *Megascolex konkanensis.*

N.B.—For *dy* on Plates read *dv.*

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

PART II.

By Sir G. F. Hampson, Bart, F.Z.S., F.R.S.

(*Continued from page* 297 *of this Vol.*)

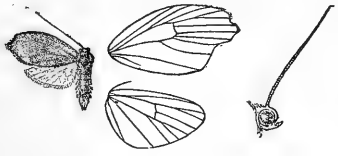
Genus Macaduma.

Macaduma, Wlk., Cat., xxxv, p. 1704 (1866).

Type.—*M. tortricella*, Wlk.

Range.—Assam ; Java.

Palpi porrect, slender, reaching beyond the frons ; antennæ simple ; tibiæ with the spurs moderate. Forewing very broad and rounded, the costa highly arched ; veins 3, 4, 5 separate ; 6 from just above middle of discocellulars ; 7-8 stalked ; 9 absent ; 10-11 from cell. Hindwing with vein 2 from near angle of cell ; 3-4 stalked ; 5 from above angle ; 6-7 stalked.



Macaduma tortricella ♂ 1/1

1383*a*. Macaduma tortricella, Wlk., Cat., xxxv, p. 1705.

♂. Head and thorax chestnut-brown ; abdomen fuscous, the anal tuft ochreous. Forewing chestnut, the inner medial area rather darker ; cilia fuscous below apex. Hindwing very pale yellow.

♀. Fuscous-brown ; forewing with the apical part of costa and outer margin chestnut. Hindwing fuscous.

Habitat.—Khásis ; Java. *Exp.* 20 mm.

1385*a*. Æmene mesozonata, n. sp.

Head and thorax pale brown ; abdomen fuscous ; anal tuft ochreous. Forewing brownish-white ; a diffused sub-basal brown band ; a waved antemedial line bent outwards to the medial line at inner margin ; a black spot in end of cell and another on discocellulars ; medial and postmedial lines with the area between them brown, angled outwards at veins 6 and 4 ; a sinuous submarginal line developed into blotches in parts ; a series of marginal specks. Hindwing fuscous.

Habitat.—Khásis. *Exp.* ♂ 18, ♀ 20 mm. *Type.*—In British Museum.

1388*a*. ÆMENE ALBISPARSA, n. sp.

♂. Fuscous. Forewing irrorated with white scales; an obscure sub-basal line; a sinuous antemedial line; indistinct medial, postmedial and submarginal lines bent outwards at middle; the area between the antemedial and medial lines gray, whitish towards costa; a black spot in cell and discocellular lunule with whitish streak between them; series of white specks on the postmedial line and on margin.

Habitat.—Khàsis. *Exp.* 22-24 mm. *Type.*—In British Museum.

1388*b*. ÆMENE FLAVESCENS, n. sp.

Palpi and frons black; head yellow and fuscous above; thorax and abdomen fuscous. Forewing ochreous with diffused fuscous bands on basal and outer areas, leaving the medial area ochreous, but the bands more or less connected in cell; the bands maculate and with some ochreous between them, sub-basal, antemedial, postmedial, and submarginal; a marginal series of specks. Hindwing fuscous.

Habitat.—Khásis. *Exp.* 20 mm. *Type.*—In British Museum.

1398*a*. DIDUGA RUFIDISCA, n. sp.

♀. Differs from *albicosta* in the bands on costa and outer margin being broader, tinged with rufous, irrorated with fuscous and with more sinuous outline; a diffused rufous patch on medial inner area; a fuscous discocellular spot. Hindwing fuscous.

Habitat.—Khásis. *Exp.* 12 mm. *Type.*—In British Museum.

1402*a*. EUGOA MULTISTRIGATA, n. sp.

Forewing with vein 7 absent. Yellowish-white; vertex of head and thorax spotted with black; abdomen with dorsal fuscous marks. Forewing with two black spots at base, two antemedial series of spots followed by a spot in cell; a medial series of streaks with short streaks beyond the cell; at post-medial series of spots angled below costa; a submarginal oblique series from vein 5 to inner margin; apical spots and two at middle of margin; the several series irregular and not well defined. Hind-wing suffused with fuscous.

Habitat.—Khásis. *Exp.* 24 mm. *Type.*—In British Museum.

1404*a*. EUGOA OCHRIVENA, n. sp.

Forewing with the cell very long; vein 2 from before middle. Hindwing with veins 4-5 from cell, the upper part of cell very long; veins 6-7 short and from angle.

♂. Brownish-gray; head with fuscous spot on vertex; abdomen fuscous towards extremity. Forewing with the basal part of costa clouded with fuscous; a series of antemedial spots; a spot in cell; the medial area clouded with fuscous diffused outwardly; a discocellular spot; some submarginal diffused blotches. Hindwing suffused with fuscous; the veins forming the end of cell and given off from it ochreous; cilia ochreous.

Habitat.—Khásis. *Exp.* 22 mm. *Type.*—In British Museum.

1470*b*. TOLPIA TRIGONIFERA, n. sp.

♂. Brownish-ochreous; palpi and collar blackish. Forewing with the base of costa black; an oblique triangular black mark on middle of costa with its apex beyond lower angle of cell and embracing a pale discoidal point; a sinuous pale submarginal line, its medial part defined by rufous on inner side, the area beyond it fuscous.

Habitat.—Khásis. *Exp.* 14 mm. *Type.*—In British Museum.

1425. **Miltochrista dentifascia** belongs to Section I. ♂ with the cell narrow.

1469*a*. MILTOCHRISTA MESORTHA, n. sp.

Differs from *punicea* in the antemedial line of forewing being dentate in and below cell; the medial line almost straight and not connected with the antemedial. Hindwing with slight fuscous shade on apical area, more extensive on underside.

Habitat.—Khásis. *Exp.* ♂ 24, ♀ 28 mm. *Type.*—In British Museum.

1488*c*. NUDARIA DISCIPUNCTA, n. sp.

White; head, thorax, and abdomen yellowish. Forewing with the medial inner area slightly suffused with fuscous; yellow spots on costa at base, before middle and at middle; a prominent black spot in cell; a postmedial yellow patch from costa to lower angle of cell connected with inner margin by a line; oblique fasciæ between end of cell and apex, middle of margin and outer angle, the last broad and suffuse in part with fuscous.

Habitat.—Khásis. *Exp.* 18 mm. *Type.*—In British Museum.

NOLINÆ.

1534*f*. NOLA FLEXILINEATA, n. sp.

♂. White, slightly tinged with brown; palpi blackish. Forewing with dentate blackish antemedial line with slight brown suffusion

on each side of it; traces of a medial waved line; a prominent postmedial black line very oblique from costa to vein 4, where it is curved and becomes erect, the area beyond it suffused with fuscous; an irregularly dentate submarginal line. Hindwing tinged with fuscous.

Habitat.—Khásis. *Exp.* 24 mm. *Type.*—In British Museum.

Section IV. Forewing with vein 9 present, arising from the cell.

1534*g*. NOLA LUNISIGNA, n. sp.

♂. Grayish-white; palpi blackish at sides. Forewing with black spot at base of cell; indistinct waved antemedial and medial lines, the latter with a small black lunule on its inner side below costa; a postmedial line oblique to vein 5, then bent inwards to near the medial line and becoming black and prominent; an irregular submarginal line. Hindwing fuscous.

Habitat.—Khásis. *Exp.* 22 mm. *Type.*—In British Museum.

Vol. IV, p. 506. For *Cyphotopsyche* insert **Proneca**, Swinh., 'Trans. Ent. Soc.' 1890, p. 193.

1545*c*. PRONECA FOLA, Swinh., 'Trans. Ent. Soc.', 1890, p. 194.

Head, thorax, and abdomen yellowish-white with blackish patch on metathorax and tuft on first abdominal segment. Forewing yellowish-white with dark brown costal fascia mixed with yellowish scales; an oblique fascia from outer margin below apex to inner margin, on which it extends from near base to middle and forming a large wedge-shaped patch; outer area tinged with brown, and with a diffused dark band between veins 5 and 1. Hindwing whitish in male, fuscous in female.

Habitat.—Colombo; Thayetmyo, Burma. *Exp.* ♂ 22, ♀ 24 mm.

1550*a*. SELCA PLAGIOLA, n. sp. (Pl. A, Fig. 2.)

♂. Antennæ ciliated; forewing with vein 7 absent; a tuft of spatulate scales on inner margin beyond middle; hindwing with vein 4 absent. Head, thorax, and abdomen pure white; palpi tinged with rufous. Forewing rufous mixed with white and black scales; a large white patch on basal inner area with a white line from origin of vein 2 to its extremity; the tufts of raised scales below basal part of costa prominent, a white postmedial line very oblique from costa to vein 5, where it is acutely angled and retracted, then sinuous; a large white

and gray patch on its inner side from costa to vein 2 ; two fine white lines with gray between them along vein 2 from cell to near outer margin ; an obscure submarginal white line strongly dentate inwards at veins 5 and 2, and with a fuscous patch inside its medial portion. Hindwing white tinged with fuscous.

Habitat.—Puttalam, Ceylon (J. Pole). *Exp.* 16 mm. *Type.*—In British Museum.

1550*b*. SELCA NIGRA, n. sp.

Hindwing with vein 5 obsolete ; antennæ of ♀ pectinate. ♀. Fuscous-black. Forewing irrorated with a few silvery scales ; the basal area darkest ; indistinct sub-basal and antemedial lines ; a fulvous discoidal spot and traces of a waved medial line, traces of irregularly-waved postmedial and submarginal lines. Hindwing paler fuscous.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 30 mm. *Type.*—In British Museum.

AGARISTIDÆ.

1583. **Mimeusemia** *ceylonica=Ægocera* **postica**, Wlk., 'Journ. Linn. Soc.,' VI, p. 6, *Mimeusemia tara*, Swinh., 'Cat. Lep. Het.,' Mus. Oxon., p. 167.....Singapore ; Borneo.

1681. *Hadena* (?) **hastata** is an **Erastria** allied to **aurata**, Moore.

NOCTUIDÆ.

TRIFINÆ.

1756*a*. EUPLEXIA HYALOPHORA, n. sp.

♂. Head and thorax olive-green and brown ; abdomen reddish-brown ; the anal tuft fulvous. Forewing olive-green and dark brown ; a sinuous sub-basal olive line defined by black, the area between it and antemedial line green ; the antemedial line black-edged and obtusely angled on vein 1 ; the medial area brown with pale-edged green orbicular and reniform stigmata almost joined on median nervure, a black-edged olive postmedial line incurved below vein 4 and outlined with gray ; the outer area green with pale waved submarginal line ; a brown patch below apex, a marginal series of black lunules. Hindwing dark red-brown with the disk hyaline ; underside with black spot in upper angle of cell. Thorax with a club-shaped process bearing a tuft of long white hair protrusile from the large abdominal stigmata.

Habitat.—Khásis. *Exp.* 34 mm. *Type.*—In British Museum.

1758*a*. EUPLEXIA CONSERVULOIDES, n. sp.

♂. Red-brown. Forewing with a black speck in cell; a pale-edged wedge-shaped mark from middle of costa; blackish on discocellulars, and with a large brown V-shaped mark below it on inner margin with short arms; the reniform indistinct, and with a double elbowed line beyond it continued as a single waved line to inner margin; a sinuous submarginal line slightly bent outward and edged with brown between veins 6 and 3; three white specks on costa towards apex. Hindwing paler. Underside of both wings with dark postmedial line and indistinct pale submarginal line; hind tibiæ with white points at extremity and on end of spurs. Thorax with a club-shaped process bearing a tuft of long hair which is protrusile from the large abdominal stigma.

Habitat.—Sikhim (Pilcher). *Exp*. 36 mm. *Type*.—In British Museum.

1766*a*. ANCARA OLIVESCARIA, Swinh., A. M. N. H (6), XIX, p. 167.

♂. Head and thorax dark olive-brown; abdomen fuscous with the dorsal and anal tufts olive-brown. Forewing dark olive-brown irrorated with black scales; traces of double waved black sub-basal, antemedial and medial lines; the orbicular indistinct; the reniform large with its lower part filled in with black, but not well defined; the claviform a large, prominent black lunule; a postmedial series of black and white specks on the veins; a marginal series of black specks. Hindwing black-brown; some marginal marks towards anal angle, and the cilia olive-brown. Underside olive-brown irrorated with black; discal area of forewing fuscous; both wings with discoidal stigmata and black postmedial band.

Habitat.—Jaintia Hills. *Exp*. 58 mm.

1804*a*. DIPTERYGIA MAGNICLAVIS, n. sp.

Head and thorax dark rufous, slightly pencilled with ochreous; abdomen fuscous, with the dorsal lateral and anal tufts rufous. Forewing rufous variegated with ochreous; a series of dark marks on costa; a dentate gray sub-basal line; an antemedial line angled inward on sub-costal nervure, then oblique, white and angled outwards on vein 1; the orbicular and reniform with pinkish outlines; the claviform black-edged, large, round, and placed on outer edge of the antemedial line; the postmedial line minutely dentate from costa to

vein 4, then bent inwards to the reniform ; an irregularly sinuous submarginal line, angled inwards below costa, and with a black point on its inner edge below vein 2 ; the apex grayish ; a marginal series of black lunules. Hindwing brownish-ochreous, the outer area broadly fuscous.

Habitat.—Khàsis. *Exp.* 38 mm. *Type.*—In British Museum.

1857*a*. CARADRINA TERMINATA, n. sp.

♂. Ochreous ; palpi black at sides to near end of second joint ; abdomen slightly tinged with fuscous above. Forewing with the outer area fuscous-brown, narrowing to apex ; a prominent black spot in the cell ; indistinct sub-basal, antemedial, medial, postmedial, and submarginal lines ; the first three irregularly waved, the postmedial dentate, the submarginal irregularly waved placed on the dark area and expanding into a dark patch at middle. Hindwing pale, the veins and outer area slightly tinged with fuscous.

Habitat.—Bhutan (Dudgeon) ; Borneo. *Exp.* 28 mm. *Type.*—In British Museum.

1858*a*. CARADRINA ATRESCENS, n. sp.

♂. Ochreous with a slight fleshy tinge ; head and thorax mixed with black scales ; abdomen fuscous above. Forewing with the basal area irregularly irrorated with patches of black scales, three more prominent spots on the costa ; a large black patch in end of cell extending up to the costa ; a discocellular spot ; the outer area irrorated with black ; a large postmedial costal patch with two ochreous specks on it ; a very large black patch occupying nearly the whole inner half of outer area and conjoined to the irregular series of marking, and lunules on the margin. Hindwing fuscous-black, pale towards base ; cilia pale with a waved black line through them. Underside of forewing fuscous, the costa irrorated with ochreous, inner area ochreous, the cilia ochreous with double series of black spots. Hindwing ochreous with medial dark patch on costa ; postmedial series of specks ; a marginal black band, the cilia spotted with black.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 40 mm. *Type.*—In British Museum.

1890*a*. LEUCANIA LANIATA, n. sp. (Pl. A, Fig. 22.)

♂. Hindwing somewhat distorted ; the outer area on underside with veins 3 to 8 clothed with long down-curved hair.

Differs from *decisissima* in being brown and gray with no ferruginous tints. Hindwing with the basal and inner areas pale, the apical area fuscous; underside with the silvery suffusion terminated by the tufts of hair; no marginal series of specks. Hind legs with the black tufts very large.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 36 mm. *Type.*—In British Museum.

ACONTIINÆ.

1968*a*. DIPHTHERA CHRYSOCHLORA, n. sp.

Head and thorax golden-green; abdomen dark-brown, the anal tuft ochreous. Forewing golden-green with dentate whitish antemedial and postmedial lines with darker green lines between them, the antemedial line strongly dentate below cell, the postmedial at vein 4 and with darker green suffusion beyond it; a large quadrate dark green reniform spot; a series of whitish and green marginal lunules. Hindwing black-brown; the cilia ochreous.

Habitat.—Khàsis. *Exp.* ♀ 30, ♀ 32 mm.

1979*a*. BRYOPHILA EXCURVATA, n. sp.

♂. Head and thorax whitish, markedwith gray; abdomen gray. Forewing with the basal area gray, bounded by a dark line from costa before middle and running with an outward curve to the postmedial line on vein 1; the medial area whitish with the obscure orbicular and more prominent reniform stigmata outlined with white; a diffused blackish patch beyond the cell rufous exteriorly; a minutely dentate double postmedial curved line dentate inwards on vein 1; the margin whitish, with a triangular black patch below apex and series of striæ on the margin. Hindwing fuscous, with obscure discocellular lunule which on underside is prominent; an obscure curved postmedial line.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 30 mm. *Type.*—In British Museum.

1995*a*. ERASTROIDES FLAVIBASALIS, n. sp.

♂. Head, thorax, and abdomen pale brownish; patagia tipped with gray; dorsal tufts black. Forewing with the basal area pale suffused with orange; a black point at middle of cell and discocellular spot; costa gray with black spots; a medial black line joined at lower angle of cell by an oblique line from before middle of inner margin; the medial part of inner area golden-orange; the postmedial area silvery-

gray, largely marked with black and olive-green; indistinct, irregular, postmedial and submarginal lines, the latter with the area beyond it olive-green. Hindwing pale fuscous; cilia white at tips.

Habitat.—Khàsis. *Exp.* 22 mm. *Type.*—In British Museum.

2012*a*. HYELA LATIFASCIATA, n. sp.

♀. White, suffused with pale brown. Forewing with blackish mark at base of costa; a broad medial black-brown band occupying one-third of wing with sinuous white edges and expanding near inner margin, the white edge enclosing two discocellular black spots with a larger semi-circular spot beyond them; some white specks on costa towards apex; a minutely-waved submarginal white line; large diffused black patches near apex and on margin below middle. Hindwing fuscous.

Habitat.—Bombay. *Exp.* 18 mm. *Type.*—In British Museum.

2008*a*. HYELA BILINEATA, n. sp.

Ochreous-brown. Forewing with black-edged, minutely-waved, white ante-and postmedial lines, the former slightly angled on subcostal nervure and below the cell, the latter strongly excurved beyond the cell and angled inwards below vein 2; reniform white with two black points, the upper often obsolete. Hindwing tinged with fuscous.

Habitat.—Khàsis. *Exp.* 22 mm. *Type.*—In British Museum.

2038*a*. XANTHOPTERA FUSCITERMINATA, n. sp.

♀. Ochreous-yellow; palpi, antennæ, and anal tuft tinged with fuscous. Forewing with two dark specks on obsolescent rufous marks at base of costa; a small antemedial obsolescent triangular rufous mark on costa with traces of a line arising from it; a similar larger medial mark and traces of waved line; traces of a postmedial line excurved beyond cell; three black specks on costa towards apex; a marginal fuscous black band narrowing to apex and outer angle, with patches of leaden scales on it; its inner edge wavy and shading into diffused rufous, and with marginal series of black specks; cilia black. Hindwing suffused with fuscous; cilia fuscous-black; underside with discoidal black speck and curved postmedial line.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 22 mm. *Type.*—In British Museum.

2049*a*. XANTHOPTERA FISSISTIGMA, n. sp.

Ochreous; palpi blackish at sides. Forewing slightly suffused with brown and red; the orbicular white, oblique, with two streaks with gray between them from its lower end, the lower streak curved, and with a

diffused olive fascia with a black streak on it, from it to outer margin ; reniform indistinct ; an indistinct double sinuous postmedial line ; a red patch at outer angle with two black spots on its inner edge and with whitish between it and the olive streak; a marginal series of black spots. Hindwing slightly suffused with fuscous ; a discocellular lunule and dentate postmedial line distinct on underside.

Habitat.—Khàsis. *Exp.* 26 mm. *Type.*—In British Museum.

2101*a*. NARANGA SEMIOCHREA, n. sp.

Ochreous ; palpi and abdomen tinged with fuscous, the anal tuft ochreous. Forewing ochreous, slightly clouded with fuscous towards costa and reddish towards the obliquely-curved blue-gray line from middle of costa to inner margin near outer angle ; traces of an irregular antemedial line ; the outer area clouded with fuscous obliquely from apex to middle of curved line, leaving a paler triangular patch on costa. Hindwing paler, underside with discoidal fuscous speck and curved postmedial line.

Habitat.—Khàsis. *Exp.* 20 mm. *Type.*—In British Museum.

2101*b*. NARANGA ALBICINCTA, n. sp.

♂. Head and collar rufous and fuscous ; thorax and abdomen ochreous with slight fuscous tinge. Forewing with the basal area ochreous, diffused outwardly to lower angle of cell ; the rest of the wing red-brown clouded with fuscous and gray ; a pale discoidal spot on blackish patch ; a slightly-curved postmedial rufous line with diffused white band beyond it tinged with bluish-gray and narrowing to costa ; a curved black submarginal band widening to costa ; a marginal series of black spots. Hindwing fuscous.

Habitat.—Khàsis. *Exp.* 22 mm. *Type.*—In British Museum.

2101*c*. NARANGA CAUSTIPENNIS, n. sp.

♂. Forewing with the outer margin slightly excised below apex. Dark pinkish ; head, thorax, and extremity of abdomen tinged with fuscous ; the vertex of head whitish. Forewing with the basal half of costa tinged with fuscous ; the outer half with orange-brown ; an interrupted fine curved medial white line ; some black specks on costa towards apex ; a diffused black patch on outer area below apex ; cilia white at the excision. Hindwing fuscous ; the area near anal angle pink.

Habitat.—Khàsis. *Exp.* 16 mm. *Type.*—In British Museum.

2103*c*. RIVULA ACYGONIA, n. sp.

♂. Head and collar bright orange-brown ; thorax and abdomen fuscous-brown. Forewing fuscous with slight purplish-gray tinge ; the costal and outer margins orange-brown ; an obscure oblique antemedial line ; an ochreous spot at lower angle of cell ; a postmedial line defined by gray on outer side and very acutely angled below costa ; some white specks on costa towards apex ; an indistinct sinuous submarginal line. Hindwing fuscous ; both wings with fine pale marginal line.

Habitat.—Simla. *Exp.* 24 mm. *Type.*—In British Museum.

2106*a*. RIVULA BARBIPENNIS, n. sp. (Pl. A, Fig. 3.)

Hindwing of male with a large fold below the cell and vein 2 on upperside clothed with thick silky hair; vein 2 curved and arising from angle of cell. ♂. Only differs from *biatomea* in the hindwing being dark fuscous, leaving the base only pale.

Habitat.—Khàsis ; Puttalam, Ceylon (Pole). *Exp.* 22 mm. *Type.*—In British Museum.

2107*a*. TATHODELTA USTATA, n. sp.

♀. Forewing with the outer margin excised below apex and excurved at middle. Brick-red ; head and distal half of abdomen blackish. Forewing with crenulate, antemedial, medial, postmedial, and submarginal lines, the first two dark and indistinct, the two latter ochreous, the postmedial with black points on it, the submarginal angled outwards at middle and with fuscous patch beyond it above middle ; a black speck in cell ; some black suffusion on costa and pale specks towards apex ; a marginal series of black spots. Hindwing with straight antemedial black line and point in cell ; medial and postmedial crenulate ochreous lines, the latter angled outwards at middle and with black suffusion inside and beyond it from middle to inner margin ; a marginal series of black spots.

Habitat.—Khàsis. *Exp.* 24 mm. *Type.*—In British Museum.

2110*a*. PACHYLEPIS ALBILINEATA, n. sp.

Dark gray ; palpi and frons black ; vertex of head and shaft of antennæ above white. Forewing with irregularly dentate, antemedial, postmedial, and submarginal white lines, the postmedial excurved beyond cell and angled inwards below it ; a black discocellular spot ; some white specks on costa towards apex ; a marginal series of black

and white points. Hindwing with black discocellular lunule; irregularly dentate white medial line and traces of a submarginal line; a marginal series of black and white points.

Habitat.—Dharmsala (Hocking); Khàsis. *Exp.* 22 mm. *Type.*—In British Museum.

2129*a*. EUBLEMMA SILICULA, Swinh., A.M.N.H. (6), XIX, p. 167.

Ochreous-white with a slight pinkish tinge. Forewing with fuscous antemedial, medial, and postmedial specks on costa with indistinct sinuous lines arising from them and obtusely angled below costa; some white specks on costa towards apex; a pinkish apical spot with two fuscous points below it on the indistinct dentate submarginal line. Hindwing with traces of waved antemedial, medial, and postmedial lines. The medial line of forewing, becoming antemedial on hindwing, sometimes prominent.

Habitat.—Allahabad; Karachi; Burma. *Exp.* 20 mm.

2131*a*. EUBLEMMA AGRAPTA, n. sp.

♂. Head and collar fulvous; thorax pale pinkish; abdomen whitish. Forewing pale, pinkish, irrorated with a few dark scales; a fine indistinct line from costa beyond middle, very acutely angled below costa, then very oblique to middle of inner margin; a submarginal series of black specks; a fulvous marginal line. Hindwing whitish.

Habitat.—Puttalam, Ceylon (Pole). *Exp.* 20 mm. *Type.*—In British Museum.

2139*a*. ZUROBATA ALBISCRIPTA, n. sp.

♀. Reddish-brown, irrorated with fuscous; thorax mixed with white scales. Forewing with bluish-gray irroration on costa and beyond end of cell; a white fascia on medium nervure joined by an oblique line from near base of inner margin and forming a white patch in end of cell, then running in a curve beyond discocellulars to upper angle and enclosing the dark discocellular spot; a postmedial white line oblique from costa to vein 6, straight to vein 4, where it is retracted to lower angle of cell, then oblique to inner margin; some white specks on costa towards apex; two oblique white sub-apical streaks; a white streak on vein 6 from upper angle of cell; a series of white strigæ on margin and spot above outer angle. Hindwing fuscous-brown with darker marginal line.

Habitat.—Khàsis. *Exp.* 22 mm. *Type.*—In British Museum.

2141*a*. ZUROBATA USTULA, n. sp.

Fulvous-yellow; palpi fuscous; abdomen tinged with fuscous towards extremity. Forewing suffused with red, irrorated with black and tinged in places with fuscous, especially on costa, inner margin and outer area; traces of antemedial, medial, postmedial, and submarginal minutely dentate red lines; two discocellular black specks and a marginal series. Hindwing suffused with red and with fuscous on apical area; two discocellular black specks and traces of antemedial, medial, postmedial, and submarginal dentate red lines, the postmedial with some black specks on it; a marginal series of black specks.

Habitat.—Ceylon (Pole); Andamans. *Exp*. 20 mm. *Type*.—In British Museum.

2147*c*. MIMORUZA PICTALIS, n. sp.

♂. Head and thorax white; palpi and antennæ tinged with rufous; abdomen pale rufous with black dorsal point on anal segment. Forewing with the basal area cream-colour; an obscure waved antemedial line; a black point in cell and two on discocellulars; a medial line sharply bent outwards to discocellulars, the area beyond it olive-brown to the postmedial line, which is white, oblique to vein 6, then dentate and at vein 3 retracted to below end of cell; a triangular olive-brown patch beyond it on costa with three white points on it and gray suffusion below vein 4 to the submarginal line which is whitish with two deep red teeth at middle, below and above which it is incurved; a fine white marginal line; cilia brown with black patch at middle. Hindwing with the base cream-colour; a rufous antemedial line bent outwards to inner margin; a black discocellular point; outer half of wing olive-gray; white medial and postmedial lines, the former sinuous, the latter strongly angled outwards at middle and bent outwards to anal angle; a fine white marginal line and slight submarginal mark towards anal angle.

Habitat.—Khàsis. *Exp*. 24 mm. *Type*.—In British Museum.

2148*a*. ORUZA TRITONIA, n. sp.

♂. Tarsi not fringed with hair. Red-brown; head blackish; abdomen at extremity and wings slightly suffused with fuscous. Forewing with the costa white with black points on it; an indistinct waved fuscous antemedial line; a black discocellular spot sometimes with white

centre; a fuscous waved postmedial line, strongly angled below costa, then oblique, and angled below vein 2; an indistinct dentate submarginal line. Hindwing with discocellular speck; sinuous medial line and indistinct dentate postmedial and submarginal lines; both wings with prominent marginal series of black points.

Habitat.—Khàsis. *Exp.* 44 mm. *Type.*—In British Museum.

SARROTHRIPINÆ.

2198*a*. PLOTHEIA ELONGATA, n. sp.

♀. Head ochreous and fuscous; thorax olive-green and fuscous; abdomen fuscous. Forewing olive-green; an indistinct double-waved antemedial line; traces of a waved medial line; the orbicular represented by a raised tuft; the reniform with raised scales on its edges; the postmedial line very oblique from costa to vein 7, then minutely dentate, sharply bent inwards below vein 2, and with two small tufts of raised scales above inner margin; some black spots on costa towards apex; traces of a submarginal line with rufous tufted spots in it below vein 7; cilia brown and fuscous. Hindwing fuscous, the cilia pale brown.

Habitat.—Khàsis. *Exp.* 46 mm. *Type.*—In British Museum.

2208*a*. ARACHNOGNATHA METASCOTIA, n. sp.

Head, collar, and patagia olive-green, the last tipped with black; thorax fuscous; abdomen fuscous-brown. Forewing olive-green with indistinct irregular antemedial, medial, postmedial, and submarginal dark lines, the two last strongly dentate, slightly defined with white towards costa and with a dark streak between them below costa; the orbicular represented by raised black scales; the reniform large, rounded, and with fuscous centre, a marginal series of dark specks. Hindwing fuscous-brown with black and white ocellate mark at anal angle. Fore tibiæ tufted with hair.

Habitat.—Khàsis. *Exp.* ♂ 34, ♀ 38 mm. *Type.*—In British Museum.

2218*d*. BARASA MARGINATA, n. sp.

♂. Head and thorax gray and fuscous; abdomen brownish. Forewing gray and fuscous, the basal half suffused with brown; an indistinct double-curved antemedial line; orbicular round and black-edged; reniform black-edged and attenuate; an indistinct highly dentate double postmedial line incurved below vein 2, then bounding the brown area; a sinuous submarginal line with some fuscous suffusion on its inner side

and a black speck below vein 2. Hindwing white with broad black marginal band from costa to vein 2, and a spot at vein 1.

Habitat.—Puttalam, Ceylon (J. Pole). *Exp.* 24 mm. *Type.*—In British Museum.

2218*a*. BARASA METALOPHOTA, n. sp.

Hindwing of male with fringe of hair below the cell on underside. Forewing with the areole very short; mid and hind tibiæ fringed with long hair. Head and thorax gray and black; collar rufous; abdomen brownish with black dorsal tuft at base. Forewing whitish irrorated with black; diffused patches of brown and black on basal area; an antemedial sinuous black line very oblique from costa to vein 2, on which it runs out to a narrow loop, then sharply retracted tomedian nervure; reniform large black-edged and with a black lunule on olive centre; the postmedial line double, waved, very much bent outwards beyond the cell then retracted to the loop of antemedial line, some fuscous beyond it on inner margin; some patches of fuscous on outer half of costa and on outer margin towards apex; a sinuous submarginal series of black spots and a marginal series. Hindwing brownish-fuscous.

Habitat.—Khàsis. *Exp.* 30 mm. *Type.*—In British Museum.

2235*a*. HYPOTHRIPA POLIA, n. sp.

♂. Gray. Forewing with two waved antemedial lines slightly angled inwards below median nervure and obsolescent towards inner margin; an oblique medial line, slightly incurved; a discocellular speck; the postmedial line strongly excurved beyond cell and minutely dentate; an irregularly-waved submarginal line. Hindwing fuscous.

Habitat.—Khàsis. *Exp.* 22 mm. *Type.*—In British Museum.

Genus DILOPHOTHRIPA, nov.

Type.—*D. chrysorrhœa*, Hampson.

Range.—Assam.

Palpi upturned; the second joint broadly scaled; the third well developed and naked; antennæ of male minutely ciliated; abdomen with large double anal tuft. Forewing narrow; the costa arched towards apex; the outer margin oblique; vein 7 from cell, 8, 9 and 10 stalked from well before angle. Hindwing with the outer margin

Dilophothripa chrysorrhœa + ♂.

excised toward anal angle, where there is a large tuft of hair on upperside in male; a fold below costa containing a large tuft of hair; the costal and subcostal nervures bent downwards; veins 3 and 4 stalked; 5 absent; 6 and 7 from upper angle.

2249*a*. DILOPHOTHRIPA CHRYSORRHÆA, n. sp.

♂. Dark olive-brown; abdomen paler, with the anal tufts fulvous-yellow. Forewing suffused in parts with fuscous; with sub-basal, antemedial, postmedial, and submarginal irregularly dentate black lines defined by paler colour; three medial black points between the cell and vein 1, and two on discocellulars; some dark marks beyond the pale line defining the submarginal line; a marginal series of black points. Hindwing fuscous-brown with the tuft of hair at anal angle black.

Habitat.—Khàsis. *Exp.* 24 mm. *Type.*—In British Museum.

EUTELIINÆ.

2271*a*. EUTELIA HARMONICA, n. sp. (Pl. A, Fig. 4).

♂. Ochreous suffused with reddish and fuscous-brown; palpi and frons black; collar with paired black spots; abdomen dorsally suffused with fuscous, and with paired lateral black specks. Forewing with indistinct very irregularly dentate brown sub-basal line, with black patch inside it on costa; a similar medial line bent inwards to costa and with discoidal spot on it; a pale patch from first line through the cell to postmedial line, which is obscure and minutely dentate with long dentate pale marks with dark streaks on them crossing it below costa; a rather obscure dentate submarginal line. Hindwing with the basal half pale with discoidal spot and traces of waved medial line; the outer area fuscous. Underside with discoidal spots prominent, and traces of three or four waved postmedial lines.

♀. With complete blackish band before sub-basal line of forewing.

Habitat.—Sikhim, 1,800 feet (Dudgeon); Nilgiris, 6,000 feet (Lindsay). *Exp.* 30 mm. *Type.*—In British Museum.

STICTOPTERINÆ.

2280*a*. RISOBA DIPHTHEROIDES, n. sp.

Head and thorax green, slightly mixed with white; palpi black; abdomen fuscous tinged with green, the penultimate segment with a black line. Forewing pale blue-green; the basal half suffused with olive-green; a white spot at base below median nervure; an irregularly

waved black antemedial line ; traces of a medial line ; the orbicular a small white ring ; the reniform olive with black edge and central point ; a postmedial waved black line arising from a black mark on costa and very much bent outwards beyond the cell ; and irregular submarginal line angled inwards at vein 5, and incurved below vein 2 ; ome olive on outer edges of postmedial and submarginal lines ; a black mark on outer margin below apex ; cilia intersected with black. Hindwing fuscous, the basal half whitish below and with discocellular black lunule.

Habitat.—Khàsis. *Exp*. 30—38 mm. *Type*.—In British Museum.

2293*a*. SADARSA ARCUATA, n. sp. (Pl. A, Fig. 19.)

♂. Forewing with the costa very highly arched, the outer margin rounded ; the areole and subcostal veins bent upwards ; the median nervures contorted, the submedian fold bent upwards to the cell before middle. Gray-brown with a greenish tinge. Forewing with blackish sub-basal bar from costa ; traces of numerous minutely-waved lines with dark marks on them on inner margin towards outer angle ; some dark specks on costa towards apex ; a submarginal series of dark specks and marginal series of striæ. Hindwing fuscous.

Habitat.—Sikhim (Dudgeon) ; Khàsis ; South-east Borneo (Doherty). *Exp*. 30 mm. *Type*.—In British Museum.

2294*a*. GYRTONA CAMPTOBASIS, n. sp. (Pl. A, Fig. 20.)

♀. Head and thorax variegated olive-green and dark-brown ; abdomen fuscous with black dorsal tuft. Forewing with the costa slightly arched at base, variegated olive-green and brown, the base brown ; a sub-basal blackish patch between costa and median nervure ; an antemedial fuscous line ; two small tufts of raised scales below the cell and some near end of it ; two medial lines angled at middle and with a pale patch between them below the cell ; three or four obliquely-curved lines on outer area with small dentate black marks on them ; a blackish patch on costa towards apex ; a marginal series of black lunules and a series of black specks on the cilia. Hindwing fuscous.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp*. 30 mm. *Type*.—In British Museum.

GONOPTERINÆ.

2324*a*. CAPOTENA TRIGONIPHORA, n. sp.

Differs from *truncata* in the head being dark olive-green. Forewing with the ante- and postmedial lines meeting and terminating below vein 2, enclosing a triangular dark olive-green patch.

Habitat.—Khàsis. *Exp*. 36 mm. *Type*.—In British Museum.

QUADRIFINÆ.

2350*a*. TRISULOIDES GLAUCA, n. sp.

♂. Antennæ minutely ciliated; palpi, frons and thorax black and white; vertex of head and collar pure white; abdomen blackish with some white hairs at base and in dorsal tufts. Forewing silky olive-green, some black and white at base; a waved antemedial black line with white on its inner edge and some pale brown marks on each side of it in cell; orbicular small, round and white; reniform lunulate, white with black centre, and a yellowish spot beyond it; an irregularly crenulate black postmedial line bent outwards beyond cell and with white on its outer edge; two white specks on costa towards apex; an irregularly dentate submarginal line angled outwards to the margin below apex and at middle; the area beyond it cream-colour and brown; cilia intersected with white. Hindwing orange-yellow; the outer area black narrowing to anal angle; some white on margin below middle; cilia intersected with white; underside with the basal part of forewing orange; reniform orange, emitting a streak outwards; a postmedial white spot on costa; outer area white except at apex. Hindwing black, irrorated with white; inner area yellowish.

Habitat.—Khàsis. *Exp*. 40 mm. *Type*.—In British Museum.

2439*a*. POLYDESMA LEPROSA, n. sp.

Head white with a rufous tinge; palpi and antennæ rufous; tegulæ white edged with rufous; thorax white with some rufous on metathorax; abdomen fuscous and ochreous. Forewing dark rufous, with a large white basal patch conjoined to orbicular and reniform patches extending up to costa and along it to apex, leaving small rufous spots on costa, larger towards base; a white spot on margin below apex and sometimes one at outer angle. Hindwing fuscous, pale towards base. The basal, orbicular and reniform patches of forewing sometimes disconnected.

Habitat.—Khàsis. *Exp*. 32 mm. *Type*.—In British Museum.

2550*a*. PLECOPTERA TRIMACULATA, n. sp.

Dark gray ; head and collar bright rufous. Forewing slightly irrorated with black ; an obliquely-waved antemedial rufous line arising from a dark rufous spot on costa ; reniform rufous, conjoined to a patch on costa ; a minutely-waved postmedial line touching lower end of reniform and sharply dent back to it below costa ; a patch on costa before apex and some pale specks ; traces of a sinuous submarginal line. Underside of forewing with the costa ochreous with small black medial spots ; hindwing ochreous, irrorated with black ; a discoidal spot ; both wings with postmedial series of points, indistinct on forewing.

Habitat.—Khàsis. *Exp.* 34 mm. *Type.*—In British Museum.

2603*a*. THERMESIA NIGRIPALPIS, n. sp.

Palpi with the third joint longer than the second and broadly fringed with hair above. ♀. Olive yellow-brown ; head black ; fore- and mid-legs black in front. Forewing very slightly clouded with fuscous ; the costa fulvous-yellow ; an indistinct curved sinuous antemedial line with black specks on it in and below cell ; an indistinct pale reniform stigma ; both wings with nearly straight oblique postmedial line defined on outer side by fulvous-yellow ; an indistinct crenulate submarginal line ; a marginal series of fuscous specks and fulvous-yellow line at base of cilia. Underside tinged and irrorated with fuscous ; both wings with discoidal black lunules, curved postmedial line and fine marginal line.

Habitat.—Khàsis. *Exp.* 46 mm. *Type.*—In British Museum.

FOCILLINÆ.

2718*a*. MECODINA OBSCURATAS, Swinh., A.M.N.H. (6), xix, p. 168.

♂. Head, thorax, and abdomen pale-brown, slightly tinged with fuscous. Forewing pale brown, slightly tinged with fuscous ; a black speck on discocellulars ; an obscure fuscous band from lower angle cell to inner margin ; an indistinct postmedial irregularly dentate line bent inwards to costa ; a diffused submarginal fuscous band ; a marginal series of black specks. Hindwing with fuscous antemedial shade, postmedial line and diffused submarginal band ; a marginal series of black specks.

♀. Darker and more suffused with fuscous.

Habitat.—Jaintia Hills, Assam. *Exp.* 64 mm.

2727*a*. ZETHES PALLIDICOSTA, n. sp.

♂. Head fuscous-brown; the vertex whitish; thorax and base of abdomen yellowish-white; the collar and a patch on metathorax dark brown; medial part of abdomen fuscous; extremity brown. Forewing with broad whitish costal fascia becoming fuscous at costa, expanding to base of inner margin and defined by an oblique black sub-basal line; an oblique postmedial band, fulvous inwardly, whitish outwardly, the two colours divided by a black line; a white discocellular speck; a submarginal series of white specks with small wedge-shaped black marks inside them, and crossed at middle by a black streak. Hindwing fuscous, with medial straight line defined by whitish on outer side; an indistinct pale minutely-waved submarginal line; underside pale with black discocellular spot and medial line.

Habitat.—Khàsis. *Exp*. 30 mm. *Type*.—In British Museum.

2731*a*. ZETHES ALBISTIGMA, n. sp.

Head and thorax gray, pencilled with brown; abdomen reddish-brown with black segmental lines; wings ochreous-white variegated with gray, red-brown, and blackish scales. Forewing with the gray almost confined to the costal and inner areas; an antemedial dark brown line, oblique from costa to median nervure; a black spot in cell; a sinuous medial line, with the dark-centred white reniform on its outer edge; the postmedial line excurved from costa to vein 5, then incurved and sinuous; a crenulate submarginal line with white lunules on it below apex; outer area suffused with dark and red-brown. Hindwing with oblique antemedial line; a discocellular line with two white spots on each side of it; the postmedial line slightly angled beyond cell and with rufous suffusion beyond it; a crenulate submarginal line with series of white lunules on it; veins of outer area dark; both wings with dark marginal line.

Habitat.—Khàsis. *Exp*. 30 mm. *Type*.—In British Museum.

2732*a*. ZETHES DISCOSTICTA, n. sp.

♂. Brown irrorated with black; vertex of head and thorax tinged with gray. Forewing with the costal area tinged with gray, widening towards base of inner margin; an obscure curved dentate antemedial line; black points at middle of cell and on discocellulars; a fine rufous postmedial line acutely angled below costa and below vein 4, then

extremely oblique to inner margin before middle, a prominent black spot beyond it on vein 5, then a fuscous shade to inner margin; traces of a waved submarginal line and marginal series of brown spots. Hindwing with antemedial fuscous shade; a medial brown line; a postmedial series of brown points with obscure diffused line beyond them; an obscure diffused submarginal line. Underside of both wings with discoidal points and strongly crenulate dark postmedial line.

Habitat.—Khàsis. *Exp.* 40 mm. *Type.*—In British Museum.

2739*b*. ZETHES LAHERA, Swinh., A. M. N. H. (6), xix, p. 169.

♂. Ferruginous red-brown; wings irrorated with a few black scales. Forewing with the basal area darker red, bounded by a fine sinuous gray line and traversed by an obscure red line; traces of an irregularly-waved medial line; reniform large indistinct oblique, with white mark on its outer edge; a sinuous postmedial gray line edged by ferruginous, very oblique from costa to vein 4, where it is obtusely angled and with bright ferruginous between it and reniform; a submarginal gray line oblique from costa to above angle of postmedial line, then bent outwards and dentate; some pale specks on costa towards apex; a series of black points just inside the margin. Hindwing with some black scales on discocellulars; an indistinct minutely waved gray medial line bent outwards at vein 4 and edged by ferruginous towards inner margin; an indistinct dentate submarginal line with ferruginous mark on it and another above it near anal angle; a series of black points just inside the margin.

Habitat.—Donaut Hills, Tenasserim; Singapore. *Exp.* 40 mm.

2739*c*. ZETHES LEPRAOTA, n. sp.

♀. Ferruginous red-brown; frontal tuft, thorax (except collar), and the greater part of abdomen, pale gray; wings irrorated with black. Forewing with oblique sub-basal gray-white band with sinuous outer edge; orbicular and a spot on costa gray, conjoined to an oblique medial band; an indistinct pale dentate postmedial line, angled below costa and conjoined to the very large apical gray-white patch, then bent inwards and incurved with a white spot on it below vein 2; a sinuous submarginal series of spots, obscure and whitish on the apical patch, then black; two white specks on costa towards apex and a dark speck on apical patch. Hindwing with the base grayish-white; a postmedial white line dentate on veins 4 and 3 and angled outwards near anal

angle; the area beyond it gray from vein 4 to anal angle, with a rufous spot below vein 2.

Habitat.—Khàsis; Singapore. *Exp.* 36-50 mm. *Type.*—In British Museum.

2740*a*. ZETHES VIRIDICINCTA, n. sp.

Palpi with the third joint short and porrect, the second slightly fringed with scales at extremity above. ♀. Gray-brown with a slight pinkish tinge; vertex of head, collar, and patagia mixed with green scales. Forewing slightly irrorated with black; a waved green antemedial line with obscure brown line on its inner side; reniform edged with blackish on a diffused gray patch; a double-waved green postmedial line; an obscure sinuous submarginal line angled outwards at middle, the area beyond it green, and with slight white points on it towards costa; a marginal series of dark points. Hindwing with blackish points at angles of cell; a waved medial green line and marginal series of dark points.

Habitat.—Khàsi. *Exp.* 30mm. *Type.*—In British Museum.

2742*a*. ZETHES PECTINIFER, n. sp. (Pl. A., Fig. 21.)

Antennæ of male bipectinate. ♂. Dark grayish-brown. Forewing with traces of sub-basal line; a medial line very oblique from costa to middle of cell, where it is obtusely angled, then erect; the postmedial line similar, but waved below the angle, where there is a discoidal white lunule with small ochreous spot beyond it; some white specks on costa towards apex; an irregularly sinuous submarginal line. Hindwing with white medial line angled at middle, and with band of ochreous specks beyond it from angle to inner margin.

Habitat.—Calcutta. *Exp.* 22 mm. *Type.*—In British Museum.

2750*a*. EGNASIA EXCISA, n. sp.

♀. Gray-brown with a slight reddish tinge; wings slightly irrorated with black. Forewing with the outer margin very deeply excised between veins 6 and 4; waved antemedial, medial, and postmedial lines, the first excurved below costa, the second indistinct and excurved round the indistinct gray discocellular lunule with two black points on it, the third oblique below costa and excurved round end of cell; some pale specks on costa towards apex and traces of a series of black submarginal specks. Hindwing with two discocellular black points; an indistinct curved rufous antemedial line, minutely crenulate medial line,

prominent straight oblique yellow and rufous postmedial line ; an indistinct submarginal series of black points ; cilia of both wings rufous with fine black line at base and near tips, which are gray.

Habitat.—Khàsis. *Exp.* 34 mm. *Type.*—In British Museum.

2753*a*. EGNASIA VENUSTA, n. sp.

♀. Chocolate-brown ; head and thorax clothed with dark and pale brown scales ; a large metathorax tuft ; abdomen with tuft on first segment. Forewing with the base dark and red-brown with bright ferruginous spots below cell, and on inner margin ; a black speck in cell ; a waved fuscous medial line angled below costa; reniform olive-green with fine blue and black edge, and with olive-green and pale yellow oblique fascia from it to apex ; postmedial line fine, black and yellow, sinuous and sharply incurved towards the reniform, then oblique ; an indistinct waved submarginal line incurved towards the reniform; a subapical black lunule and series of black points just inside the margin. Hindwing with oblique antemedial line ; black speck at lower angle of cell ; sinuous black and yellow postmedial line ; obscure waved submarginal line with black marks on it near anal angle ; a series of black points just inside the margin.

Habitat.—Khàsis. *Exp.* 36 mm. *Type.*—In British Museum.

2763*b*. CAPNODES LACTEICOSTA, n. sp. (Pl. A, Fig. 23.)

♂. Head reddish ; collar yellowish-white ; thorax and abdomen dark red ; the latter with the last three segments whitish ; wings dark red. Forewing with broad yellowish-white costal fascia ; a large oblique whitish reniform stigma ; an incurved whitish postmedial line angled below costa and at vein 5, with a large yellowish-white patch beyond it, covering the whole outer area except a triangular red patch on outer margin below apex, the patch bounded above by yellowish, and traversed by a whitish line parallel to the postmedial line, and another submarginal and strongly incurved below vein 2. Hindwing with a similar large patch on anal half of outer area, and a small whitish apical patch.

Habitat.—Ukuwella, Ceylon. *Exp.* 24 mm. *Type.*—In British Museum.

2771*a*. DIOMEA LICHENOSA, n. sp.

♂. Head and collar chestnut ; thorax and abdomen dark red-brown ; a tuft of large metallic black scales on metathorax. Forewing dark fuscous red-brown wholly suffused, except the basal and apical areas, and a small patch at outer angle with pale bluish-gray (fading to dirty gray) and bounded by the highly-curved minutely-waved

postmedial line ; a discocellular speck. Hindwing fuscous red-brown irrorated with black ; costal and inner area whitish ; a large irregular bluish-gray patch beyond lower angle of cell running almost to anal angle ; some long erect hairs below end of cell. Underside wholly suffused with pale ochreous.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 24 mm. *Type.*—In British Museum.

2773*a*. RAPARNA FERRILINEATA, n. sp.

♂. Gray-brown irrorated with black scales ; head ferruginous ; anal tuft tinged with ferruginous. Forewing with straight, nearly erect ferruginous ante- and postmedial lines ; costa narrowly fulvous, with two black specks towards apex. Hindwing suffused with fuscous. Underside ochreous tinged with fulvous and irrorated with black ; disk of forewing fuscous ; a fuscous postmedial line. Hindwing with discocellular speck.

Habitat.—Khàsis. *Exp.* 26 mm. *Type.*—In British Museum.

2774*a*. RAPARNA STIGMATILIS, n. sp.

Dark brown ; head, thorax, and forewing with a yellow tinge ; the last with the inner basal area suffused with yellow ; ante- and postmedial waved lines with pale edges, the former angled inwards on median nervure and vein 1, the latter strongly bent outwards beyond cell and slightly angled outwards on vein 1 ; a black speck in cell and yellow discocellular lunule ; an indistinct sinuous submarginal line with slight yellow marks on it ; some yellow specks on costa towards apex and a marginal series. Hindwing and abdomen dark fuscous.

Habitat.—Khàsis. *Exp.* 28 mm. *Type.*—In British Museum.

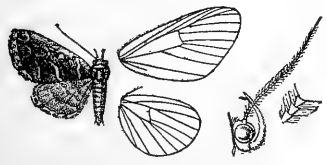
DELTOIDINÆ.

Genus APHORISMA, nov.

Type.—*A. albistriata* (Hampson).

Range.—Assam.

Palpi upturned ; the second joint smoothly scaled and reaching far above vertex of head ; the third with triangular tuft on inner side ; antennæ of male with bristles and fasciculate cilia. Forewing with veins 3 and 5 from close to angle of cell ; 6 from ♂. Below upper angle ; 7, 8, 9, and 10



Aphorisma albistriata ½.

stalked. Hindwing with veins 3 and 4 from angle of cell; 5 from just above angle; 6 and 7 stalked.

2808*a*. APHORISMA ALBISTRIATA, n. sp.

♂. Head, thorax, and abdomen ochreous, strongly irrorated, and the last banded, with black. Forewing almost entirely suffused with black, leaving the costa ochreous irrorated with black; a slight ochreous mark at base of median nervure; fine ante- and postmedial black lines angled below costa; the former defined by white on inner side and angled inwards on median nervure, the latter defined by white on outer side, angled inwards beyond discocellulars and excurved at median nervure; a subtriangular white spot in cell and ochreous points with short white streaks beyond them at the two angles; traces of an irregularly sinuous pale submarginal line. Hindwing fuscous, with waved medial and postmedial black lines defined by whitish; both wings with fine black marginal line. Underside much more ochreous irrorated with black; forewing with the orbicular and reniform, and a sinuous submarginal line, prominent; hindwing with discocellular lunule, and waved postmedial and submarginal lines.

♀. With the markings more ochreous.

Habitat.—Khàsis. *Exp*. 26 mm. *Type*.—In British Museum.

(*To be continued.*)

A NEW *CURCUMA* FROM THE DECCAN.

By D. Prain.

(*With a Plate.*)

(*Read before the Bombay Natural History Society on 6th Dec.*, 1897.)

Some time ago Mr. N. B. Ranade, * in charge of the Poona Herbarium, during the absence, on leave, of Mr. Woodrow, sent to the Royal Botanic Gardens, Calcutta, some rhizomes of *Kaempferia scaposa*, a scitamineous plant peculiar to Western India. Mixed with these rhizomes were some tubers evidently of a *Curcuma*. These latter were potted at the same time as the *Kaempferia*, and one of the resulting plants has just flowered.

The species proves different from any of those described in Sir J. D. Hooker's "Flora of British India," Vol. VI, 209—216, where Mr. Baker deals with the Indian *Curcumas*. A description of the plant, as nearly as possible parallel to the descriptions of the others drawn up by Mr. Baker, is herewith offered, in the hope that it may be of use to those members of the Bombay Natural History Society who are in the habit of consulting the "Flora of British India" in the field.

§ II. Mesantha. Horan. *Flower-spike* autumnal, in the centre of the tuft of leaves; bracts not recurved at the tip.

16b. Curcuma Ranadei *Prain*; rootstock small, sessile tubers o; petiole rather long; leaves large thin ovate-lanceolate, cuneate at base, acuminate at tip; flower-bracts green faintly tinged with pink at their tips, those of the coma few mauve-purple; flowers bright yellow, considerably longer than the bracts.

Deccan: Poona, *Ranade*! The plants were raised from tubers sent to Calcutta, where one flowered in the Royal Botanic Garden, September, 1897.

Rootstock bearing numerous small almond-like tubers at the ends of fibres, the tubers compressed, pure white within. *Leaves* thin, blade 8 in. long, 4 in. wide, uniform green, stalk 8-15 in. long. *Spike* autumnal, central; the peduncle 4 in. long embraced by leaf-sheaths; the head narrowly oblong, 2 in. long, 1 in. across, with flower-bracts rather narrow 1·25 in. long, ·6 in. wide, with an acute slightly pink tip, elsewhere pale green; those of the coma lanceolate, 35 in. wide, the lowest with purple edges only, the upper more or less uniformly mauve-purple. *Flowers* large, 1·75 in. long, projecting beyond the

* Mr. N. B. Ranade died at Poona on 15th October, 1897.

bracts ; staminode and lip uniformly bright yellow, sub-equal, both orbicular and deeply two-lobed, lobes rounded obtuse.

This interesting plant is very distinct from any of the others of its section described in the "Flora of British India." From *C. attenuata*, *C. Amada*, *C. longa* and *C. montana* it differs in having the tubers at the ends of fibres. From *C. albiflora* and *C. oligantha* it differs in having a coma of barren bracts at the top of the spike. From *C. reclinata* and *C. decipiens*, with which, especially the latter, it agrees as to tubers, it differs in foliage, and in colour and size of flowers ; both have flowers shorter than the bracts, those of *C. reclinata* being reddish-yellow, those of *C. decipiens* being purple. The nearest to our plant is a Burmese species, *C. plicata* ; that species, however, has firmer leaves and much smaller paler flowers. The most remarkable feature about the plant is that the flower-spike, the bracts, both fertile and barren, and the flowers themselves are hardly distinguishable from those of *C. angustifolia* in size, colour or shape. The tubers of *C. angustifolia* are, however, fusiform (circular when cut across), and not almond-shaped (narrowly elliptic in cross-section), and there is of course a radical difference between the two in time and mode of flowering ; *C. angustifolia* is a spring-flowering species with the flower-spike distinct from the leafy shoot and developed before the leaves appear ; in *C. Ranadei* the leaves and flowers appear together, the flower-spike being in the centre of the tuft of leaves, and appearing in autumn, not in spring. The leaves, moreover, differ considerably, those of *C. angustifolia* having longer, narrower blades and shorter stalks.

The species is named in honour of Mr. Ranade, whose praiseworthy work as Herbarium Assistant at Poona, first under Dr. T. Cooke and later under Mr. Woodrow, was well known to Indian botanists, and whose untimely death we all deplore.

EXPLANATION OF PLATE.

CURCUMA RANADEI, *Prain.*

1. Plant of *Curcuma Ranadei* : *one-sixth natural size.*
2. Ditto showing two tubers and one leaf: *nat. size.*
3. Tuber of *C. Ranadei*, cut across : *nat. size.*
4. Portion of flower, laid open, showing stamen and pistil: *nat. size.*

D.N. Chaudhari. delt.

A.L. Singha. Lith.

CURCUMA RANADEI Prain.

NOTE ON SOME SPECIES OF *COLIAS* FOUND IN LADAK.

By H. J. Elwes, F.R.S.

(*Read before the Bombay Natural History Society on 6th Dec.*, 1897.)

In a small collection of butterflies recently made by Mr. J. C. White, C.E., Political Officer, Sikkim, which were evidently taken at some great elevation on or near the Tibet-Sikkim frontier, were a pair of a small *Colias* which I believe to be very closely allied to, if not identical with, *Colias stoliczkanus*, Moore, which was described from specimens collected north of Chang-la, 17,000 feet, Ladak. I have one of the original specimens of this species from Stoliczka's collection given to me many years ago by Baron Felder, and a number of others taken on the Khardong Pass, 15,000 to 17,000 feet in August, 1889, by McArthur. I had long been disposed to consider these as a dwarf pale form of *C. eogene*, Felder, of which I have many specimens from various parts of the N.-W. Himalaya, Zogi-la Pass, Kashmir, 11,300 feet (*de Nicéville*); Shigri, Lahoul, August, 1884, 13,000 feet (*Grahame Young*); Baralacha, Lahoul, August, 1888 (*McArthur*); Skoro-la, Baltistan, July, 1887 (*Leech*); besides several pairs from Karategin and Hunza in the Pamirs (*Groum Grshimailo*). These specimens vary considerably in size and brilliancy of colour, especially in the female sex, some of which are of a very bright deep pink with very broad dark borders, and others are pale dull pink or orange. On examining the very fine series of both these species in Mr. Leech's collection, taken by himself and McArthur in various parts of Ladak, I find undoubted specimens of *C. eogene* also taken at the Khardong Pass by McArthur, and though some of the specimens appear intermediate in size and colour between the two, so that I thought they might be hybrids, yet I am now inclined to believe that *C. stoliczkanus* may be looked upon as a good and distinct species. The best means I know of distinguishing the two species is the underside, which in *C. stoliczkanus* has the inner area of the hindwing in both sexes of a darker green colour, and a submarginal band of dark spots, better defined and more conspicuous than in *C. eogene*. The pair from Sikkim agree perfectly on the underside with those from Ladak, but the male shows on the black margin of both wings above some indication of pale spots as in the female. In Mr. Leech's collection I also found four males and five females of a *Colias* which

appears to have been hitherto overlooked, and which I take to be the Ladak form of *C. nastes*, Boisduval. This very widely distributed species occurs in some form or other in many parts of the world, either at great elevations or in an arctic climate. I have it from Labrador ; in quantities from the mountains of Lapland, where it appears to hybridize with *C. hecla*, Lefebvre; from the Rocky Mountains of Alberta, where it occurs above timber-line in the Bow River valley ; from near Fort Churchill in Hudson's Bay under the name of *C. moina*, Strecker ; and from the Pamir of Central Asia at 16,000 feet under the name of *C. cokandica*, Erschoff. *C. nebulosa*, Oberthür, from Ta-tsien-lo, also seems to belong to the *nastes* group. The males of this new form, which I propose to call *C. nastes*, var. *leechii*, are more lemon-coloured than in either form of *C. nastes* above-mentioned, and at first sight might be taken by a casual observer for *C. ladakensis* Felder, which also occurs in Ladak, but the females, which are much like those of *C. cokandica*, Erschoff, are of a very pale yellowish-white, whereas the females of *C. ladakensis* are of a brighter yellow than the males. They may easily be distinguished from *C. sieversi*, Groum Grshimailo, and *C. sifanica*, Groum Grshimailo, by the smaller size and conspicuous markings of the hindwing and underside, and from *C. montium*, Oberthür, which they very closely resemble, in the colour of the upperside in both sexes and by the dark basal area of the hindwing below.

Thus it seems that we have in the British Trans-Himalayan region the following species of *Colias*, namely :—

C. eogene, Felder,
C. stoliczkanus, Moore,
C. ladakensis, Felder, and
C. nastes, var. *leechii*, Elwes.

Mr. McArthur, to whom I wrote on the subject of a possible interbreeding between *C. eogene* and *C. stoliczkanus*, writes as follows :— " Both *Colias eogene* and *C. stoliczkanus* I found very local on the mountain-side leading to the Khardong Pass. They overlapped each other in this way ; I was busy with *C. stoliczkanus* and would now and again capture one *C. eogene*. Higher up the mountain, say 800 feet, *C. eogene* was common and *C. stoliczkanus* rare, the intermediate ground producing a few of each species, the headquarters of each being quite distinct ; I never found one species *in copulâ* with the other."

PROBABLE HYBRID BETWEEN THE SCARLET-BACKED FLOWER-PECKER (*DICÆUM CRUENTATUM*) AND THE FIRE-BREASTED FLOWER-PECKER (*D. IGNIPECTUS*).

By E. C. Stuart Baker, F.Z.S.

(*Read before the Bombay Natural History Society on 6th Dec.*, 1897.)

Mr. C. Inglis has forwarded to me a remarkable little Flower-pecker which appears to me to be a cross between the two species mentioned in the heading. The upper plumage does not seem to differ in the slightest respect from the ordinary Red-backed Flower-pecker, but the under parts are coloured like those of *D. ignipectus*, but that the red on the upper breast is decidedly less in extent, and, moreover, there are traces of red on the throat as well. The dimensions are those of *D. cruentatum*, and the bill is exactly similar to that of that bird, and not like the shorter, stouter one of *D. ignipectus*.

Mr. Inglis writes to me that he has kept no notes about the bird beyond that he shot it on the 27th April at Roopacherra in Cachar. It was feeding *alone* on a flowering creeper growing beside a road.

The bird was sent first to Mr. Finn of the Indian Museum, Calcutta, but he returned it to Mr. Inglis saying that he thought it was merely a variety of *D. cruentatum*, and, although he could find no other specimens in the Museum which showed any signs of the red breast, he believed that he had seen some *caged specimens showing red on the breast.*

Personally, I should doubt its being an abnormally coloured bird, and think that if it is not a hybrid it must be a new species, and if it proves to be this, I would suggest the name *Dicœum hybridum* for it, as this expresses so exactly what the bird looks like.

One point against the bird being a hybrid, is the different elevations affected by the two species. *D. cruentatum* is essentially a low level and plains bird, whereas *D. ignipectus* is seldom found below 3,000 feet. Here, in Cachar, I have never seen it lower down than about 3,600 feet.

I have not examined the series of *Dicœum cruentatum* in the British Museum, but had there been any trace of red on the breasts of any of them, I do not think it could possibly have escaped the notice of such observers as Oates, Blanford and others, who have made no mention of such marking in any book to which I have access.

BIRDS' NESTING IN THE TONS VALLEY.

Part II.

By B. B. Osmaston, Indian Forest Department.

(*Continued from Page 72 of this Volume*).

In No. 1 of this Volume I described a birds' nesting tour made in the above valley in June, 1896. This year (1897) I visited the same locality again, and I now propose to describe the nests and eggs of some of the less common birds met with on my second trip.

16. (49). Lophophanes dichrous.—The Brown-crested Tit.

In Vol. IX of this journal I described a nest of this rare tit. This year I found another nest on June 18th in a hole in a wild cherry tree at about 11,000 feet elevation. The nest contained four fully-fledged young and was made entirely of rats' fur. The tree was a rotten one, and the hole, which was a perfect circle, had probably been excavated by the parent birds.

These birds usually breed earlier, in March or April, and this was probably a second brood.

The eggs of this species have never yet been obtained.

17. (183). Proparus vinipectus.—The Plain Brown Tit Babbler.

This bird is not very rare at elevations of from 9,000 to 10,000 feet, but owing to its extreme shyness is not often seen. It frequents hill-sides clothed with brushwood, where it breeds.

I found two nests—one placed in a low bush and a second in a clump of "ringals" (the hill bamboo). The nests are neat, compact and solid cups made of grass and fibres closely woven together and lined with hair. They remind one somewhat of the nest of *Pyctorhis sinensis*.

The eggs (three in number in each nest) are pale green blotched with brown chiefly towards the large end, where also are a few pale purple markings. They gave the following measurements:—

Largest	... ·73″ × ·53″
Smallest	... ·65″ × ·53″
Mean of 6 eggs	... ·69″ × ·53″

18. (191). Larvivora brunnea.—The Indian Blue-chat.

In a former letter inserted in No. 1 of this Volume I described a nest and eggs which I believed to belong to this species.

This year I found several more nests of the same kind with eggs precisely similar to those previously described, and having shot the bird

off the nest, I can now state positively that they do belong to *Larvivora brunnea*.

This being the case, the nests and eggs described in Hume for this bird must belong to some other species, for the eggs are there described as being spotted, whereas these are of a uniform pale blue.

They gave the following measurements :—

Largest egg	...	...	... ·80″ × ·58″
Smallest egg	...	...	... ·71″ × ·55″
Mean of 31 eggs...		...	... ·77″ × ·58″

19. (219). SIVA STRIGULA.—The Stripe-throated Siva.

This bird is fairly common in mixed forest at from 10,000 to 12,000 feet, where its melancholy call of three notes may be constantly heard in June. The nest and eggs are described by Hodgson, but apparently by no one else since, and as his description differs to some extent from what I have seen, I think it as well to add my description. I found three nests on the 3rd, 8th and 24th June containing two, three, and three fresh eggs, respectively. The nests were placed in shrubs or small trees at varying heights of from 4 feet to about 12 feet from the ground. They are very pretty, rather solid nests, composed of lichens (*Usnea*), birch bark, and thin black fern stalks, and are lined entirely with the latter.

The eggs are perfect little miniatures of those of the English Song Thrush (*Turdus musicus*), being blue (*not* pale blue), spotted rather sparingly with black or *very* dark reddish-brown specks.

They measure as follows :—

Largest egg	...	...	... ·80″ × ·60″
Smallest egg	...	...	... ·75″ × ·57″
Mean of 6 eggs ...		...	... ·77″ × ·58″

20. (241). PTERUTHIUS XANTHOCHLORIS.—The Green Shrike Tit.

Another nest of this species was found at an elevation of 8,000 feet in thick fir and oak forest. The nest was suspended from a horizontal branchlet of a silver fir sapling about two feet from the ground. It contained four fresh eggs similar in size and colour to those described in my former letter.

21. (352). ANORTHURA NEGLECTA.—The Kashmir Wren.

This bird is common in the birch and silver fir forest, as well as in open rocky ground from 11,000 to 13,000 feet. I was too early for the eggs, but found several nests in course of construction during June.

They were all built in among the upturned roots of fallen trees, and were well concealed from view. They were made of moss, grass and small twigs, exactly similar to those of the common English wren.

22. (446). NEORNIS FLAVOLIVACEUS.—The Aberrant Warbler.

I found one nest only of this bird on June 10th at an elevation of about 11,000 feet. It was built in a tuft of grass and scrub on the hill-side, and contained three most peculiarly-coloured eggs, *viz.*, of an uniform—rather pale—terracotta, absolutely devoid of gloss.

The nest was made of dry grass, domed with a small side entrance, and lined first with small dead leaves and then with feathers.

The eggs measured ·68″ × ·49″, ·67″ × ·50″ and ·65″ × ·49″, respectively.

23. (450). HORORNIS PALLIDUS.—The Pale Bush Warbler.

This is a very common bird at elevations of from 7,500 to 9,500 feet. I found several nests in the third week of June at about 8,000 feet, some containing fresh and others hard-set eggs. The nests were placed in low bushes and were made of grass, domed, and lined with feathers. The eggs were deep chocolate-brown, glossy, and generally four in number.

They measured as follows :—

Largest egg	..	... ·71″ × ·51″
Smallest egg	...	... ·66″ × ·50″
Mean of 7 eggs	...	... ·69″ × ·51″

24. (651). CALLIOPE PECTORALIS.—The Himalayan Ruby-throat.

Two nests of this species were found at 12,000 feet on June 8th. They contained three and four eggs respectively, unfortunately all on the point of hatching. The nests were made entirely of grass, and more or less domed, with a large opening on one side near the top. They were built on the ground in patches of grass and dwarf *Lonicera* bushes. The eggs were similar to those found and described by me on my previous trip.

25. (603). CHELIDORHYNX HYPOXANTHUM.—The Yellow-bellied Flycatcher.

Three nests of this species were found at about 11,000 feet on June 4th, 15th and 20th, respectively. Two contained three fresh eggs each and the third was empty. The nests were similar to the one found on my first trip and described in No. 1 of this Volume, all three being placed on horizontal branches, the first in a silver fir at a height

of about 15 feet from the ground, and the other two on wild cherry trees at heights of about 30 to 40 feet. The eggs are almost exact counterparts of pale specimens of the eggs of *Ægithaliscus erythrocephalus*, but the spots are not clearly defined, as they sometimes are in the latter, but form merely a pale purplish zone at the larger end.

The shells are, moreover, terribly thin and fragile, far more so than those of any other eggs I know.

They measured as follows :—

Largest egg	...	... ·59″ × ·44″
Smallest egg	...	... ·54″ × ·42″
Mean of 6 eggs	...	... 58″ × ·44″

26. (639). RUTICILLA FRONTALIS.—The Blue-fronted Redstart.

This is one of the commonest birds at high elevations (between 10,000 and 14,000 feet) in the Tons Valley. It has a pretty song, and the males are very pugnacious in the breeding season. I found a number of their nests between the 1st and 21st of June, some with eggs and others with young. The nest is generally placed in a hole in a steep bank or hill-side or in a niche in a rock, more rarely at the root of a tree. It is always visible from the outside, though often well concealed by plants, grass, &c. It is a rather shallow cup composed externally of moss and fine grass and lined with hair (chiefly burhel and musk deer), and sometimes a few feathers.

The eggs, three or four in number, remind one somewhat of those of *Myiophoneus* in colour. The ground-colour, where visible, is very pale greenish or white, and the eggs are mottled and spotted, sometimes all over but oftener in a cap at the larger end, with pale pinkish-brown. There are also sometimes a few grayish specks apparently underlying the above.

The eggs gave the following measurements :—

Largest egg	...	... ·82″ × ·58″
Smallest egg	...	... ·69″ × ·56″
Mean of 26 eggs	...	... ·76″ × ·55″

The blue colour of the eggs of all species of *Ruticilla* has hitherto been assumed a rule with no exception. We are therefore now forced to one of two conclusions : (1) That the blue colour of the eggs of *Ruticilla* is *not* a generic character ; or (2) that the blue-fronted redstart is not in its proper place in this genus.

27. (701). Oreocincla mollissima.—The Plain-backed Mountain Thrush.

This bird is rare in the Tons Valley. I stumbled upon a nest on June 20th, which was placed on the ground at about 12,000 feet among a thick growth of dwarf yellow-flowering rhododendron. The nest was a massive one, made of moss and lined with fine grass. It contained four rather hard-set eggs, typically meruline in colour, which gave the following measurements :—

Largest egg	...	... 1·16″ × ·86″
Smallest egg	...	... 1·13″ × ·81″
Mean of 4 eggs	...	... 1·14″ × ·85″

28. (1106). Cuculus poliocephalus.—The Small Cuckoo.

This cuckoo is found at higher elevations than any other in the Tons Valley. It is very common from 10,000 to 11,000 feet, where its irritating call may be heard day and night. It is essentially the cuckoo of the inner ranges near the snows, being very rarely heard elsewhere.

I did not myself find the egg of this bird, but a nest was brought to me by Mr. F. Gleadow, which contained two pure white eggs and one of a uniform chocolate colour, which could only, I think, have belonged to this cuckoo.

The nest was found at an elevation of about 9,500 feet at a place where *C. poliocephalus* was common. The only other cuckoos which might have been found at this elevation would be *C. canorus* and *H. sparverioides*. Both these may, however, be dismissed at once, the former, as is well known, laying grayish or brownish spotted eggs, and the latter laying white eggs and being non-parasitic in its habits.

The egg is of a uniform chocolate colour, similar to one of *Horornis pallidus*, but lighter in shade and of course much larger.

The nest was cup-shaped, made of moss and lined with thin black fern stalks. It was placed up against a low rock about a foot from the ground supported and concealed by a bunch of ferns growing out of the same. The owner of the nest was unfortunately not observed, so that I am unable to say to what species she belonged. The nest was found on June 5th, and all three eggs were fresh.

The eggs gave the following measurements:—

White eggs	...	·89″ × ·63″ ·90″ × ·64″
Chocolate egg	...	·78″ × ·60″

I should be very glad of any suggestions as to what the bird laying the above white eggs might be.

29. (1186). GLAUCIDIUM BRODIÆI.—The Collared Pigmy Owlet.

This bird is fairly common in the lower hills from 6,000 to 9,000 feet. I found a nest on May 1st in a "moru" oak tree at an elevation of about 8,000 feet. The nest-hole was about 20 feet from the ground and had evidently been orginally excavated by a woodpecker. It contained three fresh eggs which measured 1·17″ × ·98″, 1·15″ × ·94″ and 1·14″ × ·92″.

30. SCOLOPAX RUSTICOLA.—The Woodcock.

I was particularly anxious to find a nest of the woodcock. The birds themselves are fairly numerous in the forests just below the snows, and may be seen every evening at dusk flying slowly overhead uttering the strange loud "chirrup" which they reserve for such occasions, and which is very like the cry of the Indian night-jar (*C. monticola*) as he flits about in the twilight.

In spite of unremitting search, accompanied by an offer of rewards to the hill men, I never found a single nest either this or last year. On June 17th, however, as I was leaving their favourite haunts, I flushed a woodcock in thick herbage at my feet, which only flew a few yards and then fell fluttering to the ground again. My heart beat fast, for I thought that at last I had certainly found the long-sought-for treasure, but no such luck; for I soon saw instead of eggs three tiny chicks only a day or two old, quite unable to fly but most clever at running and hiding themselves. I then turned my attention to their mother who, all the time I had been inspecting her brood, had been going through the strangest of antics with outspread wings and tail, and making a continuous sort of grating, purring noise. She allowed me to approach within a few feet, and then with an apparent effort, half fluttered half ran away.

31. (202). OLIGURA CASTANEICORONATA.—The Chestnut-headed Short-wing.

This beautiful little bird is not uncommon in the dense forests with thick undergrowth at about 11,000 feet. It has a very loud call of four notes, not unlike but shriller than, that of *Culicicapa ceylonensis*. I failed entirely to find its nest, though I spent a good deal of time looking for it, and I fancy the breeding season must be in July. The distribution of this species is put down in the "Fauna of India" as Nepal, Sikhim and the Khasi Hills, so that this is apparently a new locality for the bird.

BIRDS COLLECTED DURING FIVE YEARS' RESIDENCE IN THE HYLAKANDY DISTRICT, CACHAR.

PART V.

BY C. M. INGLIS.

(*Continued from page* 204 *of this Volume.*)

Order *Columbæ.*

Family *Columbidæ.*

Subfamily *Palumbinæ.*

Genus *Alsocomus.*

149 *Hume, No.* 782. ALSOCOMUS PUNICEUS (Tick.).—The Purple Wood Pigeon.

This bird is exceedingly rare here. It frequents wooded land.

Subfamily *Turturinæ.*

Genus *Turtur.*

150 *Hume, No.* 793. TURTUR MEENA (Sykes).—Sykes' Turtle Dove.

This dove is common here; when the paddy is ripe large numbers are to be seen. They are very shy and rather fast on the wing.

151 Native Name—Parkee or Doovi. *Hume, No.* 795. TURTUR SURATENSIS (Gmn.).—The Spotted Dove.

This is by far the commonest dove we have here.

152 *Hume, No.* 796. TURTUR RISORIUS (Linn.).—The Indian Ring Dove.

This bird is very rare here, only a few being seen during some cold weathers.

153 *Hume, No.* 797. TURTUR TRANKUEBARICUS.—The Ruddy Ring Dove.

This bird is also rare, but not so much so as the former. It frequents thin bamboo jungle near the cultivation.

Subfamily *Macropygiinæ.*

Genus *Macropygia.*

154 *Hume, No.* 791. MACROPYGIA TUSALIA (Hodgs.).—The Bar-tailed Cuckoo Dove.

Exceedingly rare. I have no authentic record from the district, but one of my men "saw" a dove, whose description tallied with the above species.

Subfamily *Phapidinæ*.

Genus *Chalcophaps*.

Hume, *No.* 798. CHALCOPHAPS INDICA (Linn.).—The Emerald Dove. 155

Fairly common, frequenting both dense and thin jungle. In the early morning and in the evening it may be seen feeding on paths through the thin jungle. I only once came across its nest, which was situated in a thick bush a few feet from the ground. This is one of the thinnest skinned of birds, even when handling it carefully, large quantities of feathers come out.

Subfamily *Carpophaginæ*.

Genus *Carpophaga*.

Hume, *No.* 780. CARPOPHAGA ÆNEA (Linn.).—The Green Imperial Pigeon. 156

This Pigeon is fairly common, frequenting both dense and thin jungle. Its call is very loud and booming, sounding like gur rur, goom, goom, goom. They are rather shy birds. 157 Native Name—Goormakoll or Goorgooma.

Subfamily *Treroninæ*.

Genus *Treron*.

Hume, *No.* 771. TRERON NEPALENSIS (Hodgs.).—The Thick-billed Green Pigeon. Native Name—Anjee Koll Hurrial.

Common here. They are very noisy and quarrelsome, more so I think than any of the other green pigeons.

Genus *Osmotreron*.

Hume, *No.* 774. OSMOTRERON BICINCTA (Jerd.).—The Orange-breasted Green Pigeon. 158

Not so common as the last, a few being sometimes found in company with them.

Hume, *No.* 776. OSMOTRERON PHAYRII (Blyth.).—Phayre's Green Pigeon. 159

This is the commonest Green Pigeon found here. I have found them in both dense and thin jungle. They are not shy, and will come circling round several times after being fired at.

Genus *Sphenocercus*.

Hume, *No.* 779. SPHENOCERCUS APICAUDUS.—The Pin-tailed Green Pigeon. 160

Very rare. The only pair I have ever seen and shot came with a flock of *O. phayrii* to a Peepul tree.

Order *Cuculi.*

Family *Cuculidæ.*

Subfamily *Cuculinæ.*

Genus *Cuculus* (Linn., 1766).

161 *Hume, No.* 199 ; *Blanf., No.* 1104. CUCULUS CANORUS (Linn.).—The European Cuckoo.

Fairly common. Prefers thin to dense jungle, though I have several times seen it in the latter.

162 Native Name—Akoo-pakoo *Hume, No.* 200 ; *Blanf., No.* 1105.—CUCULUS INTERMEDIUS (Vahl.).—The Asiatic Cuckoo.

Slightly commoner than the above species here.

163 *Hume, No.* 203 ; *Blanf., No.* 1107. CUCULUS MICROPTERUS.—Gould's Cuckoo.

Mr. Baker mentions having shot one in the plains, but I have never seen any here.

Genus *Hierococcyx* (S. Muller, 1842).

164 *Hume, No.* 206 ; *Blanf., No.* 1110. HIEROCOCCYX NISICOLOR.—Hodgson's Hawk Cuckoo.

I have only procured a single specimen here, and that was shot in dense jungle.

165 *Hume, No.* 207 ; *Blanf., No.* 1109. HIEROCOCCYX SPARVEROIDES.—The Large Hawk Cuckoo.

Very common. They often frequent bungalow compounds.

Genus *Cocomantis* (S. Muller).

166 *Hume, No.* 209 ; *Blanf., No.* 1113. COCOMANTIS MERULINUS.—The Rufous-bellied Cuckoo.

Rather rare here. It frequents the brushwood and thin jungle.

Genus *Surniculus* (Lesson, 1831).

167 *Hume, No.* 210 ; *Blanf., No.* 1117. SURNICULUS LUGUBRIS.—The Drongo Cuckoo.

I have not come across this bird in this district, but got a few in the Happy Valley. They were shot on some jack trees in a " bustie." I daresay this Cuckoo is not so rare as it appears to be, as it might easily be passed over by any shikari as a *Dicrurus ater.*

Genus *Coccystes* (Gloger, 1834).

Hume, No. 212 ; *Blanf., No.* 1118. COCCYSTES JACOBINUS.—The Pied-crested Cuckoo. 168

Very rare here. I obtained one specimen in some ekra jungle and saw another in some scrub.

Subfamily *Phœnicophainæ.*

Genus *Eudynamis* (Vig. & Horsf., 1826).

Hume, No. 214 ; *Blanf., No.* 1120. EUDYNAMIS HONORATA.—The Indian Koël. 169 Native Name—Koelee.

Very common in the busties.

Genus *Rhopodytes* (Cab. and Heine, 1862).

Hume, No. 215 ; *Blanf., No.* 1123. RHOPODYTES TRISTIS.—The Large Green-billed Molkoho. 170

Very common here, frequenting both the dense and thin jungle. Sometimes in the jungle they hide where a number of creepers have got matted together and it is impossible to get them to move from the place. I have also noticed this with *Nyctiornis athertoni.*

Genus *Centropus* (Illiger, 1811).

Hume, No. 217 ; *Blanf, No.* 1130. CENTROPUS SINENSIS.—The Common Coucal. 171

Exceedingly common. The young birds are very repulsive looking before they are fledged. The natives eat its flesh as a cure for consumption, and it is also regarded as a great delicacy by some. Native Name—Mohoka.

Hume, No. 218 ; *Blanf., No.* 1133. CENTROPUS BENGALENSIS.—The Lesser Coucal. 172

This species is also very common. On the 14th of August I extracted an egg from the oviduct of a female. An excellent description of the note of this bird is given by Gammie in "Stray Feathers," Vol. V, p. 368. Native Name—ChotaMohoka

Order *Halcyones.*

Family *Alcedinidæ.*

Subfamily *Alcedininæ.*

Genus *Alcedo* (Linn., 1766).

Hume, No. 134 ; *Blanf., No.* 1035. ALCEDO ISPIDA.—The Common Kingfisher. 173

Exceedingly common.

Hume, No. 134 *ter* ; *Blanf., No.* 1036. ALCEDO BEAVANI.—Beavan's Kingfisher. Name—Chota Machrakal, 174

Found in the nullahs running through dense jungle.

Genus *Ceryle* (Boie, 1828).

175 *Hume, No.* 137 ; *Blanf., No.* 1034. CERYLE GUTTATA.—The Himalayan Pied Kingfisher.

Exceedingly rare.

176 *Hume, No.* 136 ; *Blanf., No.* 1033. CERYLE RUDIS.—The Pied Kingfisher.

Generally seen in pairs on all the rivers in the district.

Genus *Pelargopsis* (Gloger, 1842).

177 *Hume, No.* 127 ; *Blanf., No.* 1043. PELARGOPSIS GURIAL.—The Indian Stock-billed Kingfisher.

Fairly common. They breed here in May. They seem to have a preference for bheels.

Subfamily *Daceliniæ.*

Genus *Ceyx* (Lacepede, 1801).

178 *Hume, No.* 133 ; *Blanf., No.* 1040. CEYX TRIDACTYLA.—The Three-toed Kingfisher.

Rather rare here and only to be found in the streams flowing through dense jungle. Their flight is rather swift. In dried specimens the colour fades very much.

Genus *Halcyon* (Swrain, 1820).

179 *Hume, No.* 129 ; *Blanf., No.* 1044. HALCYON SMYRNENSIS.—The White-breasted Kingfisher.

Very common. It breeds here in April, making the usual burrow in the bank of a stream.

180 *Hume, No.* 130 ; *Blanf., No.* 1045. HALCYON PILEATA.—The Black-capped Kingfisher.

Some five years ago I got a Kingfisher which I could not identify. Unfortunately I sent it to the Victoria Natural History Institute at Bombay unidentified. As far as I can remember, the bird was like the description of this species given by Blanford in his Birds, Vol. III. I simply mention this in case the bird may be come across again.

Order *Coraciæ.*

Family *Cypselidæ.*

Subfamily *Cypselinæ.*

Genus *Micropus* (Meyer and Wolf, 1810).

I follow the classification of this family used by Mr. Baker in his "Birds of North Cachar," *viz.*, Vol. XVI of the "Catalogue of the Birds of the British Museum."

Hume, No. 100 *bis* ; *Blanf., No.* 1074. MICROPUS SUBFURCATUS.— 181
The Eastern Swift.

Common here during the rains, arriving in April and stopping till July.

Genus *Tachornis* (Gorse, 1847).

Hume, No. 102 *bis* ; *Blanf., No.* 1076. TACHORNIS INFUMATA.—The 182
Eastern Palm Swift.

Rare here. I only came across them during one season.

Subfamily *Chœturinæ.*

Genus *Chœtura* (Stephens, 1825).

Hume, No. 96 ; *Blanf., No.* 1078. CHÆTURA INDICA.—The Indian 183
Giant Spine-tail.

Uncommon. When the weather is fine they fly very high up, but during a storm they fly close to the ground with great swiftness.

Family *Caprimulgidæ.*

Subfamily *Caprimulginæ.*

Genus *Caprimulgus* (Linn., 1766).

Hume, No. 109 ; *Blanf., No.* 1093. CAPRIMULGUS ALBONOTATUS.— 184
The Large Jungle Nightjar.

Very common here during the cold weather, when they may be seen flying over the tea or settling on the ground. Sometimes they nearly allow one to tread on them.

Genus *Lyncornis* (Gould, 1835).

Hume, No. 114 *bis* ; *Blanf., No.* 1096. LYNCORNIS CERVINICEPS.— 185
The Burmese Eared Nightjar.

Fairly common here during the cold weather. Before sunset they are to be seen flying high over head, but as sunset draws nigh they come down closer, till at dusk they may be seen hawking insects close to the ground. Their note sounds like too-too wee-ooo.

Family *Podargidæ.*

Subfamily *Podarginæ.*

Genus *Batrachostomus* (*Gould*, 1838).

Hume, No. 100 ; *Blanf., No.* 1097. BATRACHOSTOMUS HODGSONI.— 186
Hodgson's Frogmouth.

Exceedingly rare here. I only procured one specimen, and that was during a flood, the Frogmouth was flitting about at dusk on a small teelah and after a long chase I managed to bag it. I have never heard of nor seen one since.

Family *Coraciidæ*.

Genus *Coracias* (Linn., 1766).

187 *Hume, No.* 124 ; *Blanf., No.* 1023. CORACIAS AFFINIS.—The Burmese Roller.

Very common, but slightly shy.

Genus *Eurystomus* (Vicill, 1816).

188 *Hume, No.* 126 ; *Blanf., No.* 1025. EURYSTOMUS ORIENTALIS.—The Broad-billed Roller.

Rare here. I saw several when on a visit to Roopacherra. They keep to the tops of high trees and are very shy birds.

Family *Meropidæ*

Genus *Nyctiornis* (Swains., 1831).

189 *Hume, No.* 122 ; *Blanf., No.* 1031. NYCTIORNIS ATHERTONI.—The Blue-bearded Bee-eater.

Fairly common. Principally met with in dense jungle, but they also come out to the open. On several occasions I have seen them on some bamboos near my Bungalow. They hawk insects on the wing like the other Bee-eaters.

Genus *Merops* (Linn., 1766).

190 *Hume, No.* 117 ; *Blanf., No.* 1026. MEROPS VIRIDIS.—The Green Bee-eater.

Far from common here. They frequent abandoned cultivation, where there is grass and a few bushes.

191 *Hume, No.* 118 ; *Blanf., No.* 1027. MEROPS PHILIPPINUS.—The Blue-tailed Bee-eater.

This is the common Bee-eater of these parts. On one teelah, where there had been a landslip, the side was burrowed with their nest-holes. The young have a queer habit of walking backward when being fed by the hand.

Order *Bucerotes*.

Family *Bucerotidæ*.

Genus *Dichoceros* (Gloger, 1842).

192 *Hume, Nos.* 140 & 140 *bis*; *Blanf., No.* 1051. DICHOCEROS BICORNIS.—The Great Pied Hornbill.

Common. It is a forest-loving bird, but seldom seen in the open. It is very tenacious of life. I once hit one with a charge of No. 6 shot in the head at a very close range. The bird dropped to the shot, but took a long time to kill.

Genus *Anthracoceros* (Reich., 1849).

Hume, *No.* 142 ; *Blanf.*, *No.* 1053. ANTHRACOCEROS ALBIROSTRIS.— 193
The Small Pied Hornbill.

Very common here. They go about in flocks, and when resting keep up a discordant cackle. They seldom stray from the edges of the jungle.

Genus *Rhytidoceros* (Reich., 1849).

Hume, *No.* 145 *bis*; *Blanf.*, *No.* 1054. RHYTIDOCEROS 194
UNDULATUS.—The Malayan Wreathed Hornbill.

Very rare. The only specimen I ever got was shot by Mr. Ross of the Lallamukh Tea Estate during a flood. It was, I believe, sitting on a stump in the middle of the water, and he dropped it with a bullet. I cannot say what it was doing there, unless fishing, as has been recorded of *A. albirostris*.

Order *Psittaci*.

Family *Psittacidæ*.

Genus *Palæornis* (Vigors, 1825).

Hume, *No.* 147 *quat.* ; *Blanf.*, *No.* 1136. PALÆORNIS INDOBURMA- 195
NICUS.—The Eastern Roseband Paroquet.

Rare here. I have only procured three or four specimens since I have been collecting.

Hume, *No.* 148 ; *Blanf.*, *No.* 1138. PALÆORNIS TORQUATUS.—The 196
Rose-ringed Paroquet.

Exceedingly common.

Hume, *No.* 149 *bis* ; *Blanf.*, *No.* 1140. PALÆORNIS ROSA.—The 197
Eastern Rose-headed Paroquet.

Very common. They do great damage to the crops when they are ripe.

Hume, *No.* 152 ; *Blanf.*, *No.* 1145. PALÆORNIS FASCIATUS.—The 198
Red-breasted Paroquet.

Fairly common. They are rather difficult to shoot sitting on account of their concealing themselves amongst the leaves.

Genus *Loriculus* (Blyth, 1849).

Hume, *No.* 153 ; *Blanf.*, *No.* 1150. LORICULUS VERNALIS.—The 199
Indian Loriquet.

Rare here. I only saw these pretty little birds during one cold weather. On the wing they somewhat resemble *Xantholæma hæmacephala*. Their flight is slightly undulating, and whilst on the wing they utter their note, which resembles cheek, cheek, cheek.

(*To be continued.*)

CAMPING IN CHAMBA.

By Professor Harold Littledale, m.a.

(*Read before the Bombay Natural History Society on 6th Dec.*, 1897.)

It may be well to begin by saying that Chamba is the name of a Native State in the Himalayas, north of the Gurdaspur district of the Punjab. The British hill cantonments of Dalhousie and Dharmsala are on its southern boundaries, and the nearest railway station is Pathankot. Thence it is 28 miles to Dunera, 23 more to Dalhousie, and finally 20 on to Chamba. The river Ravi and its tributaries flow through the State, but unfortunately do not add much to the sporting attractions of the country, for the fishing is said to be exceedingly poor—in fact scarcely worth taking a rod for. However, the shikar on the Chamba hills amply compensates for the lack of sport in the rivers. The game to be found there includes Gooral (or Himalayan chamois); Thar (a goat akin to the so-called "Ibex" of the Nilgiris); Bears, both black (*Tibetanus*) and red (*Isabellinus*); Ibex (in Pangi and Kilar); Leopards; Serow (or goat-antelope); Musk-deer and Barasingh (both strictly preserved); and great variety of pheasants, such as Monaul, Cheer, Koklass, Tragopan (the *Argus*, wrongly so-called, of the Chamba Game-license) and Kalij. Chukor are found in unusual numbers, and there are a few woodcock. Game birds of course cannot be shot till September. Smaller mammals abound, such as foxes, martens, weasels, and flying and other squirrels. The woods and hill-sides offer many attractions to the lover of wild flowers and ferns; and the butterfly-hunter can have a very good time with his net. But to the shikari the special attraction is the thar and gooral shooting, which one is not able to get in Kashmir proper.

It may be admitted that Chamba is not comparable to Kashmir in variety of sport or fineness of the trophies to be secured. A thar is not much beside a markhor, nor a gooral beside an ibex or an *Ovis ammon*; but thar and gooral both afford good sport, and are not to be bagged without some hard work and steady shooting. Moreover, in Chamba game is far more plentiful than in the Kashmir territories; the scenery is in many places not inferior; and the facilities for obtaining coolies and supplies are far greater. Lastly, nothing can exceed the kindness shown to visitors by His Highness the Rajah of Chamba and the chief officials, concerning whom I shall speak more particularly further on.

Early this year I resolved to try Chamba as a place for summer resort, and took some trouble to find out about the ways and means of getting there, and of obtaining sport when there. As my investigations and experiences may prove useful to some of my fellow members who may wish to add thar and

gooral to their list of animals hunted, I have written the following notes on Chamba, how to get there from Bombay, and what preparations to make for a satisfactory tour.

First then, I should lay down that Chamba is essentially a suitable place for short leave, say forty-five to sixty days. You can go farther and see a greater variety of game in Kashmir; but a shooting trip to Kashmir—a first trip certainly—should not be undertaken on less than three months' leave; and four, or four and a half, would be better; whereas Chamba is easily reached in a week from Bombay; sport is to be had within three or four marches of the town itself; the country is not shot out, or over-run with sportsmen as Kashmir is; and probably, if you have long leave, you will know of other places better worth spending it in.

I had sixty days' leave, from April 14th; my wife and child were with me, and very rapid marching was not contemplated. We were chiefly in quest of a cooler climate than that of Baroda, so I determined to wander among the hills, without expecting to get any shikar, except perhaps a chance shot or two at a gooral or a bear. Still, moving by easy stages, we did get to Chamba by the 1st of May, and I had 25 days on shooting ground, during which time I shot 26 heads, and should have got more if I had not missed some shots. I bagged 11 gooral, besides catching a young one that I allowed to rejoin its mother; 4 black bears (and 2 lively cubs, now at Naosari); 6 thar, 2 mountain foxes, 2 flying squirrels, and 1 Kalij pheasant, all with the rifle; and I wounded and lost 1 serow, 1 bear, and 1 gooral. I got all the thar fired at, but missed a number of more or less wild shots at gooral. However, considering I was only one march from Chamba, most of the time, and was only shikaring round the camp, with the exception of two expeditions of four days' each, after thar, one march further, I was satisfied with my luck, and think that most sportsmen would be content with a similar bag in the time.

When a shooting trip to Chamba is resolved on, the very first thing to do is to write to the Private Secretary to His Highness the Rajah of Chamba, Chamba State, to ask His Highness's permission to shikar in the Chamba territories. In reply you will receive a courteous letter, and a license to shoot; and if you ask for it, an order also to the lambardars, &c., to render you assistance in the matters of coolies and ordinary supplies. The receipt of this general shooting license does not do away with the propriety of subsequently calling on the Rajah himself and of obtaining a further special permission to shoot in some reserved nullah.

Next, you will do well to send on to Pathankot by goods train your tents and heavy luggage, at least 25 days before you set out yourself. Or you can have these things sent right through—it is a little more expensive—by the Railway Co. to Dalhousie, if you address them to The Parcel Out-agency, N.-W. Ry., Dalhousie. You should give them quite 30 days start of

you if you do this. Most oilman's stores and liquor you can buy at Salig Ram's in Dalhousie, but it is advisable to take from down country some tinned steel (or aluminium) cooking pots, a very light small sheet-iron oven (13" diam. at most), such as can be bought in the bazar, a Warren's broiler or other frying-pan; the Warren uses up more lard, but is best on a camp fire, as the food is not smoked ; a camp kettle and a fitted tiffin basket padlocked, containing plates, &c., of enamelware, and other dining and tea-kit. I will say more about outfit later on ; now as to route.

From Bombay to Pathankot, *via* Delhi, Umballa and Amritsar, you travel either *via* Ahmedabad and B. B. & C.I., or *via* Agra and G. I. P. This latter route is longer, but I am not sure that it is not preferable, as it enables you to avoid the sadly deteriorated refreshment-rooms at Ahmedabad and on the R.-M. Ry.

If you decide to go by the B. B. & C. I., then with a judiciously-stocked tiffin basket you leave Bombay (let us suppose, on Monday) at 21-30 o'c. Next day (Tuesday), breakfast at Ahmedabad, ice and soda can be bought on the train, dine at Nana ; next day (Wednesday), breakfast at Rewari Junction, reach Delhi at 13-40. Time for a tub and tea at Kellner's rooms. Leave Delhi at 15-20 by D.-U.-K. train (same platform); dine at Kurnal, 18-25 to 53, reach Umballa Cantonment at 20-43. Change to N.-W. Ry. same station, 21-13, reach Amritsar at 3-10 (or there is a later train from Umballa that reaches Amritsar about $9\frac{1}{2}$ in the morning), leave Amritsar by Pathankot train 10-10, arrive Pathankot 15 o'c. (Thursday).*

On arrival at Pathankot, the Tonga Agent should be promptly interviewed, and if you have written to him some ten days beforehand, you may hope to find a tonga ready to take you and some of your belongings to Dunera, 28 miles, in $4\frac{1}{2}$ hours ; also ekkas (one-horse vehicles) for your servants and heavy kit, which latter you should get from the goods office without delay. Ekkas take $6\frac{1}{2}$ hours. Start for Dunera as soon as you can, for the road is rather "jumpy" by day in certain parts, and in darkness would not be quite safe. Have nothing to do with private contractors at Pathankot, for they will solemnly swear to send your kit up to Dalhousie in less than no time, and when you have prepaid them, will suit their own convenience about fulfilling the contract. I had a heavy tent I entrusted to one Mowla Buksh to send up to Dalhousie from Pathankot on a camel ; the "Umming-bird" and the tent reached Dalhousie, after a journey of 51 miles, in the record time of 12 days. Happily, I was in no hurry, but I might have been. The Railway refreshment-rooms at Pathankot are better than the T. B. there. Tongas can only go as far as Dunera, but ekkas can go through to Dalhousie. At Dunera there is a good travellers'

*We travelled in a reserved second compt. and our carriage was cut off at Umballa and Amritsar, thanks to the very obliging Station Masters at those places, so we had not to change from Delhi to Pathankot.

bungalow and a messman; and the horse-dâk agent, or else the "chowdri," will have a dooly and six bearers (Kahars), or a pony, or rickshaw and ekkas ready to take yourself and kit on to Dalhousie. Order these of him by letter beforehand. Most people dine at Dunera, get into a dooly (palanquin), and wake to find themselves at Dalhousie (23 miles from Dunera) about daybreak; or sleep at Dunera and ride up, or rickshaw up, next morning. There is a half-way bungalow at Nynee Khud. We stayed a night at Pathankot and another at Dunera, thence marched up to Mamul bungalow (also called Chil, from the vernacular name of *Pinus longifolia* abundant there) near Bukloh, 4,500 feet. We spent two or three days there, and then marched up to Dalhousie. But if you leave Pathankot on the afternoon of Thursday (suppose), you may be in Dalhousie on Friday morning. There is no travellers' bungalow at Dalhousie, but there are several hotels. The best is said to be the Strawberry Bank Hotel, and it certainly has the advantage of being all contained under one roof. We went to Mrs. Donlea's Springfield Hotel, which consists of several houses at intervals on the mountain side. It was not very pleasant to have to make our way in a torrent of rain to one of the upper bungalows after dinner, but otherwise the hotel is a good one. The remaining hotels are the Bull's Head and the Mall-house. In case you mean to make any stay at Dalhousie, it will be well to take a portmanteau full of dress clothes, &c., which (with your light "railway clothes") may be left there. I will now recapitulate these memoranda, for the comfort and speed of the journey will depend much on the *bundobust*. Write to the Private Secretary, Chamba (or to the Chamba State Vakil, Dalhousie), for license; write to the Tonga Agent, Pathankot; the Chowdri, Dunera; the Hotel, for a room; fix your hours of departure accurately, as tongas, &c., cannot be ready without definite instructions, and in the busy season they are all booked days beforehand. If your party is not large enough to engage a reserved compartment, at least book a lower berth in the train. A reserved compartment is a great convenience for such a long journey. *Return* tickets (intermediate) can be taken for servants.

At Dalhousie you will need to spend a day or two to rest, fit out, and start your servants and kit off to that lovely "Sleepy Hollow," Kajiar, or to Chamba. Send for the Chowdri at once to order coolies, or mules, for notice must be given. You will do well to bring a servant or two from down country. A cook (indispensable), and a "boy" (optional), or a smart "orderly" who will not object to making himself generally useful. Dalhousie servants are not to be depended on. If you take men from Bombay they will need some warm kit, and it is better to give them a Whiteaway Laidlaw fit-out, than to be fleeced by the Dalhousie dirzies for expensive and cutcha-made suits of very bad puttoo. Give them each a cardigan jacket at Rs. 2-8, a syce's serge overcoat at Rs. 8-8, a warm blanket,

a warm pair of trousers and 2 pairs of thick socks, an umbrella and an old bit of water-proof sheeting. Servants are so careless about catching cold, and realize so little how utterly precious they are out in the wilds, that it is wisdom to spend something on their raiment, as an insurance against sickness. Once in Chamba territory, ordinary supplies are cheap, and much extra *batta* need not be given them, the outfit will therefore be the chief "consideration" to them for facing the unknown hardships of the hills. They will need a good supply of food for the railway journey.

Instead of serge overcoats I have made some very warm coats from millerained blankets, at about 6 rupees each coat.

About tents. To a hardy shikari travelling alone, I would say:—Take an Elgin Mills Native Officer's single-fly tent, 8 × 8, 45 lbs. without pegs, but with light durrie, and two sowars' pals, under 30 lbs. each, without pegs, one for servants and the other for use, both as a bathing tent and as a "tente d'abri" for short expeditions on the hills. Do not take iron tent-pegs to Chamba; wood is obtainable everywhere there, but you will need an adze, not only for making pegs and splitting fuel, but also for use as a kodali to dig a shallow trench round the tent-walls to carry off rain water. The Elgin Mills would make the tents of millerained khaki instead of white drill for you. Two coolies can carry the three tents in their saleetahs (the two "pals" in one saleetah); the Native Officer's tent in another, and all poles in a light canvas bag. But it will be absolutely necessary with this out-fit of tents to have also a very large drab wigan water-proof sheet, say 96″ × 72″. This sheet on the march will be tightly rolled round your bedding and strapped up, but in camp will be tied on the weather side of your tent roof to keep off rain, or on the hill away for a night from the main camp, when you have only the "bathing" pal for yourself, will be rigged up as a shelter for the men. The single fly tent, thus managed, will be ample; for on hot days, if you are in camp, you can throw your blankets over the tent to keep off the sun, as well as to receive an airing. With a camp kettle of warm water, a tin-pot and a bit of linoleum, you can bathe "Native fashion" in the "bathing tent". An alternative heavier equipment of tents and washing apparatus and bath would be: one 8 × 8 double fly Cabul pal, thin durree and detachable bath-room; two sowar's pals as above. One India-rubber bath-tub; or a stronger thing is a medium-sized zinc tub, with a stout wooden cover. The cover has two battens across it and becomes the top of your wash-hand table; it has detachable folding legs, which, together with your heavy boots, bath-mat, candle-lantern, towels, tin-pot, tent hooks, &c., go inside the tub. Have four holes punched with a 12-gauge wad punch in the zinc tub, just under the rim, at ends, and middle of sides, and four holes to correspond bored in lid, one inch from edge. Four ties of strong thin rope, or galvanized wire, will fasten your tub-top on securely for travelling. This stock of tents and tub

would need four coolies instead of two, but the double fly is no doubt an advantage, and in Chamba there is rarely any difficulty about transport, as sometimes happens further among the hills. Take some strong gunny-bags from down country ; they do for carrying stores in and for packing skins for the return journey. One cannot get leather-covered kiltas in Dalhousie or Chamba such as can be bought good and cheap in Srinagar; but a bit of gunny-bag can be sewn as a lid over the common wicker kilta for coolies to carry stores safely enough. Mule trunks are heavy things, but the yekdans made by Foy Bros., Cawnpore, especially if rivetted with copper rivets instead of screws, are excellent for holding clothes, valuables (which term includes cartridges), books, medicines, &c. Those made in Srinagar are lighter than Foy's. A saddle need not be taken, for after leaving Chamba the roads are too steep generally for much riding to be done ; but a *dandy* can usually be got along somehow. Merwanji at Dalhousie has dandies for hire and stores and a little furniture for sale. I have mentioned the needful cooking kit, but will repeat myself a little to say that the cook should have a padlocked mule trunk as cook-shop box, and it should contain the following things: four cooking pots of tinned steel, frying pan, oven, camp kettle, knife, 15″ knife-board and emery, dusters and piece of soap, enamel bowl, pie dish and three plates, concave iron pan for chupattis, tin-opener, large spoon and iron fork, adze, candle lantern. Allow him ½ a candle a day. He should have a "kit parade" before starting, to eliminate *brass* and *copper* vessels and rubbish. I use a camp bed made on Kinloch's plan, with two mule trunks as the ends, side poles socketed into the trunks and canvas stretched between ; but I also take a light (25lb.) folding camp bed, the "Army and Navy" one from the Stores, as one cannot take the mule trunks about on short expeditions. The ground is too damp for a "valise" to be safe. This camp bed alone will suffice. The curtain is essential in Kashmir, but we had no trouble from mosquitoes in Chamba, and I think it need not be taken there. The "Paragon" camp table is the lightest and most portable of tables, but it is a "jim" (short for gimcrack ?) and you should always fix and unfix it yourself. It won't stand a wetting, and should go in camp-bed bag. The "American" folding table does well too and is light. You can sit on your bedside for dinner ; but an easy chair, such as the folding "hammock chair," is a bed of asphodel to fling your weary limbs on after a hard day's climbing. Chair, table, and camp bed make one load. As a dressing case, useful in the train and everywhere, I have a copper basin, with a leather cover that straps on ; there is a light cane basket that fits inside the basin, and holds brushes and comb, sponge bag, soap, mirror, towel, enamel tumbler, tooth powder, &c. ; with the cane tiffin basket and roll of bedding it makes up one load. Miscellanea include : two sets of hooks for tent poles and some flat S hooks to put on the ridge pole, to hang clothes, &c., up on. The knife-board will usefully sharpen skinning knives ; and note that it

is a waste of money to buy expensive "skinning knives," for cheap "French cooks' knives" are all you need. Take four of them and get sheaths made; it may happen that you will some day have several skins to take off; and anyhow, it is desirable to set all hands at a skin when you are eager to push on, or night is near. Two candle-lanterns will be needed, one for the cook, the other to come out to meet you if benighted. Also a pair of small open candlesticks for use in your tent; glass shades are not needed. Oil is a dirty thing to carry; besides, you can accurately estimate your expenditure of candles. One a day will be a liberal calculation for your candlesticks; and one in two days for the cook's lantern. In addition to the "tiffin basket," which will stay in the tent, you will need a *tiffin bag.* This is a most important item. Make a strong bag, like a knapsack, or a game bag, with a flap to strap over; size 18″×15″×5″, of strong Willesden or water-proof tan canvas, short webbing sling. This will accompany you on the hill every day, and will contain (1) a small drab Wigan water-proof sheet, 72″×36″, (2) a "sweater"; one needs something dry to lie on during the daily halt, as well as something warm to wear then, and the sweater dispenses with the unwieldy ulster. These two things are most essential. The bag should also contain (3) a sandwich box (biscuit tin), (4) flask and cup, (5) a book to read; pocket diary and pencil. At times too (6) the map (Sheet 46, South West Section, Indian Atlas, 4 miles to inch, obtainable from the Officer in charge, Map Department, Survey of India, Calcutta, by V.P.P.); (7) two skinning knives, (8) extra cartridges, (9) spare pipe or cheroot case, and matches, (10) piece of cord, (11) tweed cap, (12) gloves. All these things will go in the tiffin bag, and it will be found more portable than a basket, besides being convertible into a pillow by filling it with grass during the noontide siesta under some shady cliff or pine tree. There is a sufficient map of Chamba, with notes on the best nullahs, in Tyacke's *Sportsman's Manual,* again to be referred to. You will need a good telescope (Stewart's "Lord Bury" for instance) and pair of binoculars for stalking, a hunting clasp-knife, with corkscrew, &c. The tiffin cooly will also carry your kodak, umbrella, and tea bottle. Silver's vulcanite bottle is the best; but any quart bottle, covered with felt and khaki by a dirzi, and with webbing or leather sling, will do. There are many delicious rills and springs in the Chamba hills,and your pocket cup will often come in useful, but a bottle of tea will also be needed. Your shikari will carry the rifle, a knife and the telescope; the binoculars you should have yourself. The chota shikari will take the tiffin cooly's load when the latter has to shoulder a gooral, or anything of that sort.

Your bedding will consist of a roll of four single blankets. It is a good plan to sew the blankets together along *one side and at the foot,* for camp beds are narrow and there is no mattress to tuck the blankets in under. You may then get under the top, second, or third blanket, as you please, and will not

kick them off when asleep. A pillow, a sheet, a warm sleeping suit and a cummerbund, complete this parcel. For marching, it is rolled in the large water-proof sheet and strapped up with rug-straps. I put the bundle thus made inside one of those tan-canvas cabin bags with a padlocking handle that is passed through large eyelets. The basin also will go in this bag with the bedding. This is not a load by itself, it will be tied up on top of the cane tiffin basket to make a full cooly load.

Take a supply of medicines for ordinary ailments and some Elliman, since sprains are easily got on gooral ground; some carbolic acid, turpentine, two pounds of arsenical soap and a paint brush for it. I put this "soap" in the square *vaseline* tins one buys, but it should be kept right side up if it is moist. I always apply it myself, for it is dangerous stuff. In Chamba the flies are very troublesome, therefore take PLENTY of FLY PAPERS, and a gauze meat-safe. Skinning operations near the tent will of course attract flies. Take a couple of bottles of spirits of wine and a screw stoppered jar, for *specimens*, which, as in duty bound, you will bottle up for the Bombay Natural History Society. A ball of strong cord and four packing needles will be very useful for sewing up gunnies, salitahs, &c. Until near the end of a stalk, your rifle should be carried in a tan-canvas sling cover. A tan-canvas cartridge bag for cartridges, pipe and odds and ends, will also be of use. Some books as taste may incline, besides the "Fauna of India" series, Tyacke's "Manual," and "Family Medicine;" kodak or sketching kit. Weapons and ammunition, cleaning rods, rags, vaseline, bird-skinning and egg-blowing kit, luggage labels for return journey, writing materials, pocket diary for recording sporting and other observations, expenditure, &c. A strong male bamboo as alpenstock, unshod if you are a good cragsman, otherwise safer with a chisel-shaped iron on the end. This makes a noise if struck against a stone, but when nearing animals you can reverse the stick. Spare tin-opener and corkscrew. A hot-water plate keeps dinner warm when camping high up, and goggles are advisable on snow, if the snow field is at all extensive. A terai or a shikar hat is protection enough, if your umbrella is available on the march sometimes. In May or June, ordinary (or Millerained?) Khaki shikar suits, with a flannel shirt, suffice; but it is well to have a tweed or gabardine shooting suit for wear if the weather turns wet and chilly. Against both heat and rain, the umbrella is a most necessary protection in the hills. *Cotton-soled* sambur boots are quite useless and even dangerous in Chamba. The hillsides are generally rather soft, grassy and steep, so you need plenty of large hob-nails and iron heels that you can dig into the slippery ground. The shikaries can make grass shoes for wear with ordinary socks (*i.e.*, without a band between the toes); also the toed sort, for which you could get six or more pairs of puttoo socks from Bahar Shah or Summud Shah, at Srinagar, by V. P. P. at 8 annas a pair. I found that hob-nailed ammunition boots did very well generally. See that your

servants don't put your boots near the fire to dry or they will be soon toasted into iron boots of torture. Wearing two pairs of socks prevents footsoreness on a long march. Six flannel shirts, eight pairs of thick socks, three pairs warm drawers, four khaki suits, one tweed shooting suit, strong slippers, handkerchiefs, &c., will go into the mule trunks (Cawnpore yekdans); also cash box, cartridges, medicines, books, &c., some table linen, towels, and plenty of dusters. Take two pairs of hob-nailed boots, also lighter pair of walking boots and lighter socks. If all these do not go in the two trunks, a "kit bag" will be found just the thing for some of them.

Summing up loads thus far, Cooly No. 1 will take the Native Officer's tent, and all poles, cooly No. 2 the two "pals" and relieve No. 1 of the poles sometimes, No. 3 (a strong fellow) the bedding, basin, and cane tiffin basket, No. 4 the camp bed in tan bag, the table, the hammock chair, and sundries, Nos. 5 and 6 (permanent coolies) the two mule trunks, No. 7 the servants, carpet bags and other things, the servants should carry their own great coats and umbrellas; No. 8 the cook-shop box.

To adjust the loads to about 60 lbs. each, you will need a light "Spring Balance" (weighing to 300 lbs.) to be had at Whiteaway's for Re. 1-4. When marching, your shikari should have the rifle (as usually), and the chota shikari will then carry its case and the other rifle or gun in its case. Also his own and the burra shikari's kit. If, however, as often happens, you shoot and march simultaneously, you will have to give the gun cases, &c., to the "skins and skulls" cooly No. 9. No. 10, the tiffin cooly, will be one of the permanent staff and will have the tiffin bag, camera, &c. As skins, &c., accumulate, stores will diminish, and no more coolies will be needed to carry them.

It is not much use keeping many goat skins, for, unless very well cured, they are mal-odorous things in a room, in damp weather especially, and not lovely to look at. Bear skins are of course well worth keeping. Care should be taken that they are thoroughly *fleshed* and dried before packing away, and all skins should be examined almost daily, for there is a small beetle that will make many unsightly bald patches on a good skin, if he is given a few days to work his wicked will.

Now we come to the very elastic subject of stores, which will determine the total of coolies to be taken. From Bombay take some 1-lb. tins of lard, useful both for cooking and for greasing shooting boots. Calculate quantity at the rate of one tin per week. Plenty of bovril. This is a capital thing for camp use. Try my patent mulligatawny soup! For each person one full teaspoon of bovril, $\frac{1}{2}$ teaspoon of Treacher's Madras curry powder, cup of hot water, boil and strain. A most invigorating decoction! Note too that a *very* stale loaf of bread may be broken up in a bowl of bovril, and will thus provide a satisfying meal for the hungry and weary hunter. Two-ounce tins should be taken; when open it will keep good for some days. Tin of

Madras curry powder, potted meats, tins of peas, &c., Edam cheese, a tin of arrowroot, in case of illness. A few tins of milk will suffice, for generally excellent milk is to be had from the Gujars, as the Mahomedan cowherds are called (the shepherds, called guddiwallas, are Hindus). Two tins of *Yeatman's* yeast-powder, which makes excellent bread. Recipe given below.* About ¼ of a tin of compressed hops (A and N). Try your cook at both yeast and bread-making before you start. There is a good recipe for making yeast and bread at the end of Moore's "Family Medicine." A *baking tin* for the lump of dough is not really necessary, but native cooks imagine that it is. One tin of Chollet's compressed vegetables. I make my own dessicated vegetables each season, slicing carrots, French beans, &c., and drying them on a sheet in the sun. I also dry Lima beans, not over ripe; they wrinkle up when they dry. Boiled, and then fried in a little butter (*sautè* in fact) these beans are excellent, and in Chamba it is often not easy to get fresh vegetables. After June, fruit can be had. Ordinary bran flour is to be had everywhere in Chamba, and excellent brown bread may be made with it; two 14-lb. tins of white flour might be taken for a change. These things, with spirits of wine, Elliman, dry plates, arsenical soap, &c., should fill a 56-lb. packing case. One cooly load—(No. 11).

From Salig Ram's at Dalhousie you can get more fine flour if required, also jams and marmalade, oatmeal, rice, Libby's corned beef, biscuits, tobacco, candles, Kangra valley tea, cocoa, bar soap, salt and sugar. Butter can be made freshly from the good milk. I found that Salig Ram had only tinned Bombay dairy butter! Liquor, I cannot undertake to list. You may take none; you may think a bottle of ginger wine, or a dozen of whiskey sufficient, or you may take a cask of Dalhousie beer. Stores from Dalhousie may be put down as two cooly loads more. Take a supply of potatoes, &c. You will pick up a bhisti perhaps in Dalhousie. I do not think one is needed, for the coolies fetch water and hew wood when in camp. You will keep three on permanently, and your shikari will be responsible if you take one of his men as your dâkwallah. I had a very good dâkwallah, a bhisti named

* Take 2 lbs. flour, put into it two good large teaspoonfuls of yeast powder and one of salt, mix with one pint of cold water, mixing it lightly and by degrees with the hand until all the flour is taken up. Turn it out on a board and knead it for a few minutes. Either flour the inside of the two 1-lb. tins, and put the two loaves in, or lay one flat loaf (or little scones) on a baking pan (that for chupattis will do); sprinkling flour under the dough. Place the tins or pan on some pebbles or sand (to keep the bread from burning) in the small iron oven. Bake for 1¼ hour. When fully risen, after 20 minutes or so, open the oven for a moment to let off the steam. With brown bread, rubbing about 3 oz. of lard into the flour first improves the bread, as bran flour is rather dry. The mixing, &c., then proceeds as above. For a change try sometimes mixing the bread with luke-warm milk, instead of water. So many men have to put up with indigestible chupattis in the hills because the cook declares he cannot make bread, that I hope this recipe will not be considered an impertinence. Be sure the Yeast Powder *is* Yeatman's.

Mamdu, whom I picked up in Dalhousie, and who proved an exception to the rule that all Dalhousie servants are scoundrels. There is a good dhobi in Chamba. He washes for the royal family, and will take you as a client. Your dâkwallah can take in clothes to him when fetching letters weekly or oftener. Thus you will have 13 coolies, a shikari and chota shikari, a cook and one other servant. Three of the coolies permanent, and 10 temporary, for marching. Plenty of small change and silver should be taken. Bank-notes can be cashed in Chamba, Lahore-Calcutta notes are preferred to Bombay ones; and after April 15 there is a branch of the Punjab Banking Co. at Dalhousie. Have your letters and papers redirected to Chamba. *Nota bene.*—Letters for British India, if posted in Chamba, *must bear Chamba State stamps*; but those for Europe *must bear British Indian stamps.* Both kinds may be bought in Chamba Post Office. The nearest Telegraph office is Dalhousie; telegrams addressed Chamba, *via* Dalhousie, are posted on to Chamba and they can be posted to Dalhousie from Chamba.

The cost of the railway journey from Bombay may be ascertained from the Time-books, but it may be useful to note here some charges that will be incurred after leaving Pathankot. From Pathankot to Dunera there are two sorts of tonga. The "Invalid's tonga" costs Rs. 18, and the ordinary tonga Rs. 14, for the single journey. The larger sort takes three passengers and nominally one maund of luggage (more will go on it). Your bedding, rifles, ammunition, basin and Dalhousie portmanteau will have first claim to accompany yourself. Ekkas, or one-horse traps, cost Rs. 3-3-0 to Dunera, and Rs. 4 thence to Dalhousie. A baggage camel, Pathankot to Dalhousie, costs Rs. 3-4-0; the time of arrival is uncertain. A dooly or a dandy, six Kahars Dunera to Dalhousie, costs Rs. 9-12, Kahars included. Rickshaw, costs Rs. 8, A riding pony costs Rs. 4. Coolies get 3 to 5 annas a stage, and Kahars 5 annas stage. They are changed at each chowky, about seven miles interval. Mules right through from Pathankot to Chamba cost about Rs. 4-8-0 each; from Chamba to Pathankot they cost Rs. 3-8-0 each. The rate for mules generally is 8 to 10 annas a day; load two maunds. They cannot be taken beyond Chamba, but from Pathankot to Chamba they do very well, and make the journey in about five or six days. There is a shorter direct route from Pathankot to Chamba, but the Dalhousie road is preferable for several reasons. Each ekka carries one passenger and one and-a-half maund of luggage, or three maunds and no passenger. Ekkas do well enough for men coming *down* from Dalhousie, but ladies will prefer dandies or doolies, which take longer, but are more aristocratic modes of transport. Probably the cheapest way to be carried *up* would be in ekkas from the railway to Dalhousie.

Leaving Dunera before dawn, you might ekka up in one day, or you could sleep at Nynee Khud, half-way, below Bukloh. Expenses at travellers' bungalows are about Rs. 5 a day, a rupee more at hotels. The Dalhousie draught beer is excellent, and Dalhousie-made soda-water costs 14 annas a dozen in

Chamba at Merwanji's branch shop. These prosaic hints on things in general have necessarily to be much abridged in the pages of a journal sacred to high-class Natural History, and the intending traveller will do well to consult the usual books on Himalayan sport and outfit, for instance, K.C.A.J.'s sportsman's *Vade mecum* (Horace Cox); Ward's "Sportsman's Guide to Kashmir" (Calcutta Central Press); Tyacke's "Manual" (Thacker, Spink); Neve's "Tourists' Guide to Kashmir," &c. (Civil and Military Press, Lahore). Kinloch's, Baldwin's, Macintyre's, Newall's Stone's and other books on Himalayan game will be found useful; and Hooker's "Himalayan Journals" (Minerva Library), Knight's "Three Empires," Lawrence's "Valley of Kashmir," are books that will deepen one's interest in the mighty hills. The main problem is to keep down the quantity of kit and yet to travel in comfort.

Having safely reached Dalhousie, sampled the draught beer, and started your servants and coolies or mules down to Kajiar or Chamba, you set off at last for Chamba. The first three miles past the post office, up Putrain hill, by the water-works road to Kalatop, 8,000 feet, will try your walking powers a little perhaps, but thence the road gradually descends for some 9 miles, through lovely forest scenery, with views of the distant snows to Kajiar, 6,400 feet, where there is a good bungalow and a messman. There is a "week" at Kajiar annually about the end of May, when the Dalhousie people camp out there, and races, soldiers' sports, &c., are held. It is a most picturesque spot. The town of Chamba is 7 miles distant and hot, being only 3,030 feet above the sea-level. When crossing the new suspension bridge over the Ravi, you will have some tolls to pay, and on all skins, heads, young animals, coolies, ponies, &c. I think my tolls came to Rs. 10 or so. Arrived at Chamba, make for the travellers' bungalow, to the left of the "Chougan" or Polo ground, and on the cliffs above the roaring Ravi. Send word to the Postmaster, Mr. Mubarik Khan, that you will be glad to see him. He is a most useful person and very obliging. He has charge of all the cooly and other transport arrangements, and will also see to the stamping and posting of your letters, and the collection of supplies by your dâk-wallah, if you leave a small sum in his hands to cover such expenses. He will set about collecting coolies, but if you are provident you will have written to him beforehand fixing the day on which you will require them, and stating the probable number you will need. The provision of cooly transport is a troublesome matter at times, and coolies have to be supplied in rotation from the various "ilakas" of the State. If you have a little spare time at Chamba you will find it very pleasant to make the acquaintance of His Highness the Rajah Saheb, and also some of the chief officials. The Rajah was a very keen sportsman, and one of the best horsemen in India, but I was told that latterly ill-health had somewhat hindered him from devoting himself to manly recreations as eagerly as in former times; still, he is interested in sport of every sort, and is most courteous and agreeable to meet. He took

my wife and little son through the palace to visit the Rani Saheb, and also showed us over his Zoological collection in the Palace yard. Interviews with His Highness are arranged by addressing Prince Bhuri Singh, the Rajah's brother and Private Secretary. He too is a very keen sportsman and popular with all classes. In his absence, apply to the genial Captain Sri Kanth, commanding the forces of the State. The Vizier, or Prime Minister, is a Mahomedan statesman of the good old sort, and though he does not talk English (as the gentlemen above-mentioned all do), he will be found a very interesting companion for a chat. There is a thriving Scottish Mission Station at Chamba, with a Medical Missionary, Dr. Hutchinson, and some ladies. The town is very picturesquely situated on a sort of plateau, edged with high cliffs above the Ravi. There are some very ancient temples, a polo ground, &c. You will not be in Chamba long before you are besieged by a troop of shikaries, candidates for employment. The Chamba shikari is no more to be compared to a good Kashmir one, than a thar is to be compared to a markhor. But (like the thar) he has his points. Certainly, if I were specially desirous to do the thing cheaply, I would merely take coolies and engage some keen villager when I got on my ground. With one other villager to carry the tiffin bag and help generally, fair sport might thus be had. But there are some other things to be taken into account besides shikar. A good shikari will make himself useful in getting supplies, arranging for coolies, messengers to Chamba or Dalhousie, &c. Besides, he will be able to advise you as to route and nullah to be chosen, and will pick up khubber from the local men and utilize them directly, if necessary. It is convenient too to have some one directly responsible for the proper skinning of trophies, but this, and the pegging out, preserving and custody of skins and heads, should receive a good deal of your personal supervision, at all events until the men have fully learnt what you want done. Bear skins, especially, need careful *fleshing* to clear the grease away. With thar and gooral, the *halal*, if performed, or else decapitation, should be done very low down, on the shoulders almost, to preserve the neck skin as large and perfect as possible. On the whole, I think the professional shikari is worth his hire, which is Rs. 15 a month (and a tip); but he will try to get you to take a Chota shikari on Rs. 10 and several coolies on Rs. 8 each as well. So long as he shows you sport, you need not mind a little swindling of this sort, at least I don't. My friend the Captain Saheb kindly recommended me his own man, a shikari named Bhiku, whom I found rather exasperating in some ways at first, but after he got to understand that I did not like him to be flustered and idiotic when I was preparing to fire at game, he suited me well enough. He was quick at seeing game, but almost useless in judging how to make a stalk. He paid no regard to the wind. He could not see through a telescope, though he could use binoculars. He had no idea of range, and my little Männlicher hit some animals at distances that made him think anything

inside 400 yards within easy shot. He became frantically excited when nearing game, and at first could not refrain from touching me, and urging me to fire, when I was trying my level best to take steady aim. This is not a very laudatory account of my worthy gilly ; but in spite of these defects, which a a month of my society considerably toned down, he was serviceable, being a keen and willing fellow, and if I went there again I would take him on, rather than fly to ills I know not of. Some of the shikaries come up as far as Dalhousie to get employment, but I think it is better to reach Chamba before finally engaging one, unless you have had some special man recommended to you. I had nothing to do with the Chamba Chamars (taxidermists) ; they are said to be far inferior to the Srinagar men. I believe they can cure skins passably, however, but they seem to use lime and other pernicious things.

Now as to armament. There is no doubt that smokeless powder confers an immense advantage. Many a time have I been able to get in a second and fatal shot at a bewildered gooral with smokeless powder, when with black powder the animal would have been going full speed away. I used a Männlicher rifle and do not wish for a better weapon. It has only to be held steady and it will kill thar or bears at ranges when the 500 Express would go wide, say 250 to 350 yards. The only drawback is that it is troublesome to clean. To do this, hang the rifle up by the stock, and having removed the " bolt," put a cloth plug in the chamber. Use several brushes ; wash out first repeatedly with warm water and a little washing soda ; after drying carefully lubricate with the " Rifle oil for cordite " sold by Treacher & Co. I see that *acetone* has been recommended for removing cordite fouling. I have not tried it. Military men will probably prefer the ·303. A capital sporting ·303 may be improvised by fitting Lyman back-sight and Beach foresight on the " Martini-Metford " carbine that can still be had at some Government arsenals for about Rs. 60. The split Jeffery bullets are quite satisfactory. The shock of the Männlicher bullet is very great, and animals seemed to go over at once if hit at all fairly. Jeffery's advertisement of these rifles appears frequently in the *Times of India* and Messrs. King, King and Co. keep supplies of Männlicher cartridges. In April and following months the game birds are nesting, and it is useless to take a shot gun, unless one that takes ball, as a second rifle, for following up a wounded bear. Three bears that I shot with the Männlicher were killed almost instantaneously ; a fourth was hit too low down, and got away. My first bear I killed with the 500 Express. He took five shots. To say nothing of the climbing saved, I am quite certain that the great accuracy, diminished recoil, increased range, smashing power, and absence of smoke, of the Männlicher, enabled me to get double as many animals as I should have done with the Express burning 5 drams of black powder. The report of the little rifle too, is different from that of the older weapons, and seemed to puzzle animals at times.

Some practical maxims should be remembered. One is, that if your shikari thinks the ground unsafe, as it often is after rain, you should not attempt it; unless you do not mind trying what it feels like to be a landslip. When game is sighted, take your time; it is a question of steadiness and patience, not hurry and flurry. Use your glass to see which heads are worth firing at, and do not accept your shikari's mere assurance, after you have shot one, that some other is "marneko laik" also. Study the wind; with bears and thar especially. As a rule it is down-hill from 6-30 p.m. to 8-30 a.m., then up-hill; but on cloudy days it is changeable and unsafe for near stalking. It is specially variable near glaciers and before rain. A pocket Aneroid in the tent gives timely warning of rain, so is useful in this connection as well as for altitudes. Clean your rifle daily yourself. Maintain a strict check on the number of cartridges issued and expended. Use strong padlocks; keep your keys on you; a lanyard is a good thing to hang them by, day and night. Thefts take place. At Dunera three gentlemen were at dinner when a cash-box was stolen. Dalhousie is infested with "barrack boys" and other thievish rascals from the Punjab. We had a burglar at Hul who helped himself to Rs. 40; and subsquently found himself, not for the first time, in Chamba jail. The hillmen are very honest unsophisticated fellows, but some of them go up as servants to Dalhousie, and return *educated*.

Always move camp in the early morning; thus you get in while the day is still young, and your baggage is not belated. It would be venturing beyond my experience to offer suggestions as to routes to follow, but Northward Ho! I think. Tyacke's book gives a few hints on this subject. The strict preservation of game in Chamba during the past few years, though made the subject of grumbling by injudicious critics, has done great good; this good especially, that whatever line you take you are pretty sure to find animals, if you know how. Do not spare any foxes, martens, weasels, that you may get a chance of a pot at, when not near more important game. By shooting these vermin you greatly help the preservation of pheasants and chukor. Gooral seem to be almost everywhere; but to get them you must be out at the dawn, and work till after dusk. They are sometimes very low down; only a few hundred feet above the rivor bed; but they are to be found anywhere between 4,000 and 8,000 feet. From 11 a.m. till 4 p.m. it is, as a rule, useless trying for either bears or gooral; but I have more than once seen thar rise to feed at 2 p.m. Bears are often come on quite by chance when returning in the evening or going up a valley early. Thus I shot a bear that was on a grassy bank about twenty yards above me when I was returning after a blank day. He came rolling down, bellowing; but hardly needed the other shot that I sent into him as he reached the path five yards from me. The ground that gooral, and still more, thar, are found on is exceedingly dangerous in bits; test every step if you have any doubt of your foothold

A strong piece of rope is occasionally useful when after thar. It is a mistake to move rapidly on an open hillside; animals are often hidden for the moment, or lying down or motionless; they catch sight of you at once. Whenever a point of vantage that commands a view of the slopes or cliffs is reached, lie down and watch closely for some time. Impress on your shikari the necessity of keeping a very cautious look-out round corners when going along the hillsides. I should probably not have to mourn now the loss of a wounded serow if my head keeper had walked more circumspectly. Gooral hide in crevices or brushwood on the face of precipices; but they also lurk in pine forest adjoining grass slopes and steep cliffs, and it is surprising what a number will come out sometimes from a cover to graze on the slopes just as it is growing dark. Don't forget your hand-lantern if after them then. The Chamba woods are full of delight for the lover of nature. On all sides one hears "cuckoo, cuckoo," or the "hoopoo, hoopoopoo," of our silent Indian visitor; the koklass springs up from the ferns to glide screaming away, or the monaul cock flashes, a gleam of amethystine splendour, through the pines and across the glen. Innumerable thrushes hop about the glades, and families of tiny titmice hover round the ends of the pine branches, while golden-backed woodpeckers are tapping away at the resonant old trunks. You will often catch glimpses of the *Diplo* or *Dipli*, as the Indian Marten, *M. flavigula*, is called; sometimes single, sometimes a couple or more of them working along the crevices or up the slopes. Once the yellow-bellied weasel *Putorius cathia*, and another time the white-nosed weasel, *P. canigula*, came out near me; and I shot a pair of mountain foxes, one early dawn, firing from my tent door. Early in April the rhododendrons are magnificent; and even in May they are in bloom among the higher forests, 10,000 feet up. On the upper path from Bukloh to Dalhousie they were in a blaze of scarlet when we passed along it, though a little late for their meridian splendour. The pines whisper continually; and *Pinus longifolia* especially, when the wind rushes through its long leaves, makes a hissing sound almost like steam escaping. The oaks at Dalhousie are very grand, and hoary with moss; there are some noble deodars (cedars of Himalaya), as at Kajiar. The sides of the paths are tapestried with waving ferns, and fragrant with wild apple blossoms and roses. All who have heard the Himalayas "a-calling," will know what a land of dreamy beauty to expect; and will not be disappointed.

From Chamba we marched 16 miles up to Hul, a scattered group of villages on the side of some irregular hills, with cliffs, grass slopes, pine forests, and terraced fields, in abundant variety. We found that the "dandy" was impracticable beyond Hul, and my wife had to walk along a very narrow track for nearly three miles further to Gundera, where, near 7,000 feet, our first camp was pitched, in a little ravine above a torrent of delicious water, icy cold, from some snow on the hills at the head of the glen.

My shikari warned me that we should on no account eat gooral flesh, as once a saheb had had the hardihood to try it, and his body swelled up to such an alarming extent that he very nearly died. Undeterred by this awful example, we did *not* hand over all our gooral venison to our worthy shikari and his gang of omnivorous myrmidons, but took the risk, and found gooral most excellent eating, in fact far better than the rather inferior mutton we occasionally purchased. For weeks we revelled in gooral soup, gooral chops, gooral roast and boiled, curried gooral, gooral liver and bacon; these delicacies ought surely to have produced symptoms of violent "Gooralism"; but our iron constitutions seemed to withstand them remarkably well; in fact we even began to suspect that our beloved Bhiku liked gooral himself, and had been trying to obtain more than his fair share by a pleasing little fiction. We let him have all the thar meat, however; and so he continued fat and contented.

It would be tedious to give long extracts from my diary;—they would be for the most part of the stereotyped sort; but I feel bound to impart a flavour of Sport and Natural History to this very heterogeneous paper by a few concluding quotations.

So, as touching gooral, or "Bun Bukri:" Opposite some Gujars' huts near the camp in Gundera there stood a precipice, sheer rock some hundreds of feet in height, on the other side of the river. Surveying these cliffs one evening—350 yards distant—I made out with the glasses two gooral among some brushwood. One stood out clear on the edge of a rock. It was the first day of my new rifle, and I determined to try a sighting shot across the glen. The first bullet went a little low, but the gooral did not move. I put up the 300 yards sight, and fired again. The gooral seemed perturbed in spirit. Lowering the sight to 100, and aiming full, I fired a third shot and the gooral fell down the cliff, shot through the neck. * * * Starting at 5 in the morning, Bhiku, the tiffinwallah, and myself went up the hill behind camp. I saw a gooral across the ravine to the left; it was high on the face of the precipice, lying down in a small cave, partly hidden by some branches, too far for shooting at. Continuing our climb we saw another on a peak some 500 feet higher, and half a mile away. Keeping out of sight, we crept along the slopes till we were about three hundred yards from the crag on which it had been standing; it was no longer visible; but as we moved up, two other gooral darted out of a hollow 200 yards away, and stood to see who we were that had intruded on their solitary realm. I shot one, a male, and missed the other as it bolted. So home early. In the evening we went down to some cliffs below the Hul road from Gundêra, and saw two gooral far below. Making a detour, we crossed the torrent, intending to get opposite them through the woods on the further side of the glen. The plan succeeded. I got to about 250 yards of them, but finding that it was a doe and young one, did not shoot. Instead, I sent a man across

to drive them towards me. They were in some brushwood above a small precipice. When the man got above and near them, they suddenly darted down the rocks, and the young one made across the open and up the valley. But the mother, as quick as thought, flung herself into a narrow cleft in the rock, and hid there, with just the tip of her nose showing, while the man hunted about everywhere for her. He came back at last and said he could not find her ; yet all the time she had been within a few feet of him, tucked away in the cranny. Another day I saw a wounded gooral get far in under a rock in the same way ; it had bolted down hill, dashed past a large boulder, and disappeared. The men sought it for some time before one of them peeped under the rock and dragged it out. o o o

There were no thar round Gundera, but a few were said to be at the head of the valley above Mundola, about 8 miles distant. Taking a small tent, a camp bed, and a tiffin basket, I set off for a short expedition to try for a thar. The first-half of the way was a heavy pull up-hill. I saw several gooral, one of which I shot ; and when nearing the camping-ground I had the misfortune to wound and lose a serow. It saw my shikari, and was making off when I fired a long shot at it. It looked a queer lolloping sort of creature, with large ears and sloping hind-quarters. We found much blood, mixed with froth, sign of a fatal wound generally ; but it got away in some bad precipices, and we never saw it more. We camped on the edge of an old sheep-fold, at about 8,000 feet. The glen had some snow in the higher parts, as well as in the river bed, and a strong torrent rushed along, for the most part under the snow. The sides were steep and rugged, with heavy pine forest covering the lower slopes, and bare, rugged, precipitous rocks projecting amid the trees—just the sort of ground for thar, for they frequent the most dangerous cliffs and the densest thickets. There were several snow bridges to be crossed, and a detour had to be made, to get above a waterfall that had cut its course between vertical walls of rock. Halting when the upper parts of the valley came into view, my telescope showed me a shaggy old thar (or Kurt, in Pahari speech) amid some bushes about half a mile away ; and on the slopes above him, a large snow bear was feeding. The climb up the snow bed took us till 9 o'clock and then it was too late to do anything, for the bear and the thar had both disappeared and would not turn up till the afternoon, if then. We went on to about 10,300 feet, and breakfasted near two lovely cascades that fell over a precipice and disappeared behind the bed of snow in the ravine. I saw several koklass and monaul ; one monaul hen was sitting beside what was evidently her nest, in a cranny under a juniper bush on the face of a precipice, safe from any featherless biped. While we were walking up the glacier, Bhiku saw a thar up a side ravine to the right; but the thar had previously seen him, and was over the hills and away before Bhiku had quite grasped the situation. If he had reconnoitred the ravine before openly crossing the mouth of it, we should have got that thar then, instead of two

days later. We climbed up the northern side of the valley after breakfast, and took up a position in the precipices, under some grand pines, to watch the opposite cliffs and the ruggged ground below us. The rhododendrons were in full bloom still at this altitude, and three lovely and distinct shades —scarlet, pink, and lilac, were to be seen. The hoary oaks, too, had long streamers of greenish-yellow moss trailing all over them. After lying down for a couple of hours, we saw five thar on the opposite side of the ravine, amid some steep precipices. We climbed down through the forest—a very slippery climb—when I fell. (I had put on my cotton-soled boots 5 minutes before to see how they would do, and my ankle twisted under me. I never wore those boots again in Chamba, but stuck to my hob-nails.) Slowly I limped down, and after a painful scramble got opposite three of the thar that were feeding quietly along the cliffs, some 300 yards distant, and nearly level with us. Bhiku wanted me to fire at 250 yards, but I said I would try to get nearer. Not without some trepidation, for I had never shot a thar, I crawled to about 180 yards. Two thar were visible. I fired, and hit ; fired again, and hit the other ; they both fell down the precipice into the little crevasse beside the deep layer of snow that covered the torrent ; but we got them out without difficulty. On our way home we came on a very large black bear, over 7 feet in length, and added him to the bag. The next morning I did not go out, but from my tent door, with my glasses, I saw a bear feeding along the opposite cliffs, about a mile away. We set off promptly to try for a shot from our side, and after a difficult clamber down the precipices beneath the tent, we got to about 200 yards of him. He was by this time (9 o'clock) meditating a sleep ; he chose a grassy bank under a shady tree ; before finally settling to his siesta he sat up and looked round him, then he slept, with his nose between his paws. Right across the ravine, the little rifle got him fair through the heart. It seemed as if he never woke for an instant even. He rolled down about five yards, and lay stone dead. To make sure, I gave him another shot, that also hit him ; then I sent over for his skin. * * * The kestrel breeds in the cliffs everywhere. If an eagle or lammergeyer comes along, the little fellow is out at him, and chases him away, with the pertinacity of a king-crow. * * * It is curious to note how exactly the forest runs up to the edge of a ridge, and then stops ; not a tree crosses the boundary ! The other slope is covered with grass only. I could not discover any regular principle in the directions of this curious forestation and denudation ; but it seemed that generally the slopes facing north-west to north-east were clothed, and those facing south or south-east were inclined to be bare. Have forest fires, burning the drier southern aspects, caused this ? Or is it due to the force with which the monsoon rains wash down all seeds and seedlings with the mould from the more exposed sides? Or to an accidental deficiency of suitable mould on some slopes ?

Returning after my four days' expedition, with 3 thar, 2 bears, and 2 gooral, we moved camp to Hul, pitching on the southern slope of the vale, on the level dancing-green in front of a picturesque old temple of Kali, which was much in need of repair. The temple was built chiefly of pine-wood, and had some quaint carvings, as of a leopard and a snake, on the front over the architrave, and a pair of 11-inch thar horns nailed over the door of the inner shrine.

When the temple *mela* (fair) takes place annually, there are wrestling matches and dances held on the little green, so by request we did not dig our usual trenches along the tent walls, but only put a little embankment of earth round, which failed utterly to keep out the flood water one very stormy night. After getting the camp into order, I went up the steep hill over the camp, and saw a good gooral lying down on a little ledge, half in a small cave on the face of a tremendous precipice. My first shot missed, as so often happens if one fires at a recumbent animal; the gooral sprang up, stood for a fatal moment; and was picked up quarter of a mile below, whither he had fallen in three bounds and a short roll! Just below where he was shot, I saw on the face of the cliff, a nest of *Gyps fulvus*, the Tawny Vulture. There was a full-grown young bird crouching in the nest. As we were resting on the hillside, we heard some shots in the valley below. Descending, we learnt that they were being fired for the benefit of a dying man in the village. "Many a holy text around she strews, that teach the rustic moralist to die." But in this case the object was to cure the sick man; and the means was by firing blank cartridge, wadded with paper. on which texts had been inscribed. It was no doubt as efficacious as praying by water-power; or the *hakim's* dodge of making the patient drink the water in which the prescription has been washed off. Healing by faith is not limited to people who believe in patent medicaments! * * * Again I deserted my sorrowing family for four days, taking the small camp a distance of 16 miles or so, up the Hul valley, and over three passes, 9,100, 8,700, and 9,700 feet high, *via* Banjah, to Bhangori, a village in a glen on the south of the Chanju valley, with a splendid view northwards towards Chanju and the great snowy peaks beyond. Hul is just 6,000 feet at the river bed below the lambardar's house, so this was a good long walk. I started at 5-50 a.m., and taking it easy, got in at 3 in the afternoon. We camped near the panchakki, or water-mill, about a mile or so from the village, if three huts can be so designated. On the way down the last ridge, a flying squirrel, or *Een*, as the hillmen call it, glided past me, and went some sixty yards further down-hill, to the foot of a withered old pine, up which it scrambled rapidly to near the top, when it disappeared into a hole in the dead-wood. I got to about 40 yards of it, and sent a man to tap the trunk. The squirrel put its head out; the little Mannlicher bullet caught it on the cheek-bone; and down it came. It was the larger flying squirrel, *Pteromys inornatus*.

On a former day I similarly got *P. fimbriatus* above Gundera. The men said that these Een were often killed for their skins; the method being, to light large fires in the forest at night, for they are mostly nocturnal; the blaze attracted them, and small shot did the rest. Both these I got at 8,000 feet elevation. Arrived at the village, I heard that an old thar was in the habit of frequenting the cliffs low down on the opposite hillside. Bhiku and I went down to the top of the precipice below the village to have a look for him, and we had not been watching for more than five minutes when we saw the thar, a shaggy old fellow still in his winter coat, coming out from behind a pine tree and moving down the rocks. He was 300 yards away, but the Männlicher was all there, and hit him about midway on his side. He slowly walked behind some rocks, and was seen no more. It was too late to send men over, as the ground was almost impracticable even for hillmen; but next day two men retrieved him, dead, and with his face partly devoured by a bear that had come upon him during the night. The horns were 11½ inches, and thick. Having sent off the search-party for this thar, I crossed through the fern-carpeted woods to the torrent, and we climbed up the steep and slippery cliffs, along the course of a cascade, clinging to tufts of grass or fern, lifting ourselves by means of overhanging roots, getting just a partial foothold in some cranny or on some tottering projection, with often sheer chasms beneath us, certain death in case our hold gave way. We had seen some thar on the cliffs the night before, and we took a line that would keep us out of sight in case they were there still. After climbing slowly for about two hours, we peered through some brushwood on a ledge, and saw three thar, a male and two females, on the face of a steep shelving precipice some 200 yards distant across an impassable ravine. The thar moved just as I pressed the trigger, and the shot went over his back. He turned and faced me, as if to see whence might be this new strange sound, not quite that of a falling rock, nor yet distinctly that of a smoke-compelling gun. The second shot caught him just below the right eye, and passed out at the back of his neck; and down the precipice he went, in one terrific bound, quite eighty yards, when he was stopped by some bushes on a ledge. It is remarkable how the horns of wild goats stand these tremendous falls; they are very seldom damaged, in spite of the crash on the rocks below. This was a smallish thar, with thick horns, but only a little over eight inches in length. Having recovered the slain and hidden the trophies in a tree, we went on, along the worst lot of precipices I ever climbed among, but saw nothing more. It was, however, a fine study in thar ground. All night it rained, hailed, lightened, thundered, and blew. At 10 next day it was fine, but my shikari declared that it would be too dangerous to go on the opposite cliffs after such a storm. I reluctantly agreed that it would be better not to run the risk, and decided to try easier ground, for gooral, instead. Accordingly, we started at 12, going past the village, and up to a stately pine tree on a wind-swept ridge, where

we settled down till the afternoon. There is a nice footpath here that goes towards Tikri I believe, and we followed it for a mile or so, till it faded into nothingness on the face of some steep slopes where a landslip had swept the hillside bare. While climbing over the broken ground, a gooral appeared running up-hill about 150 yards above me, and a lucky running shot wounded him. After a short but heavy climb I finished him with another shot. The horns were unequal in length : one was $7\frac{1}{2}$ and the other $6\frac{1}{2}$ inches ; and one fore-foot was curiously deformed, the outer half of the hoof being turned flat outwards, as if from some fall on a sharp stone. Hiding the gooral in a tree, we went up a valley where some shepherds told us we should find a red bear ; but our search was unsuccessful, and it began to rain. At 6-30 we started back for home. Coming out of the forest we saw a gooral standing on a projecting rock and looking down the chasm. It was an easy shot, and down he went. The sound startled another gooral above me, and he too was knocked over, running about 100 yards off ; but he picked himself up, and got into the forest, where it was too late to recover him, though I left Bhiku to search for some time, and sent the lantern out for him.

Another thunderstorm during the night ; and very large hailstones (the "Pigeon's egg" brand which really are about the size of 12-bore bullets). There are some grand deodars (cedars) here. The ferns and flowers are quite wonderful. The woods are simply carpeted with maidenhair ferns ; and the bracken is rapidly growing (May 22) on the hillsides. Note that the natives cook the shoots of bracken ; it tastes somewhat like seakale. With our usual rashness, we tried it but did not think very much of it. Wild strawberries, tasteless little things, abound ; and no doubt rhubarb could be found above 12,000 feet, but I was never so high up. The wild thyme serves to season dishes. The irises, violets of several sorts, some very sweet and others without scent, marigolds, large daisies, and tiny geranium-like flowers, red and pink : these and many other flowers grow everywhere. The tillage is on terraces, levelled ledges on the slopes ; barley and wheat are ready for reaping, and the monsoon crop of *maki* (Indian corn, beloved by bears and men) is just coming up. The village houses are flat-roofed. Hill unsafe after the storm. Bar. down to 22·7. Heavy clouds rolling on from the eastward ; another storm imminent. A villager who came to grind some *maki* said that he had seen a big thar going up the opposite rocks, near where I had shot the small one on the 21st. At a height of 200 feet above the torrent bed, the ravine is about 250 to 300 yards wide. We started at 1·30 from my tent and at 2 o'clock were just opposite the cliffs where the game had been seen. We sighted two thar—one large and one small male. We were well hidden by the forest. The opposite hill was more precipitous, and had patches of pines and bushes on the ledges amid the crags that projected everywhere. The two thar had just risen (2 o'clock) ; descending a short way, they began feeding. We were nearly level with and opposite them, about 280 yards

distant—a long shot ; but a thar is a bigger mark than a gooral ; and I had a rock in front to rest my rifle on, with Bhiku's cap as a pad to keep it from "jumping." The animals were only occasionally exposed, and the brushwood was dense ; but at last the big one was in full view, and I fired. The two thar stampeded, and I fired again twice as I caught glimpses of the big one crossing open bits. After going about 100 yards full speed, the big thar pulled up amid some pines and the small one went on alone. " He must be hit," I said ; and I sent two men over to see what had become of him. The noise made by the men climbing, moved him ; he was hit hard ; slowly he walked along the steep bare rocks. I fired—300 yards—and struck him ; he pirouetted round and round ; I fired again, and making one last effort to save himself, the fine old fellow went down the precipice. His horns were nearly 11 inches. The storm was now rumbling overhead. It was so dark that at 4 p.m., on the way home, we met a cooly coming with the lighted lantern to meet us ! We got in just as the rain began to fall. Such rain ! The single fly Native Officer's tent held it out till the two-ply cotton cloth was well soaked, and then the pattering of large hailstones sent a fine spray over me. I had no large water-proof sheet to hang outside, so I put all my kit under the bed, spread the small waterproof over the bedding, and with my invaluable umbrella over me, sat down to an excellent dinner of *Soup de Bovril*, and *Côtelettes de gooral*. Next day I returned to Hul. The storm still raged, and flashes of lightning and crashes of thunder were all round us. One pine tree was struck a couple of hundred yards from the path, and blazed away merrily. I made good time over the pass, 9,700 feet, and down the steep drifts of hail-stones to the valley far below. Leaving Bhangori at 11 we got to the Hul camp at 5 ; good hard going all the time, and bitterly cold. These six thar were all I had a chance at ; some fair heads, but not first-class. To get 14-inch thar one must go further than two marches from Chamba. o o o

June 1st.—I worked along the pine forest above Hul at about 8,000 feet. To my delight, up flew a woodcock about five yards from me. She had a young one—the men said two young ones, but I could not see two distinctly myself—in her claws pressed close under her ; and she flew slowly and heavily for about ten yards, then rested above a bramble which the young one seemed to catch hold of with its claws, or become entangled in. The old bird fluttered for quite half a minute over it before she could pull the little one clear and fly a few yards further down, when she alighted, but rose again when I sent a man to try to catch the young one. I have seen woodcocks carrying their young in County Wicklow, and have caught the young fledglings there ; but this was my first sight of a woodcock in India, and I think it must be the first Indian record of a woodcock being distinctly seen carrying the young thus between its claws. I may note that there is a capital picture of the bird carrying its young in Harting's " Sketches of Bird Life", page 225. It seemed to me that this Chamba woodcock did not carry her

young one with her claws stretched down, as in the picture, but rather drawn up somewhat closely, as St. John describes it in the same book. The position of the legs would depend on the grip taken, and that would vary occasionally no doubt. In this instance the bird was taken by surprise and may have snatched her young one up anyhow. Hume and Marshall mention this habit. In Vol. iii, p. 319, they say: "Whether the woodcock ever does remove its eggs, as has been asserted, it certainly does carry its young about, one at a time, grasped between the two thighs and pressed against the lower part of the breast." In "Nests and Eggs" there is only an account of the taking of four hard-set eggs.

These samples of my diary may suffice to give some idea of the pleasures and risks of "Camping in Chamba."

DESCRIPTIONS OF NEW SPECIES OF MARINE SHELLS FROM BOMBAY.

By J. Cosmo Melvill, M.A., F.L.S., &c.

(*With a plate.*)

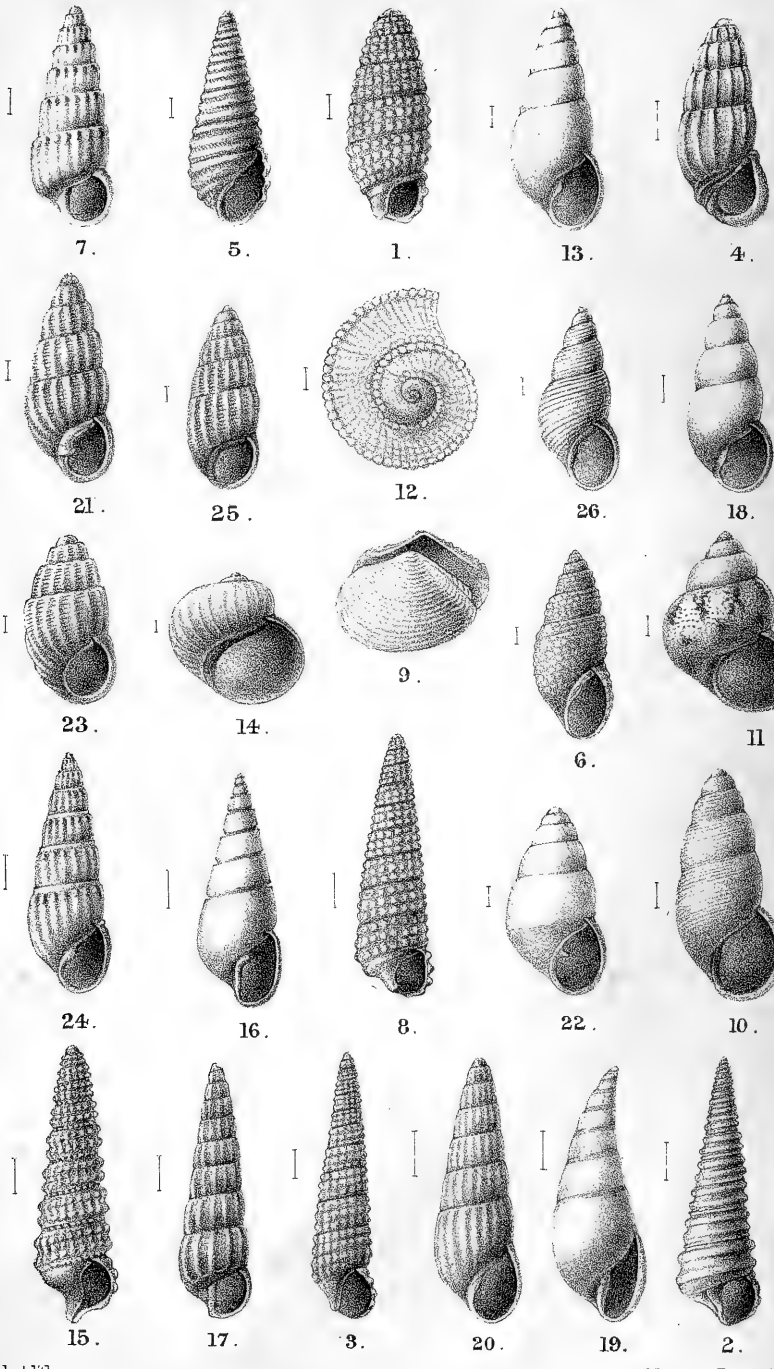
In November, 1892, conjointly with Mr. Alexander Abercrombie, of Bombay, I published (1) a Catalogue of about 320 species of marine *Mollusca* that had been collected by the latter gentleman during three successive seasons on the shores of this favoured, specialized, and little explored centre. Specialized, Bombay is certainly proved to be in this particular, since many showy species would seem to have made her coasts their head-quarters; and, besides, in the Catalogue just referred to, no less than twenty-five were signalized as novelties, many belonging to the more attractive genera, *e.g.*, *Purpera*, *Murex*, *Tellina*, and *Rœta*. At the same time a few of the *Minutiora* were described and figured, and a far larger number set aside for future investigation. These have received welcome additions by an assortment of two further boxes of shell shingle, kindly forwarded a year ago by Mr. Abercrombie, which, while yielding further specimens of nearly all the smaller species first enumerated, likewise provided fresh material in the way of many novelties.

The molluscan fauna of Bombay being, as already observed, well differentiated and specialized, it is rendered a simpler task than might be thought to discriminate such forms as are now to be described. No dredgings, scientifically made, have been carried out here—indeed, I am informed, the configuration of these coasts is not satisfactory for the purpose—and no collections of the smaller species, excepting a few by the Rev. Mr. Fairbank, of Bombay, and Messrs. H. F. and W. T. Blanford, had been made, when a few species, *e. g.*, *Irawadia trochlearis*, Blanf., and *Fairbankia bombayana*, Blanf., were described. Mr. Geoffrey Nevill subsequently discovered a few, mainly *Pleurotomidæ*, and it is regrettable that his types are all in the Calcutta Museum, and therefore inaccessible to most British conchologists. Some, however, have been figured in the Journal of the Asiatic Society of Bengal.

The Ceylon fauna and that of Karachi, the latter now being assiduously explored by Mr. F. W. Townsend, differ widely from that of Bombay, though of course a few species are common to two or all three of the localities. We cannot think that, numerically, the Bombay list will exceed 500 species (exclusive of brackish-water forms such as *Neritina*, *Potamides*, *&c.*); and the publication of the following twenty-six new forms, mainly belonging to the families *Solariidæ*, *Scalariidæ*, *Pyramidellidæ*, and *Cerithiidæ*, will swell up the total of those catalogued to 350 species.

I would tender my best thanks, not only to Mr. Abercrombie, for providing the material of which this paper is the outcome, but also to Mr. E. A. Smith, and Mr. E. R. Sykes, for aid and advice. It is my intention to offer to place

(1). *Cf.* Memoirs Manchester Lit. and Phil. Soc., series IV, vol. vii, pp. 17-51.



J. Green del. et lith.

NEW MOLLUSCA FROM BOMBAY.

Mintern Bros. imp. L

the types of all these small species in the Natural History Museum, South Kensington.

1. BITTIUM TENTHRENOIS, n. sp. Pl. Fig. 1.

B. testa cylindrica, obesula, doliiformi, solida, ochracea, apice obtuso, apud apicem, simul ac ad basim pallidiore, anfractibus 7, in medio latioribus, tribus papillarum ordinibus transversim regulariter instructis, papillis parvis, gemmatis, interstitiis, alveolatis, apertura ovato-rotunda, labro exteriore minime expanso. Long. 3, lat. 1·25 mm.

About twenty specimens of a small, tun-shaped, cylindrical shell, warm ochraceous in colour, with the extremities pale, almost white, ornamented with three rows of papilliform gemmæ on the whorls, the spaces between them being alveolate, whence the specific name, derived from τενθδας, "honeycombed." This species is slightly like *Cerithiopsis pulvis*, Issel, from the Red Sea, a very small species, which, with the present one, I should be inclined to class rather as a *Bittium*.

2. CERITHIOPSIS RUBRICINCTA, n. sp. Pl. Fig. 15.

C. testa fusiformi, solida, pallide ochracea, anfractibus 10 vel 11, tumidis, apud suturas impressis, binis gemmarum ordinibus transversim decoratis, longitudinaliter clathratis, interstitiis alviolatis, infra juxta suturas tenui rubra zona accinctis, apertura subrotunda, peristomate tenui, canali brevi. Long. 3·25 mm. sp. maj., lat. 1 mm.

Very beautiful, though minute. Of a pale ochraceous colour; the ventricose whorls are ornamented, just below the sutures, with a red band; the sculpture is, as is usual amongst the *Triforis*, *Bittium* and *Cerithiopsis* a double row of transverse gemmæ, crossed by lattice forming riblets, the interstices being honycombed and deep. The mouth is almost round, canal very short, lip simple. Several specimens.

3. CERITHIOPSIS SYKESII, n. sp. Pl. Fig. 8.

C. testa attenuato fusiformi, aciculata, ochracea, anfractibus 12 vel 13, rectis, minime ventricosulis, trinis gemmarum papilliformium ordinibus transversim cingulatis, apud suturas impressis, in uno specimine juveni duobus apicalibus anfractibus pellucidis, vitreis, apertura subquadrata, simplice. Long. 4·25, lat. 1·20 mm.

A tropical representative of the typical species of the genus, *C. tuberc ularis*, Mont., from which this shell differs in being straighter, more attenuate, and regular. It comes nearer to the *C. diadema*, Watson, from Madeira, of which I have only seen a figure, but is smaller than that species. It is of a uniform pale ochraceous-brown, and the single young individual of the series possesses two vitreous apical whorls intact. I have much pleasure in connecting with this small *Cerithiopsis* the name of Mr. E. R. Sykes, our indefatigable Secretary.

4. CERITHIOPSIS PULCHERRIMA, n. sp. Pl. Fig. 3.

C. testa tenui, multum attenuata, aciculari, albida, anfractibus 13, apud suturas canaliculatis, apud canales uno gemmularum ordine, cæterasque in

partes anfractuum bino ordine similari instructis, aperture subquadrata, labro tenui. Long. 4, lat. 1·15 mm.

Seven specimens, mostly rather imperfect. The largest, from which this description is taken, is slightly distorted in one of the central whorls ; it is in very good condition, being white, elongated, very attenuate, thirteen-whorled, ornamented with three rows of gemmules, one row being at the canaliculate depression, just below the sutures of each whorl, the other two on the normal whorl. The mouth is simple, aperture squarrose. It is a very beautiful little species.

5. Solarium (Torinia) homalaxis, n. sp. Pl. Fig. 12.

S. testa minutissima, depressa, profunde umbilicata, albescente, gemmulata, supra depresso-planata, anfractibus 4, ultimo rapide accrescente, ad peripheriam bicarinato, carinis regulari gemmarum ordine decoratis, simili bino ordine circa umbilicum, inter has, infra, simul ac supra, quatuor minorum gemmularum ordinibus instructis, apertura quadrato-rotunda. Long. 1, lat. 2 mm.

I alluded to this specimen when describing its congener, *S. delectabile*, also from the same locality.* This species differs in its more depressed form, the bicarinate angles at the periphery, and its smaller size. The shell is in juvenile condition, however, and may grow slightly larger, the apical whorls showing this. It is an exceedingly highly chased and sculptured little species.

6. Rissoina epentroma, n. sp. Pl. Fig. 23.

R. testa oveta, gradata, solidiuscula, candida, anfractibus 5, undique longitudinaliter crassicostatis, costis lævibus, interstitiis transversim :tenuistriatis, apertura ovata, labro exteriore incrassato. Long. 2, lat. 1·15 mm.

Three specimens, one being juvenile, of a highly sculptured little species, which I have placed in *Rissoina* rather than in *Rissoia*, owing to the thickened base of the aperture, the general form being more in accordance with a species of the latter genus.

The shell is gradately turreted, five whorled, the whorls being uniformly costate, the ribs very thick in proportion to the size of the shell, and the interstices between transversely finely striate. The name, from the Greek ἐπίντρωμα, signifying "a delicacy," is chosen on account of the extreme beauty of this little *Rissoina*.

7. Ressoina pachystoma, n. sp. Pl. Fig. 4.

R. testa solida, fusiformi, albo-cinerea, anfractibus 8, undique longitudinaliter recticostatis, costis regularibus, lævibus, nitentibus, interstitis lævibus, apertura oblique ovata, labro exteriore multum incrassato, ad basim quasi-truncato, margine columellari obliquo, crasso. Long. 5, lat. 2 mm.

The nearest approach to this species seems to be *R. conifera* (Schwartz). It is principally distinguishable by its straight, smooth ribs, and extremely

* Mem. Manch. Lit. and Phil. Soc., vol. vii, p. 57.

incrassate outer lip, the base being somewhat truncate, and the thickening extending to the columellar margin.

8. ADEORBIS VANIKOROIDES, n. sp. Pl. Fig. 14.

A. testa profounde umbilicata, depresso-globosa, apice exserto, tenui anfractibus 4, ultimo rapide accrescente, longitudinaliter obliquissime tenuicostatis, costis lævibus, interstitiis sub lente striatulis, ultimo circa umbilicum effosso, angulari, apertura ovata, labro exteriore simplice, paullulum incrassato. Long. 1·50, lat. 1 mm.

Extremely small, but very characteristic. Of the same character as *A. scalber*, Phil., a Central American shell, but differing entirely in form ; the apex is conspicuously exserted so far as the first two whorls are concerned, the last whorl is large, and entirely longitudinally obliquely ribbed, the interstices between being very finely striate. The umbilicus is profound, angularly ridged above, and the aperture ovate. The specific name suggests a superficial resemblance in miniature to species of *Vanikoro*, Quoy and Gaimard, which name has precedence by several years over *Narica*, Recluz.

9. ACLIS ATEMELES, n. sp. Pl. Fig. 10.

A. testa angusta, attenuata, fusiformi, delicatula, albido-cinerea, anfractibus 6, tumidis, apud suturas impressis sub lente tinuissime transversim striatulis, apertura ovata, labro exteriore paullulum incrassato. Long. 3·25, lat. 1·25 mm.

A finely striolate species, with ventricose whorls, six in number, apex obtuse, mouth ovate, simple. The name suggested is the Greek word for "neglected," from the inconspicuous appearance.

10. ACLIS EOA, n. sp. Pl., Fig. 18.

A. testa oblongo-fusiformi, delicatula, semipellucida, lactea, apice obtuso anfractibus 6, paullum ante apicem irregularibus, ventricosis, apud suturas multum impressis, fere lævibus, vix nitentibus ; apertura ovata, peristomate simplice, tenui, margine columellari obliquo. Long. 3·50, lat. 1·25 mm.

A thin, semipellucid, milky shell, without any gloss, six-whorled, the whorls a little irregular and distorted, ventricose, and impressed at the sutures. The aperture is ovate, the outer lip simple, and the columellar margin somewhat oblique.

It does not yield in beauty to the other known species, nearly all of which are exquisite in form. The specific name is given from its Eastern habitat.

11. EULIMA DENS-COLUBRI, n. sp. Pl. Fig. 19.

E. testa parva, politissima, attenuato-curvata, apud basim latiore translucida, anfractibus 10, juxta, infra suturas zona lactea pellucente cinctis, apertura oblique oblonga, labro marginem apud columellarem paullum incrassato. Long. 5 mm. sp. maj., lat. 1·75 mm.

A small incurved species, ten-whorled, smooth, polished, but translucent, the basal portion being broader in proportion. This form is allied to the European and British *E. incurva*, Renieri, *E. distorta*, Phil. (*non*

Defrance), but the shell is much broader at the base, and the whorls are not so flattened. The mouth is obliquely oblong, and in full-grown specimens the shell is slightly thickened at the columellar margin. Many specimens.

Another small species of *Eulima* occurs, of which I have two specimens : it is straight, and in form like *E. polita*, L.; it may possibly be identical with *E. subangulata*, Somb, described as being an inhabitant of the Indian Ocean.

12. SYRNOLA METRIA, n. sp. Pl. Fig. 16.

S. testa elongata, fusiformi, solida, alba, nitida, anfractibus 10, apud suturas acute canaliculatis, rectis, apertura ovato squarrosa, peristomate tenui, simplice, marginem apud columellarem uniplicato. Long. 5, lat. 2mm.

A shining, smooth species, deeply channelled at the sutures. Mouth squarely ovate, with one columellar plait. In form an *Obeliscus*, in mouth-process a *Syrnola*. The name is the Greek μέτριος, " moderate," " modest."

13. OSCILLA INDICA, n.sp. Pl. Fig. 5.

O. testa attenuata, fusiformi, delicatula, tenui, semipellucida, candida, anfractibus 9 vel 10, transversim undique spiraliter tricostatis, costis acutis lævibus, interstitiis sub lente tenuissime longitudinaliter striatis, apertura oblonga, labro simplice, marginem apud columellarem uniplicato. Long. 3, lat. 1·25 mm.

A very beautiful little form, of which only one specimen has so far occurred. It might easily be overlooked for the young of *Irawadia trochlearis*, Blanford, but this is a coarser shell, though of the same transversely carinate pattern and white colour. It is a most delicate species, and the columellar plait, though somewhat deep-seated, is very evident.

14. MYONIA GAVISA, n. sp. Pl. Fig. 26.

M. testa tenuissima, albida, subpellucida, elongato-attenuata, anfractibus 7, ventricosulis, undique transversim filostriatis, apertura oblonga, peristomate tenui. Long. 2·25, lat. 1 mm.

A very small, delicate species, with some appearance of an *Aclis*, but we consider rightly referable to *Myonia* (*Actocpyramis*, Fischer). The shell is white, subhyaline, whorls probably seven (but the sole specimen is a little broken at the apex), much ventricose, and uniformly transversely filostriate. The name is the Latin *gavisus*, "that has given pleasure," from the beauty and sculpture of this little shell.

15. MIRALDA IDALIMA, n. sp. Pl. Fig. 6.

M. testa oblonga, gradatula, tenui, albida, subpellucida, anfractibus 6, ad suturas multum impressis, subcanaliculatis, turritis, infra suturas bino gemmarum ordine decoratis partes ad cæteras anfractuum transversim costulatis, ultimo apud basim læviore, apertura oblonga labro tenui, marginem ad columellarem uniplicato. Long. 2, lat. 1 mm.

A very small but well-marked shell, its sculpture being distinct. The whorls, six in number, of which two are very small and apical, one turreted being much compressed—almost canaliculate—at the sutures. Below the sutures

there is a double row of transverse gemmæ, and the rest of the whorls are ornamented with plain, transverse, raised lines or small costæ. The mouth is oblong, and the columellar plait is large and strong.

Only one specimen is in existence, one other, which was in all respects precisely similar, having, unfortunately, got mislaid.

Εἰδάλιμος is a Homeric adjective for "comely," the Latin *formossus*, and is well bestowed upon this little shell.

16. ODOSTOMIA ANTELIA, n. sp. Pl. Fig. 22.

O. testa ovato-fusiformi, tenui, crystallina, lævi, nitida, anfractibus 6 apud suturas multum impressis, ventricosulis, sub lente spiraliter tenuissime calcario-lineatis, apertura ovato oblonga, margine columellari uniplicato, plica recta conspicua. Long. 2, lat. 1 mm.

A typical *Odostomia*, with translucent, white, polished surface, six whorls, ventricose, deeply impressed at the sutures, giving a gradate appearance to the shell; under a lens in certain strong lights very indistinct, chalky, transverse lines are seen on the surface; the aperture is ovate-oblong, the lip simple, the columellar plait being straight and conspicuous.

The specific name is the Greek ἀντήλιος, "eastern."

It has some affinity with certain European species, e.g., *O. eulimoides* and *O. rissoides*, of Hanley.

Another species of *Odostomia* has unfortunately been mislaid. It is a very distinct form, a little larger than the preceding, with the whorls (seven) deeply channelled at the sutures, shape conically fusiform, columella with strong plait, aperture internally spirally striate.

17. ODOSTOMIA SYRNOLIODES, n. sp. Pl. Fig. 13.

O. testa attenuata, fusiformi, alba, parum nitente, delicata, anfractibus 6, apud suturas impressis, apertura oblonga, labro fere continuo, marginem apud columellarem fortiter uniplicato. Long. 2·50, lat. 1 mm.

A smooth, dull white, six-whorled little shell, the apex vitreous, mouth ovate, with a strong straight plait on the columellar margin. Like a *Syrnola* in miniature, hence the specific name. Of the typical form of the genus, allied to *O. plicata*, Montagu.

18. PYRGULINA PYRGOMELLA, n. sp. Pl. Fig. 24.

P. testa attenuata, fusiformi, gradata, candida, anfractibus 7, ad suturas subimpressis, longitudinaliter, ad medium anfractuum, costulatis, costis lævibus, papillosisque infra juxta suturas, apertura oblonga, labro exteriore simplice, paullum reflexo, columellari conspicus uniplicato. Long. 5 mm. p. maj., lat. 1·25 mm.

Two specimens of a conspicuously beautiful species, of the same facies as *Turbonilla scalaris*, Phili., but white, whilst the columellar plait gives it generic distinction.

The longitudinal ribs begin at a little distance from the sutures, the immediate space between being quite smooth, and the ribs are also slightly

papillose at the upper end, the papillæ merging into the rib. The specific name is derived from the Greek πύργωμα, 'a tower', from the turreted whorls. It may possibly be equally well placed in the genus *Mormula*, Ad.

19. PYRGULINA EDGARII, n. sp. Pl. Fig. 21.

P. testa angusta, fusiformi gradatula, tenui, candida, anfractibus 6, ad suturas impressis, undique longitudinaliter crassicostulatis, costis scalariformibus, interstitiis trasversim tenuissime striatis, apertura ovata, margine columellari fortiter uniplicato. Long. 2, lat. ·75 mm.

About twenty specimens. This species I venture to name after Mr. Edgar A. Smith, as a very small token of appreciation for his invariable kindness and assistance. The smaller size, turreted or graduate whorls, thick, longitudinal, scalariform ribs, and extremely fine transverse striations, differentiate this little species from *Pyrgulina interstriata*, Souverbie, and other allies.

Amongst the Bombay species of this genus, which is sometimes taken as a section of *Odostomia*, the following occur in more or less plenty :—

P. callista, Melvill. Twelve of this most beautiful form in the second consignment of shell-sand ; only four in the first.

P. casta, Adams. A few, not quite typical ; may be a different species.

P. interstriata, Souverbie. I cannot separate the most abundant species at Bombay from this. I have specimens from the Gloyne Collection, from Upolu, precisely similar.

P. pyrgomella, n. sp.

P. edgarii, n. sp.

20. TURBONILLA ABERCROMBIEI, n.sp. Pl. Fig. 7.

T. testa pergracili, attenuata, albida, nitida, anfractibus 11-12, subturritis, omnibus longitudinaliter recticostatis, costis interstitiisque æque lævissimis, anfractu apicali in specimine juvenali, heterostropho, vitreo, apertura subquadrata, peristomate simplice. Long. 4, lat. 1 mm.

Three specimens, of which two are juvenile, showing the apical nucleus, and the third mature, but not quite perfect. Conjecturally, the whorls would be eleven or twelve The longitudinal ribs are straight, the whole surface is very smooth, and the mouth is square. I have much pleasure in associating with this species the name of my friend Mr. Abercrombie, to whose kindness I am indebted for the whole of the material descanted upon in this paper.

21. TURBONILLA SORORIA, n. sp. Pl. Fig. 17.

T. testa gracili, attenuata, albido ochracea, semipellucida, tenui, apice heterostropho, anfractibus 11-13, subventricosis, undique longitudinaliter recticostatis, costis, interstitiisque lævissimis, apertura ovata, peristomate simplice. Long. 6 mm. sp. maj., lat. 1 mm.

Several specimens, in various stages of growth ; the younger shells all showing the mamillate heterostrophe apex so distinguishing a trait of this family. In form resembling *T. acuticostata*, Jeffreys. The trivial name now imposed suggests such affinity.

22. TURBONILLA TEREBRINA, n. sp. Pl. Fig. 20.

T. testa gracillima, multum attenuata, candida, nitida, perlævi, anfractibus 11, longitudinaliter lævissimi-costatis, interstitiis omnino lævibus, apertura oblonga, peristomate simplice. Long. 6, lat. 1·15 mm.

About the same size as the preceding, but a more solid, shining shell with smoothly rounded ribs, scarcely elevated, and the interstices also quite smooth; mouth oblong, lip simple. Five specimens. The superficial likeness to a species of *Terebra* suggested the trivial name. It belongs to the typical genus *Turbonilla* proper, and is nearly allied to some European species.

23. TURBONILLA (PYRGOSTELIS) EMILIÆ, n. sp. Pl. Fig. 25.

T. testa minuta, oblonga, cylindrica, candida, apice mamillari heterostropho, anfractibus 6, undique longitudinaliter recticostatis, interstitiis transversim arcte tenuissimi striatis, apertura ovata, peristomate, paullum incrassato, margine columellari simplice. Long. 1·75, lat. 75 mm.

A very small, straightly-whorled, white, semipellucid species, of which many specimens occurred in the last consignments of shell shingle, but which was not noticed in previous siftings. I am not quite satisfied with the location, though it seems to resemble in form such species as *Pyrgostelis flexuosa*, Jeffreys. Had a columellar plaint been present, no doubt it would be relegated to *Pyrgulina*. I venture to associate with this little shell the christian name of Mr. Abercrombie.

24. CINGULINA ARCHIMEDEA, n. sp. Pl. Fig. 2.

C. testa pyramidato-fusiformi, candida, concinna, solidiuscula, anfractibus 11, transversim spiraliter acute bicarinatis interstitiis oblique rudi-lineatis ultimo anfractu apud basim lævi, ad peripheriam angulato, apertura subquadrata, labro simplice. Long. 5, lat. 1·75 mm.

Three specimens all precisely similar, of a pure white shell, with a slight bluish tinge in parts, spirally acutely twice keeled on the whorls, which would be in a perfect specimen eleven in number, but none of those before us have the apex complete; the keels are sharp and projecting. At the base the shell is smooth, the aperture is squarely angular, mouth simple. This species is the most sharply carinate of any *Cingulinæ* we have examined. The miniature screw-like appearance suggested the trivial name, after Archimedes, the celebrated Syracusan mathematician, inventor of the screw, who is reported to have taken for his model thereof the well-known Mediterranean shell *Turritella terebra*, L.

25. PHASIANELLA MINIMA, n. sp. Pl. Fig. 11.

P. testa minutissima, perforata, solidiuscula, alba, nitida, anfractibus 5, tumescentibus, ventricosis lævissimis, rubro-punctatis et flammulatis, apud medium anfractus ultimi squarrose rubro-maculatis, maculis transversis, paucis, apud basim multipunctatis, apertura ovatorotunda, labro simplice. Long. 2 mm. sp. maj., lat. 1 mm.

A very minute shell, which I cannot exactly match with any portrayed and described in Pilsbry's exhaustive collaboration of the genus. It comes near to *P. umbilicata*, D'Orb., from Cuba and Florida, but would seem even more tumid than that species, while it is entirely smooth, with no impressed lines ; the shell is perforate, solid, white, shining, very smooth, with five whorls ; whorls extremely tumid and ventricose, impressed at the sutures, painted with a sprinkling of minute red dots, these most profuse at the base of the shell ; a little below the lower half of the last whorl there is a transverse row of a few somewhat square, dark red spots; the mouth is oval, outer lip simple.

Ten specimens, but mostly not full-grown.

26. TELLINA (TELLINELLA) THYMAPES, n. sp. Pl. Fig. 9.

T. testa delicatula, tenui, alba, subtrapeziformi, compressa, concentrice multi-costulata, margine dorsali declivi, serrulato, latere antico expanso rotundato, postico truncatulo, margine ventrali latus ad posticum contracto, deflexo. Long. 13, lat. 20 mm.

A most delicate species, resembling in texture, but not in form, such species as *Tellina perplexa* or *T. lyra*, both of Hanley. The shell is trapezium-shaped, compressed, delicate white, thin, regularly concentrically closely ribbed, the dorsal margin sloping slightly, thus recalling the genus *Tellidora* (e.g., *T. crystallina*), serrulate both posteriorly and anteriorly, the anterior side being roundly expansive, somewhat truncate posteriorly, the ventral margin contracted towards the posterior side.

The specific name is from the Greek θυμάρης, 'delicate.'

EXPLANATION OF PLATE.

1. Bittium tenthrenois.
2. Cingulina archimedea.
3. Cerithiopsis pulcherrima.
4. Rissoina pachystoma.
5. Oscilla indica.
6. Miralda idalima.
7. Turbonilla abercrombiei.
8. Cerithiopsis sykesii.
9. Tellina thymares.
10. Aclis atemeles.
11. Phasianella minima.
12. Solarium homalaxis.
13. Odostomia syrnoloides.
14. Adeorbis vanikoroides.
15. Cerithiopsis robricincta.
16. Syrnola metria.
17. Turbonilla sororia.
18. Aclis eoa.
19. Eulima dens-colubri.
20. Turbonilla terebrina.
21. Pyrgulina edgarii.
22. Odostomia antelia.
23. Rissoina epeuroma.
24. Pyrgulina pyrgomella.
25. Turbonilla emiliæ.
26. Myonia gavisa.

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INOCULATION AGAINST THE VENOM OF SNAKES AND THE NEW TREATMENT OF VENOMOUS BITES.

By Doctor A. Calmette,

Director of the Pasteur Institute at Lille.

The fact has long been recorded that certain warm-blooded animals—the mongoose, the pig, and the hedgehog, for example—present a natural immunity to the bites of snakes. The pig readily devours vipers, and is even trained, in some countries, to destroy these animals.

During my stay in Indo-China, I inoculated a young pig with a dose of cobra poison sufficient to kill a large dog; the animal resisted the poison, but I did not repeat this experiment. In the Pasteur Institute I experimented with a specimen of pig's serum from the slaughter-house; 3cc., 5cc. and 8cc. of this serum mixed with a fatal dose of cobra poison showed no antitoxic effect *in vitro*. The rabbits which had received these mixtures, as well as others which had received 10cc. of pig's serum as a preventive, died at the same time as the control animals which had been inoculated with the fatal dose of venom diluted with 8cc. of water.

Thanks to the kindness of M. Lecorre, Chief Medical Officer for the Colonies, and of M. Pignet, Chemist for the Colonies, I have been able to procure six living mongooses from Martinique, and I have ascertained that the saying in the Antilles which attributes to these little carnivores (*Viverrides*, genus *Herpestes*) a real immunity against the bites of *Trigonocephalus fer-de-lance* is partially justified. Mongooses were imported from Barbadoes to Guadaloupe twenty-five years ago with the view of destroying the rats in the island. At the present time an effort is being made to spread them to Martinique, because they wage desperate war against the snakes and rats which, to the great injury of the Colonists, abound in the sugar plantations.

The six mongooses which were sent to me had been captured in Guadaloupe, where there are no venomous snakes. During their stay in Martinique they remained in captivity; their immunity with regard to the venom could not therefore proceed from their being accustomed to the bites of venomous reptiles.

Immediately on their arrival at the laboratory I placed one of the mongooses in a glass cage with a large cobra de capello. The cobra sat

up at once, dilating his hood, and threw himself furiously upon the little carnivore which, eluding him with agility, avoided his attack and took refuge, frightened for the moment, in a corner of the cage. But recovering quickly from his stupor, the mongoose, just at the moment when the cobra was preparing to fall upon him again, threw himself open-jawed upon the head of the reptile, bit his upper jaw vigorously, and crushed his head in a few seconds.

From the experimental point of view, this battle, as stirring as it was rapid, did not teach us much, except the fact that a mongoose, the size of a large squirrel, can easily make an end of a cobra two metres in length. It was impossible to know for certain whether the mongoose had been bitten by the reptile.

I then inoculated a second mongoose with one millegr. of venom (a dose fatal in three hours to a rabbit of two kilogrs.); the animal resisted perfectly this inoculation, and did not experience the least discomfort.

I then took blood from three other mongooses by tying a carotid without killing them. This blood either mixed with venom or injected preventively into rabbits has a decided antitoxic power, but insufficient to protect the animals with certainty from death. All the rabbits which received a preventive dose varying from 2 to 7cc. of mongoose serum succumbed to the inoculation of venom, but considerably later than the control animals.

I attempted to determine the limit of tolerance of the mongoose with regard to the venom. Two of these animals which had never been in contact with snakes in the laboratory, and which had never been inoculated, received one a dose of venom four times fatal, the other a dose six times fatal to a rabbit. The first was not ill, the second was uneasy for two days and then recovered.

A third mongoose into which I injected eight times the dose fatal to a rabbit succumbed in twelve hours.

The mongoose of the Antilles is, then, but little sensitive to the venom; it is able to bear without discomfort very considerable doses relatively to its size, but its immunity is not absolute. If it generally triumphs in its struggles with venomous snakes, it is chiefly due to the extreme agility with which it is endowed.

India is known as the country *par excellence* of snake charmers. An entire caste of individuals is found there called *Mal*, whose calling

is to catch and sell snakes, but who do not perform jugglery with them. The charmers or *Psylles* are recruited from another caste, that of the Sangis or Tubriwallahs of Bengal.

These Psylles handle the cobra capello with a really marvellous dexterity. All travellers who have had occasion to put into an Indian port have witnessed scenes similar to that described by Natalis Rondot:—

"Towards six o'clock in the evening a Hindu juggler comes on board. He is poorly clothed, wears a turban ornamented with three feathers, and has several necklaces of those amulet bags called in Senegal *gris-gris*. He has a spectacled cobra capello in a flat basket.

"This man settles himself on the deck; we seat ourselves on the bench, the sailors form a circle round.

"The basket is placed on the deck and uncovered. The cobra is lying flat at the bottom. The juggler squats a few paces off and begins to play a slow, plaintive, monotonous air on a sort of little clarionet, the sounds of which recall those of the Breton *biniou*. Little by little the snake moves, stretches itself, then sits up. It does not leave the basket. At first it appears uneasy, tries to examine its surroundings, becomes agitated, distends its hood, becomes irritated, blows rather than hisses loudly, and shoots out its slender forked tongue often and quickly; it darts forwards several times, as if to strike the juggler; it trembles frequently or rather makes sudden starts. The juggler all the time has his eyes upon the cobra and regards it with a singular fixity. At the end of some time, about ten or twelve minutes, the cobra becomes less animated, grows calm, then balances itself as if sensible of the slow and monotonous cadence of the musician; it darts out its tongue incessantly with extreme vivacity; by degrees it is brought to a certain state of somnolence. The eyes, which at first watched the juggler as if to take him by surprise, are in a manner immobilized and fascinated by the look of the latter. The Hindu takes advantage of this moment of stupefaction on the part of the snake to approach him slowly without ceasing to play, and upon the head of the cobra he places first his nose and then his tongue. Although this takes but an instant the cobra is roused with a start and the juggler has barely the time to throw himself back to avoid the snake which darts furiously upon him.

"We doubt whether the cobra still has its fangs and whether the Hindu runs any real danger in approaching it. We promise our man a Spanish dollar if he will make the snake bite two fowls. A black hen is brought struggling very vigorously and is presented to the cobra. The latter sits up partially, looks at the fowl, bites it and lets go. The fowl is set free, it runs off in fright. Six minutes afterwards, watch in hand, it vomits, stiffens its claws and dies. A second hen is placed in front of the snake; it bites her twice: she dies in eight minutes."*

Some jugglers exhibit snakes from which they have taken care to extract the fangs or to extirpate the glands, but it is incontestable that many of them—for I have satisfied myself on this point—perform their tricks with cobras in whom the venomous apparatus is absolutely intact. It is due to their perfect acquaintance with the habits and movements of the reptile that they almost always avoid being bitten. Nevertheless accidents sometimes happen to them and every year some fall victims in the course of their jugglery. It appears therefore that they do not know how to render themselves immune to the venom by any method.

However, in a paper published in 1895 (*British Medical Journal*, 17th August), Professor Fraser of Edinburgh cites a certain number of experiments performed in his laboratory upon white rats and kittens, from which it would appear that the prolonged injection of the venom in the end renders these animals absolutely refractory to the subcutaneous inoculation of doses many times fatal of the same venom. He concludes from this that probably this method of vaccination must be in use amongst snake charmers.

I must say that, on repeated occasions, I have attempted without success to demonstrate these facts recorded by Professor Fraser. I have succeeded in making rabbits, guinea-pigs and pigeons absorb enormous doses of cobra poison by the stomach.

I have administered thus up to a thousand times the fatal dose, and never have I been able to ascertain, contrary to what one finds in the case of abrine and ricine (Ehrlich), that the serum of these animals became antitoxic, even in a feeble degree. It appears to me certain that the venom is neither destroyed nor absorbed in the digestive tube,

NOTE.—A. E. Brehm:—"*Les reptiles*," p. 436.

and this is confirmed by the experiments of Répui (*Ann. de l'Inst. Pasteur, Juin*, 1895). This non-absorption is probably due to the fact that the venom does not dialyse through the membranes except with extreme slowness.

In Mexico certain Indians called Curados de Culebras know how to acquire the privilege of being able to be bitten by the most venomous snakes without the least danger to life, by inoculating themselves several times with the fangs of crotales. During a visit to Tuxpan, Dr. Jacolot, Naval Surgeon, made enquiry respecting these Curados de Culebras and convinced himself that their immunity is indeed real.

The method of vaccination employed by the natives of Tuxpan is as follows:—

"A preparatory treatment is necessary. The same day that the man inoculates himself or has himself inoculated, he takes from five to fifteen tubers of a plant known as *mano de sapo* (toad's hand, *Dorstenia contrayerva*). These tubers, and this is very important, must be administered on a Friday, and always an uneven number—five, seven, nine, &c., up to fifteen, according to the tolerance of the subject.

"If the plant is gathered the first Friday of the month of March, it possesses its marvellous properties in the highest degree; then, even when dry, it is excellent as a preparation for inoculation.

"Ordinarily the root of *mano de sapo* is taken fresh. Another indispensable precaution is to abstain, during the period of treatment, from all sexual relations for three days after the second and one day after the third.

"The inoculation is begun on the dorsal surface of the left foot, taking care not to hit upon a vein. The skin is torn with the extremity of the fang, so that it bleeds a little. From the left foot they proceed to the right fist, then to the right foot and to the left fist, always alternating from one side of the body to the other. Then in turn to the right thigh and left arm.

"All the limbs are thus inoculated. On the trunk an inoculation is made in the median line on a level with the sternum, another at the nape of the neck, and finally one on the head on the middle of the forehead—in all eleven inoculations.

"Seven series of such inoculations is the minimum required to protect a man with certainty from the spell of the snake and at the same time

to confer upon him the power of healing by suction the bites of the most venomous snakes."*

Superstition and mystification play, it is seen, a very great part in this preventive treatment which the Curados de Culebras of Central America undergo, but it is not surprising that—thanks to these successive inoculations—they succeed in attaining an immunity sufficient to preserve them from the ordinary bites of snakes. Can it be that the snake-charmers of Egypt, of Tunis, and certain classes in India possess secrets of the same kind? The fact appears to me in any case very probable.

M. d'Abbadie recently communicated to the *Academie des Sciences* (24th February, 1896) a note by Colonel Serpa Pinto relative to another method of vaccination used by the natives of Mozambique, and to which the Colonel himself submitted :—

"It was at Inhambane (east coast of Africa) amongst the *Vatuas* that I was vaccinated.

"They extract the poison of a snake called in Portuguese *Alcatifa* (carpet); thus named on account of the varieties of colour in its skin which resembles a carpet. I am ignorant of the means employed to obtain the poison. This poison is mixed with vegetable substances and forms with them a very brown sticky paste. They make two parallel incisions in the skin, five millimetres long each, and introduce into them the paste containing the poison. These incisions are made on the arms near the junction of the radius and ulna with the carpal bones, on the back of the hand, on the back, on the shoulder-blades, and on the feet near the great toe. After the operation they exact an oath that the vaccinated man will never kill a venomous snake, because they say that henceforth the snake is his intimate friend, and they throw upon him an *Alcatifa* snake which does not bite him. When I underwent this operation I was swollen all over for eight days and suffered every imaginable pain.

"I have never been bitten by any snake and cannot affirm that this remedy is infallible. The *Vatuas* say that it is, and they never kill a snake.

"A short time after being vaccinated I was stung in the Seychelles Islands by a scorpion and felt no pain from it; ten years later, when

* Notes by Dr. Jacelot ("Arch. de Méd. Navale," 1867, p 890).

travelling in Africa, I was again stung by a scorpion which caused me so much pain, that for eight days I thought I should die or lose my arm.'

In France, in the departments where vipers are very numerous, certain individuals who have a reputation for their skill in catching these reptiles enjoy a complete immunity against their bites. One of these snake-hunters, who lives in the Jura and to whom I am indebted for a portion of the venom used in my experiment, can allow himself to be bitten several times in the same summer with impunity. Each season he intentionally gets bitten once or twice in order to preserve his immunity; if he did not take this precaution, he would expose himself, he asserts, to grave risks. Thus it is possible for man, under certain circumstances, to acquire the power of resisting the poisonous effects of snake-bite. We shall see that the same is true of animals.

As far back as 1887 Sewall (*Journal of Physiology*) had shown that the organism can become gradually resistent to the action of snake-poison just as to that of infectious virus such as charbon. By injecting very small quantities of poison he succeeded in rendering animals refractory to the effects of doses large enough to kill rapidly animals which had not been thus prepared.

Somewhat later, in 1889, Kaufmann obtained the same result in the course of his studies upon the poison of the viper. He succeeded in getting animals to stand quantities of poison two or three times fatal.

In a communication to the Society of Biology (February 10th, 1894) I mentioned the methods by which I succeeded in rendering rabbits and guinea-pigs really immune to considerable doses of poison, and I demonstrated that an animal which is immune to the poison of the cobra, for instance, is so also to that of the viper or *Hoplocephalus* and *vice versa*.

M.M. Phisalix and Bertrand also announced (*Acad. des Sciences*, February 5th, and *Soc. de Biologie*, February 10th, 1894) that they had been able to secure to the guinea-pig immunity against the poison of the viper by means of preventive inoculations of this same poison heated to 80° in a *bain marie* for 10 to 15 minutes.

One can, therefore, render animals refractory to the inoculation of a fatal dose of venom either by accustoming them to it by repeated doses, or, as I have pointed out, by mixing alkaline hypochlorites or chloride of gold with the venom, or by the venom modified by heat.

The first method is capable of giving a very solid immunity against considerable doses of poison, but it is slow, and its application requires very careful surveillance. If animals are injected with increasing doses at short intervals, they speedily become thin and succumb. It is necessary to begin with very weak doses, continued for a long time, and to increase the quantity of venom injected little by little, until, after four or five months of treatment, the animals are able to stand without being ill a dose which would kill 100 fresh animals.

The surest method to adopt in vaccinating any animals, whether rabbits, guinea-pigs, dogs or horses, consists in injecting at first, for four weeks, increasing quantities of venom mixed with decreasing quantities of a solution of 1 in 60 of hypochlorite of lime. The initial dose of venom, of course, varies according to the relative toxicity of the latter; it should not exceed half the minimum fatal dose.

The variation in weight of the animals must be carefully observed, and the intervals between the injections regulated according to the state of health. In this way one succeeds little by little in setting up a toleration, first of four to five times the fatal dose, then of doses double, triple, and at last centuple and even more.

The serum of animals immunised against venoms by either of the preceding methods possesses properties similar to those which Behring and Kitasato, Roux and Vaillard ascertained to exist in the serum of animals immunised against tetanus and diphtheria.

This fact mentioned by me in the *Société de Biologie* (February 10th, 1894) had been observed at the same time by M.M. Phisalix and Bertrand in the case of guinea-pigs vaccinated against the venom of the viper by the method described by these experimenters. It was confirmed a year later by Professor Fraser of Edinburgh (*British Medical Journal*, June, 1895), who successfully repeated almost all the experiments of which I had published the results in the *Annales de l'Institut Pasteur* (May, 1894, p. 275.)

If 1 milligramme of cobra poison or 4 milligrammes of viper's venom is mixed *in vitro* with a small quantity of serum from an immunised rabbit, and if with this mixture a fresh rabbit is inoculated, the latter experiences no discomfort.

It is not necessary that the serum should be taken from an animal vaccinated against a venom of the same origin as that introduced

into the mixture. *The serum of a rabbit immunised against cobra or viper venom acts indifferently upon all the venoms with which I have experimented.*

The action of the serum is the same in the organism before or after the poisoning as *in vitro*. If we inject, for instance, into the peritoneum or under the skin of a fresh rabbit one c.c. of serum from an animal immunised against a dose of venom one hundred times fatal, and immediately afterwards inoculate into the muscles of the paw a twice fatal dose of pure venom, the animal will not even be ill; and if, after the injection of preventive serum, we wait twenty-four or forty-eight hours before introducing the venom, we shall ascertain that this also produces no toxic effect. Our rabbit is then immunised from the first by the serum it has received.

On the other hand let us inject into a second rabbit the twice fatal dose of venom which will kill a control animal in about three hours. Let us then, one hour or even an hour and a-half later, when the symptoms of poisoning begin to be manifested (regurgitations, acceleration of the heart's action, dyspnœa, slight paresis of the limbs) inject into the peritoneum and under the skin at different points of the body 2 c.c. or 3 c.c. of our immunising serum.

The animal remains for a longer or shorter time in an alarming condition of malaise, characterised at first by a slight rise of temperature, then by a high fever. Its temperature rises from 1 to 5 degrees for 48 hours, then falls gradually to normal. From that time all danger is at an end.

The serum of animals immunised against venoms is, therefore, not only capable of acting upon these venoms *in vitro*, but it is also preventive and therapeutic, exactly like that of animals immunised against diphtheria or tetanus.

The antitoxic power *in vitro* and the preventive power naturally vary according to the dose of venom against which the animal which furnishes the serum is immunised.

The serum of the horse which we furnish at present at the Pasteur Institute at Lille is active to the 20,000th—that is to say, that 1/10th c.c. of this serum injected under the skin of a rabbit weighing two kilos. is sufficient to preserve it against the injection of a dose of venom capable of killing a rabbit of the same weight in less than eight

hours. The maximum preventive effect is obtained by injecting the venom twelve hours after the serum.

The immunity acquired by the injection of serum is thorough, but it disappears after an interval which, according to my experiments, does not exceed eight days. It is then not lasting, differing in this respect from the immunity produced by the poisons themselves. The latter holds good in the case of hypervaccinated rabbits for at least ten months.

The antivenom serum is more active and efficacious for a longer time according as the animals which furnish it are more highly immunised.

The following is the method by which we ascertained the length of time during which the injection can prevent death after the inoculation of a twice fatal dose of venom in our animals.

We inoculated a certain number of rabbits, let us say under the skin of the thigh, with the same dose of venom—1 milligr. of cobra poison—and we treated all these animals, with the exception of some for control purposes, with subcutaneous injections of the serum of a horse active to the 20,000th. The control animals, not thus treated, died in from three to four hours.

The rabbits which had half a cubic centimetre of therapeutic serum half an hour, three quarters of an hour or one hour after the venom, all resisted the poison.

Those which got the therapeutic serum between one hour and one hour and a-half after the venom, resisted in the proportion of two in three.

The injection of 1 c. c. of serum one hour and a-half after the poison is, as a rule, followed by recovery.

This interval once passed, recovery is no longer possible, because the rise of temperature and the bulbar phenomena characteristic of the poisoning have already begun to show themselves.

In man it is possible that intervention by means of the antivenom serum may be efficacious much later on, as it is rare for bulbar symptoms to be manifested under three hours.

In the commonest cases death supervenes between ten and twelve hours after the bite, and even later still when the bite is caused by the *Crotalus bothrops*, and the snakes of Australia.

In the case of the cobra, the *Daboia* and the *Bungara*, the statistics of Fayrer, based upon a total of 65 fatal cases, give a mean period of survival as follows :—

	Proportion per cent.
Under 2 hours	22·96
From 2 to 10 hours	24·53
„ 6 „ 12 „	23·05
„ 12 „ 24 „	9·36
Above 24 hours	21·10

Admitting that, as regards India, it may be impossible to succour in time persons classed in the first category above, who succumb in less than two hours, it is plain that the treatment has a great chance of being efficacious in the case of all the others, that is, in 77·04 per cent. of those otherwise doomed to death.

This new application of serum therapy should be immediately brought into general use in all cases of venomous bites in countries like India, Australia, the Malay Archipelago, the Cape, Natal, the Transvaal, Egypt, Brazil, Central America and the Southern States, where snakes make such numerous victims every year.

The Governments of these countries should at once create stations for medical aid at least in the principal agricultural centres and in forest and mining works, where any person bitten by a venomous reptile can repair in the shortest possible time to seek assistance. These stations should be provided with a supply of serum, hypodermic injection syringes, a constantly fresh solution of hypochloride of lime, and other medicaments and necessaries for the dressing of wounds.

The expense of carrying out this organization would be small indeed compared with the immense services rendered thereby.

The above is an extract from a work lately published by the "Société d'éditions scientifiques," Paris.

MISCELLANEOUS NOTES.

No. I.—AN IRON BAND ON A TIGER'S TOOTH.

(*With a Plate.*)

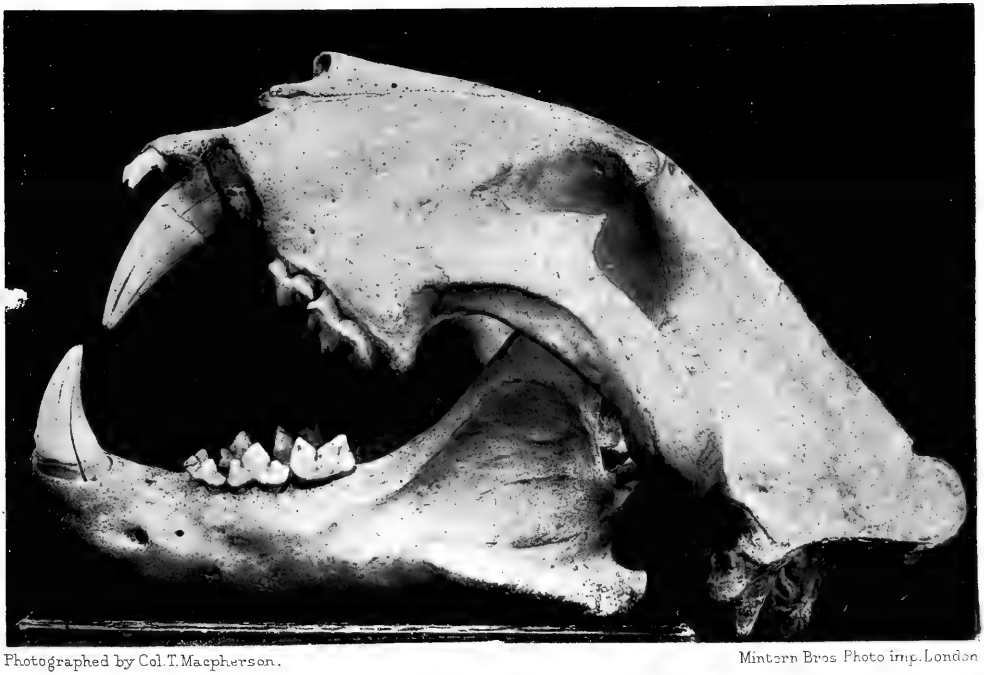
I send herewith two photographs of the skull of a tiger, shot by me at Ekambi in the Kanara District, on the 17th of February, 1880, and which you may think of interest, as, in its way, it is, I fancy, quite unique. The tiger was a very old male, measuring 9 ft. 8½ inches; his skin was very pale and faded, which I think as a rule means age, and he was well known in the neighbourhood. He was supposed to be under the protection of a village temple and to bear a charmed life, as he had been repeatedly fired at by different officers, but had always escaped unwounded. On my killing him my shikari did a thing which I never saw done before or since. He filled his two hands full of the blood, which was pouring from the wound in the tiger's neck, and plastered himself all over with it. But all this has nothing to do with the interest in the skull which consists in the broad iron band round the left upper large canine tooth. The photographs show it very distinctly, and you will notice, from the front view of the skull, that the iron has eaten its way through the gum and has destroyed a considerable portion of the bone of the jaw, so that it must have been on the tooth for a long time before the tiger was killed. The band does not quite meet round the tooth, the open ends being on the inside and compressed into it, and they have eaten away some of the ivory. The question is, how this band could possibly have got into its present position? My idea is, that the band formed a link in a rough chain round a bullock's neck, and that the tiger in seizing the bullock got the tooth through the link and was unable to get rid of it. I have never noticed a chain of this kind round a bullock's neck, but there might have been an attachment of this sort to the bells they frequently wear.

T. MACPHERSON,
Lieut.-Col.

BEAMINSTER, ENGLAND, *June*, 1897.

No. II.—THE PROTECTIVE POWER OF SCENT IN ANIMALS AND OTHER MATTERS.

With the greatest diffidence I venture to offer a few suggestions on this subject, prompted by the desire to offer an answer to the question propounded by Mr. Eardly Wilmott in his paper read at a recent meeting of the Society. He asks how it is that an animal will not wind a man who is raised a few feet above the ground, and why the most chary of the deer tribe will graze without concern round a tree in which a man is concealed? The more



Photographed by Col. T. Macpherson. Mintorn Bros. Photo imp. London

IRON BAND ON A TIGER'S TOOTH.

important question he seems to take for granted, that is, do any of the deer met with in India wind a man when he is on the ground? In the first place, I should like to define what I conceive to be the distinction between scenting and winding. An animal is said to scent when the earth is the medium which conveys a particular taint to its nostrils, and its instinct in most cases induces it to follow the trail; when the taint is air-borne an animal is said to wind it, and when this power is protective it warns the animal to fly. For instances red deer in Scotland and bison in India have this protective power, but how far sambhar and cheetal, the deer most often seen in Indian jungles, possess this power, opens, I think, a wide field for discussion. Animals as a rule are gifted with certain powers to protect themselves against their natural enemies, and generally particular powers are specially developed in each animal, according to the nature of the country inhabited by it. An old German saying, quoted in the Badminton Library, illustrates this: "The deer heard it, the chamois saw it, the pig smelt it." In the Scotch deer forests, where a large area can be covered with the eye, and the unevenness of the ground renders a stalk comparatively easy, the deer can wind the presence of man at an extraordinary distance, while, from the above quotation, it would seem that the deer which inhabit the thickly wooded forests of Europe, depend for their protection on their powers of hearing. As far as my own experience goes I believe that sambhar and cheetal depend entirely on their powers of seeing and hearing, which are very acute, though I regret to say my evidence on this point is all of a negative character. Mr. Inverarity in his papers on sambhar and cheetal published in this Journal, makes no mention of their being able to wind human beings and, as far as I know, when stalking, he never takes the wind into consideration. In good jungle, whether going up or down wind, one always sees a fair number of deer, though of course it is impossible to say if deer can wind a human being; how many have gone off without being seen. I think if they could, one would not see half the number one does. I have often watched sambhar and cheetal without being seen, and they have never shown any signs of winding my presence, though the wind must on some occasions have been blowing towards them.

Generally, the first thing that alarms them is some unwonted sound, when they bring their ears forward and then look for the cause. When a sambhar first sees you, it will continue staring for several seconds before bolting, so that you can always get a standing shot if you see it soon enough, while I have generally found that a cheetal concludes at once that you are not a desirable acquaintance and gallops out of range before stopping again. At night one often hears sambhar and cheetal barking quite close to and all around the camp, alarmed no doubt by seeing the fires and hearing the men's voices, but apparently in no way warned by the taint of man's presence, as they may be seen the next morning a few minutes after starting. Cheetal are said to bark at night when there is a tiger about, but how they detect his presence

I cannot say. Anyhow it seems a very foolish practice and perhaps they bark for some different reason altogether. I have also heard cheetal making a curious noise like a rattle, which my shikari said was produced by the stag, and as I heard some distance off another answer in a similar way ; the first may have been in the nature of a challenge to a rival. The doe sambhar when alarmed, if it cannot see the cause of the alarm, will often keep on barking for a long time, but I have never heard a stag bark in this way. If with a herd, he allows the does to keep watch for him, though I have seen him pay no attention to their barking but only follow them when they bolted. The only stag I have ever convicted of talking was a young one which, after staring at me for some seconds, went off with a short bark, and I have heard a bull nilgbai make much the same sort of noise. That panthers and tigers hunt by scent seems to me rather doubtful.—I have been in country where, if this were so, I must have frequently come across natural kills. Deer were plentiful, and tiger and panther were always about, yet in many weeks I have only come across one fresh kill by a panther, and scarcely ever seen even the trace of a kill by a tiger. My own theory is that tigers use their noses very little. The tracks of a man or elephant may attract them, but the smell produces no impression on their minds ; it does not prompt them either to run away from it or to follow it up, and a man standing behind a tree would have just as good a chance of a shot as if he were sitting in the tree. Their powers of memory are marvellous. A tiger will often go miles away from his kill and return to it again the next night, but if you drag it away a few yards and hide it he is often unable to find his expected dinner. One often has to drag away a kill so that it may be within convenient distance of the tree in which the machan is erected, and I certainly know of one case where the tiger came back to where he had killed, went to the place where he had himself dragged the kill, but could not follow it any further. Again a tiger will often pass within a few yards of a "gurah" tied up without apparently having noticed it, and though it may be said that he had been rendered suspicious by scenting the tracks of the men who had tied up or fed the "gurah," if this were the reason no tiger would ever kill a "gurah".

N. C. MACLEOD.

BOMBAY, 20*th October*, 1897.

No. III.—THE DESTRUCTION OF LOCUSTS BY MEANS OF ARSENIC.

Cultivators in many regions of the globe will be interested in what appears to have been a successful series of locust-destroying experiments carried out in Natal, a report of which has been published in that colony as a Government notice. From a note in the *Times*, it appears that all attempts to suppress the locust scourge have proved only partially successful, with the excep-

tion of the plan of poisoning with arsenic, which, it is asserted, has met with absolute and unqualified success. The mixture used is prepared by heating four gallons of water to boiling point, and then adding 1 lb. of caustic soda. As soon as this is dissolved, 1 lb. of arsenic is added, after which the liquid is well stirred and boiled for a few minutes, care being taken that the fumes are not inhaled. When required for use, half a gallon of the liquid is added to four gallons of hot or cold water, with 10 lb. of brown sugar. A still better preparation is made by adding half a gallon of the poisonous liquid to five gallons of treacle. Maize-stalks, grass, &c., dipped in the mixture, are placed along the roads and in the fields, and the material can also be splashed with a brush upon anything which the locusts are known to have a liking for. Attracted by the odour of the sugar or treacle over a distance of as much as 100 yards, the locusts will eat of the mixture and die. These are eaten by other locusts, and in a few days' time the ground may become strewn with the dead bodies of the insects. With ordinary care no risk of poisoning any human being is incurred, whilst the small quantity of the material on a piece of grass or maize stalk is said to be insufficient to injure stock of any kind—fowls have been known to feed without injury on the arsenic destroyed locusts. The evidence adduced indicates that "hoppers," however numerous, can be destroyed in a few days, and the crops thus saved from their ravages.

No. IV.—THE SOCIAL SYSTEM OF *TERMITES*.,

Though more than a century has elapsed since Smeathman published the first careful account of the *Termitidæ*, but few workers have substantially increased our knowledge of the subject. The reasons for this apparent apathy lie, indeed, on the surface. With few exceptions the *Termites* are tropical or sub-tropical in habitat; avoiding light, and living in vast concealed communities, their cryptic manner of life renders the task of observation extremely prolonged and arduous, while the multiplicity of forms in a single species, and the difficulties attending their preservation, have earned them little regard from the systematist.

The first marked advance towards unravelling the complexity of the termite community was made by the great naturalist so lately lost to science, Fritz Müller. Following out Lespés' observations on the nymphs, he showed that a certain number of *Termitidæ* reach maturity and propagate without leaving the nest or acquiring the imaginal characteristics, and contended that the function of the swarming adults was not that of founding fresh colonies, but of furnishing royal pairs to pre-existing orphaned nests.

1 "The Constitution and Development of the Society of Termites, &c." By Prof. B. Grassi and Dr. A. Sandias. English translation in the *Quarterly Journal of Microscopical Science*, vols. 39 and 40, with five plates.

His conclusions were supported by observations in nature, but were not made the subject of experiment ; they are to be regarded as suggestions, which, however, approach very nearly to the truth.

The subject was taken up by Prof. Grassi in order to investigate the origin of the sterile castes, and the results of seven years' labour have been put forward in a monograph which, for the first time, places the nature of the termite society beyond the reach of speculation. Intricate as the memoir is in the presentation of facts and inferences, it cannot but leave the reader with a profound sense of the perseverance, fertility in experiment, and deductive ability which it reveals.

Species of two genera, *Calotermes* and *Termes* were studied, and success was largely due to the fact that it was found possible to keep small numbers of the former genus alive for long periods in corked test-tubes containing rotten wood. Careful observation thus became practicable, and by varying the number and kind of individuals introduced, their development and inter-relations could be studied.

Grassi's work on *Calotermes* shows that the eggs are of one kind and the newly-hatched larvæ undifferentiated, the caste distinctions arising after birth, and depending on the development of the genitalia. If this proceeds normally, the larva ultimately becomes a winged imago ; if it is arrested at any period before the completion of the nymph-stage, the larva becomes a soldier ; and finally, if it is precociously stimulated, a neoteinic form is produced, one, that is, which reaches sexual maturity without ever acquiring the imaginal characters. The insect remains plastic until the atrophic change of the genitalia has been set up ; thus a soldier-larva or soldier cannot be modified, but a nymph can be converted into a soldier possessing wing-buds (a " nymph-soldier "). These buds may be subsequently reabsorbed, so that a retrogression actually takes place. The colony is headed normally by a single king and queen derived from the perfect insects ; should either or both be missing, their place is supplied by neoteinic " substitute " forms, which are then always produced if the society contains examples capable of undergoing this modification. An orphaned colony may be made to produce a much larger number of substitutes if subdivided into small societies than if kept together, and the same is true of the soldiers. This and similar observations go clearly to show that the modification of these individuals is in no way predestined.

The insects must possess the faculty for estimating a numerical ratio, and if the number of soliders or royal substitutes is in excess of their needs, the supernumeraries are killed and eaten !

The colony of *Termes* is more complex and more difficult to study : it is similar in character except that it contains two sterile castes, soldiers and workers, and two kinds of neoteinic forms, one, the " complementary royal forms," are constantly present in large numbers as the ordinary reproductive

members; the other, the "substitute forms" are developed on an emergency to supply their loss. In Sicily, according to Grassi, the winged imagos are entirely lost after swarming, and never give rise to fresh societies; but there is evidence that this remarkable example of natural wastefulness is not constantly exhibited in France. According to Marlatt, the closely-allied *Termes flavipes* of North America is known to reproduce by means of complementary forms alone.

Grassi holds that the caste-modifications are caused by variation in nutriment, and records a series of minute observations on the rather repulsive feeding-habits of these insects, made chiefly by his coadjutor Dr. Sandias. The staple food is wood, passed and repassed through the alimentary canal of several individuals; the society tolerates no waste, and everything of nutritive value, cast skins and dead bodies alike, is greedily devoured.

Newly-born larvæ and forms destined for sexual maturity are fed upon the saliva of their comrades, the largest amount being given to those which are becoming neoteinic; within forty-eight hours after its administration they become altered, acquiring ocular pigmentation and a translucent white appearance.

It is therefore contended that sexual development is directly stimulated by the saliva taken as food; but a disturbing factor has had to be eliminated. The alimentary canal of most *Termites* teems with protozoa, which bring about the dilatation of a cæcal ampulla so as to fill the greater part of the abdomen. These protozoa disappear under the influence of a salivary diet, and the question has arisen whether the resulting diminution in size of the ampulla may cause the gonads to ripen. Grassi answers this in the negative. All *Termites* lose their parasitic protozoa at the time of moulting, and by taking advantage of this circumstance he has been able to keep colonies alive for a month or more entirely free from protozoa. A few examples only in these colonies became neoteinic; and it is therefore clear that the saliva is one, if not the only, necessary factor in bringing about sexual maturity.

No light has been thrown on the causes which, in *Termes*, lead to the differentiation of the soldier from the worker; but it may be reasonably inferred that they are also due to differences in nutrition.

As already indicated, the results of this research are directly opposed to the hypothesis that special ova or special sets of 'determinants" exist for the various castes in *Termitidæ*. It is not necessary here to dwell upon this point which, it may be recollected, has been dealt with conclusively by Mr. Herbert Spencer in his controversy with Prof. Weismann (*Contemporary Review*, October, 1894).

The means by which the special characters of the sterile castes are inherited is a matter which has caused Prof. Grassi some trouble. In the original

memoir he appears scarcely to have made up his mind on the point; but in a footnote appended to the English translation he puts forward the supposition previously advanced by him in the case of bees, that it is to be interpreted by the exceptional occurrence of soldiers and workers capable of oviposition. This view is supported by the discovery of a "nymph-soldier" with well-developed ovarian tubes. Much more evidence is still required as to the occasional existence of fertile soldiers and workers, especially in species, if such exist, in which the caste distinctions are still incipient. If it can be shown that the evolution of caste characters is in any way anterior to the loss of fertility, the difficulties of interpretation will disappear; at present the evidence points to the fact that owing to qualitative changes in nutrition, rather than simple mal-nutrition, an atrophy of the sexual organs is set up which is correlated with a hypertrophic modification of other structures, by a deflection, so to speak, of the nutritive stimulus.

Many neoteinic forms show no trace of wings. If the termite colony were headed by such forms only, the phenomenon, as Grassi points out, would occasion no surprise, but all valid evidence would be wanting that the species had ever possessed wings. This leads to the admission on his part that there is no proof that all existing wingless insects may not be descended from winged ancestors, and in the absence of such a proof he is led to reject Brauer's division of Insecta into *Apterygogenea* and *Pterygogenea*.

Space forbids any reference to the full account of the social life, habits and instincts of the species which Prof. Grassi has studied Their intelligence, though remarkable, is far inferior to that of ants, and may be profitably contrasted therewith. Whilst referring to this subject, it may be worth while to call the attention of those interested in animal psychology to two lately-published pamphlets on the subject, particularly that on the psychology of ants[1], by Father Wasmann, a most careful observer and thorough student of animal intelligence.

One practical result of Grassi's work requires mention. An isolated group of ten or a dozen *Termites*, containing any forms which have not begun to undergo the atrophic changes induced in the sterile castes, is capable of converting such forms into reproductive individuals; and the little society, thus started, possesses the power of multiplying into a large colony.

It is therefore hopeless to attempt the extermination of *Termites* merely by the destruction of the kings and queens.

W. F. H. BLANDFORD.

(The above appeared in *Nature*.)

1 "Instinct and Intelligenz im Thierreich," and "Vergleichende Studien uber das Seelenleben der Ameisen und der hohern Thiere," by Erich Wasmann, S.J. (Freiburg, 1897).

No. V.—THE MIGRATION OF BUTTERFLIES.

By migration in the case of butterflies one means the frequently observed habit of the insects of flying in a certain direction, or, to speak more accurately, on one route. They follow one another in hundreds, a steady continuous flow, seldom more than half a dozen or so passing at the same time, but the stream never stops for hours. Usually the flight is against the wind, which suggests that the butterflies are following the scent of some flower or that they are really meeting the pollen of their food plant up the wind; the real difficulty is to account for these processions in any manner which shall show some symptom of reasonableness. The *Danainæ* are the most often observed in the act of migration, and I well remember the first procession that was shown me by Mr. Davidson at his camp at Siddapur, in North Canara. This consisted entirely of the common *Danainæ* and was passing steadily across the front of his tent for at least two hours under my observation. A week ago, in the course of my duty on Mody Bunder, I watched a procession of *Euplœa core* passing down the harbour just clear of the bunder; they were passing for certainly an hour, and may have gone on long after I had left the place. Many hundreds of butterflies must have passed me in this hour. There are several points of interest in the occurrence; the first one suggesting itself to any one who has reared butterflies is the entire impossibility of breeding so large a number as you may see passing you in one of these migrations in anything but a large area; to follow up this line of suppositions it is manifest that if they were not all bred in one place they must have assembled after hatching; and finally if they were bred as I suppose over a large area they must have assembled to migrate in response to some call not yet appreciated by the intellect of man.

S. E. PRALL, Surg.-Captain.

Bombay, 28*th October*, 1897.

No. VI.—SPEED OF FLIGHT IN BUTTERFLIES.

During the monsoon in travelling by rail from Bandra over the Mahim creek it has been interesting to note the way in which butterflies of all conditions and sizes have used the railway causeway as a road of safety to cross the water of the creek which is at this point of considerable width, probably nearly a mile. On a fine morning looking from the carriage windows one could very clearly see the way in which the crowds of butterflies flew steadily over the embankment with its flowers and grasses and avoided the water. The difference in the number of butterflies seen on this particular embankment and others with practically the same vegetation, would seem to warrant the supposition that insects were using the bank as a safe road from the one side to the other. The trains run over this part of their journey at speeds varying from seven to fifteen miles an hour, and while most butterflies seemed to be

unable to keep up with even a slow train, either not flying fast or straight enough, others, of whom *Papilio erithonius* was easily the best, seemed to keep their place without effort beside the windows of the fast train, thus making their speed of flight about fifteen miles an hour at a modest computation.

S. E. PRALL, Surg.-Captain.

Bombay, *October*, 1897.

No. VII.—CURIOUS ACCIDENT TO A PALM-CIVET.

It is not uncommon for a bird to be found with its tongue projecting through a wound in the lower mandible, but with animals an accident of this sort is, I imagine, a much rarer occurrence.

A Palm-Cat (*Paradoxurus andamanensis*) killed in a trap this morning appears at some time to have staked itself under the chin, possibly by springing upon a sharp-pointed stick in attacking a bird.

The injury must have been very severe, as the whole skin and lip of the lower jaw have been drawn back as far as the wound, at the posterior edge of which the lip has readhered to the flesh. The cat's tongue was hanging out of the hole, through which it must have been forced subsequently in swallowing a large piece of food. In spite of this nasty wound and the loss of the use of its tongue the animal was in good condition. It was caught in a dead-fall baited with plantains, to which these Palm-Cats are very partial.

A. L. BUTLER.

Andaman Islands, *October*, 1897.

No. VIII.—EXTRACT FROM PEDRO TEIXEIRA.

Just about three hundered years ago, an ancient globe-trotter, Pedro Teixeira, off the coast of Omân, observed "certain birds chasing others from natural enmity. The weaker soar upwards to escape from the stronger, and in terror void the contents of their stomachs. The bird below, hunting the other to this end, or for natural spite, as fast as this happens, opens his beak, catches the same droppings, and eats them. I have it [says Teixeira] from the natives, that on this matter he subsists."

The habit is that of many predatory sea fowl. But what species uses it off the coast of Omân? A skua gull (Richardson's) is said to have been observed in the Persian Gulf; and seems the likeliest. But it may have been a sea-eagle. Teixeira, probably, could not exactly observe the precise way in which the victim dropped his dinner.

I do not think that the frigate-birds range so far north. But probably some of our members, working and warring on the Persian Gulf, can name the bird.

If any member happens to know more about Teixeira, and especially about the English translations of his book (by Captain John Stevens, 1712 and 1715, or thereabouts). I shall be much obliged for any information. I want the translations which appeared in a collection of travels.

W. F. SINCLAIR,
late I. C. S.

LONDON, *October*, 1897.

No. IX.—THE LARGE PIED WAGTAIL (*MOTACILLA MADERASPATENSIS*, GM.) IN CAPTIVITY.

I wonder how many of our members are aware what a charming and interesting little pet our common pied water-wagtail makes. I must confess, at least, it came as a surprise to me when one day in July I saw hung up in a cage in the Nimach Bazaar two half-fledged specimens of the bird in question. They were being fed on a mixture of ground parched gram moistened with ghi, called by the natives "satu," and on enquiry I was informed that they had been taken from the nest only a few days before, and fed on nothing else. I passed on, thinking that of course such a purely insectivorous bird would never flourish on this diet. However, a fortnight afterwards, I found one still living, the other having died. The owner seeing me interested in it offered it to me, so I took it home and had a spacious wicker cage made for it.

It became, or rather it always was, excessively tame, not to say fearlessly contemptuous of man, and would at any time take insects from one's fingers, or if it found them empty attack them with mock fierceness, opening its beak, ruffling up its feathers and drooping its wings. I found that an effectual way of feeding it was to sweep with a large net in long grass and then place the cage over the mouth of it. As the insects gradually extricated themselves and struggled up to the light they were pounced upon and captured by the expectant wagtail. It was interesting to note its preference for the different kinds of insects. Green ones of every kind, except *Hemiptera*, were invariably first choice, then the order was somewhat as follows :—Grasshoppers, Mantidæ caterpillars, crickets, flies, butterflies, wasps. Harder insects, such as the metallic coloured wasps, beetles, etc., it did not care for, nor would it touch cockroaches or bugs. The quickness and accuracy of its movements were something wonderful. It would sometimes watch a fly circling round its cage, until in an unguarded moment the former would make a short cut through, when a flicker, a swallowing motion and the fly had disappeared, but the rapidity of the action was such that it was impossible to follow the movements. It never by any chance used its claws to assist in tearing its prey to pieces, but would go on hammering away and beating it from one side to the other till something gave way and it could get the contents in smaller detachments. It was a most indefatigable songster, with a loud clear

pipe and considerable variation of song. It sang mostly in the mornings and up to about 3 p. m. all the year round, except when moulting in the months of June, July, and August.

Some naturalists maintain that young birds learn their song from their parents, but this certainly was not the case with my bird, which was taken too young from the nest to have profited much in that way. The following incident is interesting as showing that birds inherit instinctive knowledge and do not necessarily learn by experience or the example set by other birds.

As a rule when hanging in the verandah my bird used to take no notice of the kites which were continually hovering round and sometimes coming close to it, but one day a small hawk happened to fly through the compound and the wagtail was immediately thrown into a state of the wildest fright and dashed about the cage uttering its alarm note.

On being transferred to this barren rock I found it impossible to procure insects in sufficient numbers, so tried giving it sandhoppers, annelids, small crustacea, but nothing came amiss to this most accommodating little bird, who ate these things as readily as its former food, occasionally varying it with plum-pudding, raw meat, and chopped egg, though "satu" continued to form the basis of its meals. At the beginning of the hot weather I went home leaving my little pet in excellent hands, but the climate proved too much for it and it died during moulting. I had had it for two years, and a more cheerful and engaging little pet it would be difficult to imagine, to say nothing of its singing powers which, in my opinion, excelled those of a canary.

A. NEWNHAM,
15th Bo. L. I.

ADEN, *November*, 1897.

No. X.—NOTES ON MAN-EATERS AND OTHER THINGS.

The object of this paper is to give a summary of the information as to the habits and ways of tigers and panthers that have taken to killing human beings, gathered during three seasons spent in hunting some of them. The information is scanty, I admit—but it was all I could get. If I had been able to speak the Gond dialect or language, I might have got more, but I could not pick it up, and had no one to translate it for me, except in fragments. Still, perhaps, there may be among the scraps of information I have gathered something that is not already known even to shikaries of great experience.

Every man-eater, I suppose, is more or less an animal by itself, with characteristics differing more or less from every other individual of its species—including (usually at least) other man-eaters. Therefore each one must be studied separately and treated accordingly; for to hunt an exceptional animal according to the familiar routine will do no good to any-

body except the tiger. (This is an idea that can scarcely be *got* into the head of the ordinary native shikari, and there are some white men who are very slow to grasp it though they may have been hunting tigers for a great part of their lives.) Still they have some characteristics in common.

Man-eating tigers are nearly always more cunning and more timid than other tigers. One does hear of exceptions showing amazing impudence—I have heard of a tiger that had a habit of charging a crowd in broad daylight and carrying off the man in the centre—I suppose experience and great natural sagacity taught him that that man was likely to be the fattest—and that he would attack a squadron of cavalry as readily as a wedding procession. I never came across this tiger myself, but I remember one that used to blockade the high road until routed by the drivers of the mail cart with a brilliant charge and some fluent Hindustani. After this although he picked up two or three men in the jungle, he kept more or less in seclusion for the rest of his life, which was about four or five weeks.

As to the character of tigers in general, the usual idea seems to be that a tiger is a ferocious beast, and cowardly withal. I do not think so. He avoids a fight it is true, except when driven into a corner, or stirred up and made to walk over nearly red-hot rocks in the heat of a June sun ; but even then he mostly only acts in self-defence. One would not call a horse a coward because he had never killed a groom, and I don't see why we should argue in that way of a tiger. All animals at one time, if we believe history on the subject, stood in awe of the human species ; some of them show traces of that feeling still, others have nearly, if not quite, lost it ; but there is none that remembers that primitive standard of manners so clearly as the tiger. I see no trace of it in the common ("domestic"?) cat, and none in the panther.

This is clear, I think, if we observe the behaviour of young tigers, when caught early, and kept tame. It is noticeable that this sense of respect (reverence, or whatever it may be called) is mainly a male characteristic, and does not appear in the female character, except in high-bred races and individuals, and only in the very highest-bred individuals does it equal the male. This is very noticeable among dogs and horses and is equally true of the human species. But among tigers the female has not got much of this quality, and is altogether a weaker animal than the male, and generally inferior. It has been noticed by those who have kept tiger cubs, tame, that the female becomes queer-tempered and dangerous long before the male, and can rarely be left at liberty when more than a year old. So we generally find that a tiger that has taken to man-killing is in most cases a female. I do not wish to ignore the greater necessities of a female—the difficulty of getting other food during gestation and when cubs are young—still I think the cause is more in character than in circumstances. Among tigers, as among human beings, there are some criminals, and among tigers the crime takes the form of man-killing ; but such cases are rare. If we could take

a census of the able-bodied tigers in India in one year and compare it with the list of man-eaters, I think we should find that the percentage of crime was most creditably small. And I doubt whether any tiger ever took to killing man from malice alone, without circumstances having something to do with it. Some few of those go about with a light heart and a smiling countenance (I can vouch for one smile myself, for I saw it—*all* and it was very comprehensive—) but most, I think, go about like convicted criminals, feeling the brand of Cain upon them and more than ever shunning the face of man—alive or dead. The old tigress mentioned afterwards, although she had killed so many people was always careful to jump on them when they were not looking, and, as she was stalking a boy asleep one afternoon, when he awoke and saw her, she turned and sneaked away like a detected pickpocket.

A panther on the other hand has no sentimental scruples. He certainly can fight, but I think his pluck is more of the nature of the brutal ferocity of the pig, than the cool courage of the buffalo. (I refer to the tame buffalo : the behaviour of the wild one is a subject I do not feel competent to classify : my impression is that he is rather a beast—but that is another story.) I think it is very much a question of size and strength whether a panther takes to killing human beings or not ; and if he once begins he shows sometimes unlimited impudence, and does not merely kill to eat, but kills for the pleasure of killing. He will lurk about villages and houses in a way no tiger ever does. As Sir Samuel Baker says: " A tiger has more of the dog than the cat in his disposition : the panther is a real cat." So much for the natural iger.—The man-eater is an animal that has broken his caste and become a pariah - to be destroyed like a snake—if you can catch him, but there's the rub. The first man eater I met with in the Central Provinces was a panther. Kills had occurred over a space of about five miles square, and were attributed to a tiger, until after some weeks of random beating, an animal began to kill a series of tied-up buffaloes in the same place, and was stalked and shot over the last kill at daybreak one morning, dissected, and from internal evidence proved to be the local man-eater. This was a panther, male, 6 feet 7½ inches, in length, but very heavy and powerful and amazingly fat.

The evidence in his case was two metal rings found in his stomach, which were practically identified by the villagers as having belonged respectively to two old people killed about three weeks and five weeks before. He had a good coat, teeth and claws perfect. [As to the popular theory of man-eaters being mangy and toothless, I regard it as a sort of pre-historic myth absolutely without foundation. I have examined four myself (two tigers and two leopards) and found they all had good coats (one particularly fine) and perfect teeth, and only one showed any traces of injury or defect in his claws.] This panther, as far as I could gather, kept to the same stretch of ground—three or four villages and the ground adjoining—but where he lay

up could not be discovered. Sitting up for him from 4 p.m. to dark was quite useless. He never came then. He seemed to do all his feeding (if not his killing) about daybreak, being seen twice or thrice about that time and never at any other part of the day. Finally, he was stalked and shot over a kill at dawn—as above stated.

The next animal of this kind was the tiger above-mentioned that tried to stop the mail. He occupied the same ground as the panther, but a greater extent to the west : something like 16 miles east and west by six or seven north and south. He shifted his ground at intervals—perhaps three or four miles in three or four days ; just getting out of the way of a beat, after a human kill, but not (so far as I could learn) going any distance. He was got in a beat after killing a buffalo, with only about 30 beaters. It is clear that they did their work well. He turned out to be a very powerful and handsome male, rather young, with a beautiful coat, teeth and claws perfect. He was shot in January.

When dissected there were no rings found, nor any substance that would convict him: it was only by a careful comparison of places, dates and distances that it became evident that he was doing part of the man-killing in the district. The most conclusive bit of evidence was the fact that there had been two distinct areas of kills, from 7 to 10 miles apart, and after the death of this tiger there was no human kill reported on that ground. Before he was shot they had occurred with some regularity, but not very often. Both before and after he was killed, human kills continued to occur at intervals in the other (western) area. Perhaps this tiger killed a dozen people. I belive he was a cub of the old tigress, the principal district man-eater, and learnt to kill human beings when with her.

It is certainly good policy to examine every tiger or panther killed, on the chance of its being a man-eater and containing some evidence of the fact. But it is very seldom that anything of the sort will be found, except within 12 hours after an animal has fed off a human kill. The finger nails or pieces of bone are likely to be found. An old shikari, who has been present at the examination of many tigers, several of which were man-eaters, says he never found anything of the kind. The old tigress above-named was said to make a practice of removing not only the hair, but the clothes and ornaments of the people she killed, before eating them, and it is said that other man-eaters have been noticed as doing the same.

The next was the local celebrity—an oldish tigress that had been known to the police and the Sirkar generally for four years.

She occupied the western of the two stretches of ground referred to, her centre being 20 or 25 miles to the west of that of the male tiger last-named. She killed on an average two men a month, usually ceasing to kill for a time about the end of the hot weather, or beginning of the rains, every year. During the rains, before she was bagged, she went on killing men more

rapidly than usual. After this she began to go about with a very big powerful young male tiger, supposed to be a grown-up cub of hers, and made him provide for her, and bullied him ferociously if he tried to get a bit of meat before she had finished. He killed game, cattle, and occasionally a tied-up buffalo, but never a human being. There seemed a danger, from the company he had kept, that he might take to man-killing afterwards, especially as he went about in an awful temper for some days when bereaved of his unprepossessing parent, but for some months after her death there was not a case reported. So it seemed clear that he at any rate was free from the family failing. She was a big clumsy tigress, heavy in the back and shoulders, but comparatively weak in the hind legs, with a skinny neck and a very small sneaking-looking head. She had a paw twisted, but this was stated by an anatomist to be a congenital deformity and not the result of an injury.

She was extremely cunning and timid, very careful to keep out of sight, and never showed herself, if she could help it, even to a single native. Once in her life she showed a suggestion of fight, when she threatened to charge Colonel Pollock three times in one morning. She didn't charge up to him, but she did show herself for a moment, and it was a most unusually vigorous demonstration for her.

She was a very sly beast, and during the four years of her celebrity had been hunted as often as any animal of her tribe in the whole of India, and accordingly understood the local system of shikar (*viz.*, beating) as thoroughly as nine shikaries out of ten. She had one or two stock tricks that hardly ever failed.

When she killed a tied-up buffalo, instead of sleeping heavily near the kill, she seemed (if she stayed near it at all) to keep her ears very wide open, and when the shikaries came to see what had become of the buffalo, she knew that those stealthy steps and whispers were the prelude to a beat, with crowds, howls, tom-toms, and rifles, all complete. So she lay still until the steps of the shikari had died away in the distance, and he was well on his road to tell his master where she was and where she could be bagged, and all about it: then she rose and placed herself well outside the area of the intended beat; just over the ridge of the hill for choice. Then, I suppose, she lay down and enjoyed the view, and studied the devices of the Sahibs for future guidance.

But no man-eater is always right, and it did happen that she got enclosed in a beat two or three times. Then her plan (at least after she got experience) was simply to refuse to go forward, but break out at the side, stops or no stops.

Her tricks got so well known at last that the people who knew her best said it was a waste of time to beat for her, for she never could be got in a beat. That was quite true of any place within twenty miles except one: Chauki kho Nàlàh, a place with cliffs at the sides, in places 30 feet high, and quite perpendicular, with only about three outlets, each of which could be

made safe by a trusty stop. In this place she was killed in a beat by a man who had been after her for three seasons. The big tiger with her should have been bagged at the same time, but was let away by a worthless stop—whether from fright or spite did not appear. He was a Kurku. The tigress made a determined attempt to break out at another place, but was turned by the stop, the bearer of one of the shikaries, a Pathan named, appropriately, "Sher Khàn." So she had to go forward and was presently killed.

The deformity of her paw did not appear to have disabled her at all, unless it made her less active. Her teeth and claws were perfect, her coat was good—if anything a trifle short in the hair, but she was getting oldish and she was killed in March.

The last man-eater I met with seemed the most hopeless of the lot. It was a panther, male, "not very big," with a lame foot. During the rains of 1895 he had got into the way of hanging about the village, where he took away two or three children, and slightly mauled a woman who was sleeping on the floor of a hut. After this there was not much seen of him for some months.

About the beginning of March, 1896, he was seen loitering about the village at night, and the people did not like it. They did not really mind it so very much—at least the men did not—for he was not likely to hurt them. He only killed children, and the emergency was not really serious enough to make them wake up and try to mark him down and get him killed. They were a poor lot in that village, and I must say I never met with such people in any other part of the jungle. In other places the Gonds used to work for me—quite cordially. Once the panther was reported as having killed a cow out of a herd a few miles from camp. "When he pulled the cow down he tumbled down himself," was the report of the boy who saw it. Although I made all haste to get a *machan* put up, it could not be got ready until long after dark, by which time the panther had come and been frightened away, once at least. After I had taken my place he did not return.

After that I sat up several evenings over tied-up goats. No result.

Next I sat up all night in a *machan* near the village, with goats tied up every night for a week. No result: nothing to see, nothing to hear, not a track. At last, in sheer desperation, I started beating every nullah in turn that seemed big enough to hold a panther. But that was not any use either. We never even saw a track. Once only in five weeks we saw a track that was thought to be his (which I doubt) within 200 yards of the village. But it could not be traced from anywhere or to anywhere, and it led to nothing.

Most of the villagers were Gonds, and, as my shikari was of the same tribe, I expected that they would be glad to give him *khabar*—especially as it would bring them rupees—but that meant trouble too, so they thought it was no worth it. Perhaps the presence of Kurkus in the village affected the others still, when the panther began to haunt the village again, there was a distinct feeling of uneasiness, and on the whole they wished him out of the way.

Altogether, it seemed as hopeless a prospect as could be imagined. All the information I had got about him in the course of several weeks was that he sometimes came into the village at night. Where he had his home could not be found. My men scoured the country for miles round, but found nothing. He would not touch a tied-up buffalo—even a very small one. No trace of him could be found. Suddenly he turned up—seemingly from nowhere—and the village became awake. He had come into a house the night before, killed a calf and was carrying it out, when the people sitting there shouted at him and frightened him. He dropped it outside and bolted.

When the old headman reported this next morning, the orders he got were : "Leave it there. Sit quiet to-night—let him come and take it away—to-morrow morning look where he has put it, and come and tell me early. I getting panther, you getting rupees." So he went away and obeyed orders. He was old and decrepit, but he was the best man in his village, and next morning he reported. The panther had come and taken the calf away—eaten most of it, and stuck the rest 12 feet up a big tree. I sent my shikari at once with coolies, to see the place, and put up a *machan* at once if suitable, or otherwise to arrange. Then I rested, and waited. No news came. At last I sent messengers ; then started myself. The *machan* was only being finished as the sun was setting. What the explanation might be, if any, I don't know. It seemed almost useless to sit up at that hour of the evening—most likely the panther had come and gone already. However, there was nothing else to do, and I took my place. The moon was two days' old and not visible, and no light except from the stars. To make matters worse the sky was slightly clouded. I had an 8-bore with buckshot cartridges, and a fresh coat of luminous paint on the big foresight, and there were no more preparations I could make. I had a live goat tethered near the remains of the last. At 10 o'clock the panther came and killed the live goat. I fired at where I thought he was—and missed—two minutes later I heard him eating again. After one miss it seemed useless to fire again—but I took a very careful aim at the nearest landmark, with an allowance—waited till I heard him again, and pulled. At daybreak, I saw him for the first time, lying dead. The first shot had missed him clear, and the second had hit him fair, three pellets being in his heart. He was identified by his deformed paw, which had only one claw left, the forearm being three inches shorter than the other. It looked as if he had been caught in a trap, or had a blow from something heavy when a cub. The deformed forearm was much thicker than the other—as if the muscles had run to thickness instead of length.

This deformity accounted for his reluctance to attack animals of any size, and for his falling over, as the boy reported, when he killed the cow. The wonder was that he could climb as he did carrying so much meat. The marks on the tree showed that he slipped a good deal on the way up.

In hunting a marked tiger everything depends on reliable information—but things happen sometimes that scatter one's "facts" to the winds. The 1892 panther, when he found himself comfortably provided for with meat supplied fresh every week in the same place, began to take advantage of the arrangement, and fed there regularly until he was put in the bag. In 1895, when the shikari had (or thought he had) got on the track of the old tigress, an animal (presumably the said tigress) did the same thing, but, just as he was expecting to get a shot, she (if it was she) disappeared, presumably for breeding purposes. On continuing the hunt in 1896, in the same place, the tied-up buffaloes were successively killed just as in the year before. Therefore the shikari concluded that this was the man-eater, and that she had taken with satisfaction to this easier mode of getting her living. He also noticed that about this time an animal, which he supposed to be the old tigress, came prowling round the buffalo nearly every night, to look at it if not to kill it. One night he got a glimpse of it in the dusk, and it seemed to be certainly a tiger. This went on until one night there was a kill, and the buffalo was dragged past his tree in stages of 25 yards at a time. In the morning he looked at it, and it showed, as they all said, the unmistakeable marks of a tiger—the part eaten being the back of the thigh, near the tail. He sat up that night with a companion. At the first darkness of the sunset, before the moon shone out clear, an animal came straight to the kill and began eating at the same place as before, and his assistant killed it. In the morning this animal was found to be a small but powerful female panther.

On dissection this animal was found to have had a heavy meal the night before, from which the two or three mouthfuls it had taken just before it was killed could be clearly distinguished. Here was a puzzle! Was this or was it not the animal that had killed and dragged away the buffalo the night before? If it was, how did it do it, and why did it eat like a tiger? If it was not, how had it got the meal it had? Why did it go so straight to the kill? And, lastly, what had become of the animal that had really killed the buffalo?

It seemed a hopeless puzzle. Everything had seemed so clear a few days before, but now when the Forest Officer said he supposed he "knew all about the man-eater now" the shikari had to admit the truth, that "nobody in the whole of the Central Provinces knew less about her than he did."

The following week she was put in the bag—as stated above—and she was settled—but the puzzle wasn't.

Has anybody ever seen a leopard driven away from a kill by a hyæna? Sitting over a kill one night I saw an animal feeding, and was just able with a glass to distinguish the spots of a leopard—a small one. It became uneasy—there was a ferocious roaring, grunting and general fury, ending in a grand charge and the flight of the first animal. In a minute, when the light was clearer, I saw that the beast then at the kill was a hyæna.

LONDON, *November*, 1897. J. STRAKER, F.Z.S.

No. XI.—THE YOUNG OF THE HUNTING LEOPARD.

(*With two Plates.*)

Late one evening in December, in Berar, on returning from shooting, my boy informed me that a man, during my absence, had brought two very young leopards, which he wished to sell. During my stay in India I had experienced so many disappointments in attempting to bring up various young animals, that I had vowed I would never go through the trouble and anxiety of doing so again. Consequently I told my servant to tell the man that I did not want any young leopards; just then, however, the man came forward carrying a small basket, into which I just glanced, and greatly to my surprise, in place of seeing, as I expected, ordinary leopard cubs, I saw two small balls covered with long, grey tow-like hair, nestling together at the bottom of the basket, and when these moved, two most comical looking little grey kitten heads were raised,—they had large brown eyes and a black stripe running from the corner of each eye to the mouth. I at once felt that these were not ordinary leopard kittens, but must be those of the Hunting leopard. On attempting to put my hand inside the basket, there was much explosive "spitting," but there was no arching of back and raising of fur, as seen in cat kittens. The man informed me he had found them under a thick bush in the jungle, some five miles off; that he and a companion, two days previously, had seen a large cheeta enter this bush, and suspecting it had young ones hidden there, he revisited the place, and finding the old cheeta was away, looked about and discovered the two cubs, which he carried off at his best pace; both were males and one a good deal larger than the other; the man thought that the cubs were about five days old, if so, possibly, like lion cubs, they were born with their eyes open. I was so much interested in their appearance, that at last I told the man I would keep them until next day, and purchase them if I could feed them. I then took them out of the basket and carried them in my arms to the Forest bungalow, where I was putting up. They were but little alarmed, and on being placed on the floor walked quietly here and there. I tried to feed them by means of a rag dipped in warm milk and water; they took a little this way. I noticed that their front teeth were only just above the gum, and constantly as they walked about, and when returned to the basket, they made a chirping cry, most bird-like in sound; this, no doubt, was calling for their mother. As it became dark the cubs lay down in the basket and went to sleep. Next day I was away shooting and left the cubs to the care of my boy; on my return he told me that he had great trouble in getting them to take any milk. As they appeared to be getting weak, I determined to spoon feed with warm diluted milk; to this they offered much resistance at first, but after a couple of days got quite to enjoy it, and walked very strong. They were not easily frightened, but whenever they lost sight of each other, while wandering from room to room, they became much disturbed—constantly making the shrill bird-like chirrips until they met. On

Photographed by Major Roden. Mintern Bros. Photo imp. London.

YOUNG HUNTING LEOPARDS OR CHITA.

Cynælurus jubatus.

3 weeks old.

Photographed by Major Roden. Mintern Bros. Photo imp. London.

THE SAME ANIMALS WHEN 4½ MONTHS OLD.

bringing them into the Headquarter Station of the district, it was noticeable during the few days I spent there, that they had a strong antipathy towards all dogs, large or small ; they would go for them at once, "spitting" and bouncing towards them ; so much was this the case, that on several occasions I was afraid they would come to grief. I also remarked that they were hostile to small native children, but did not appear to dislike white children. On the other hand they were alarmed at the sight of a quarter-grown leopard cub, which was led about on a chain. Every one was much interested in their curious appearance and ways : long grey woolly hair, without spots, covered the head, back, tail, and came half-way down their bodies, giving them the appearance of wearing greatcoats, the remainder of the body and legs were covered with short grey hair sprinkled over with single black spots. On taking them out to play in the compound of the Travellers' bungalow at Damergaon, while waiting for a train, all the crows about the place made a very noisy demonstration on seeing them, collecting in large numbers on the trees overhead, cawing loudly and following them about—these crows appeared instinctively to know that the cubs, although so very small, were not ordinary cat kittens. Shortly after arriving at Dharwar the smaller cub became very ill and extremely weak, I separated it from its brother, who was inclined to pull it about, and for warmth used to keep it folded in my arms with a hotwater bottle ; many a time I thought it was dying, but, no matter how bad it appeared—if it heard the chirrip call from its brother, it would at once struggle into vitality, tumble down, drag itself across the floor to where he was, and then lie down quiet and contented beside him ; after a lot of careful nursing it gradually recovered. When about a month old they seemed not to care for their milk diet, so I tried beef tea in place, which they took most readily, lapping it up from the first. I possess two dogs, one an old spaniel, and the other a young half-bred dog ; on first arrival at my bungalow the cubs did not at all like these dogs, but at once bounced at them and were most disagreeable and aggressive ; the older dog would growl a good deal and avoid the charges by jumping on to a chair, while the younger one would bound round barking in play, but the cubs were very serious in their feelings, and I had great difficulties ; however, after a time I got them to make friends with the younger dog, and finally with the old spaniel. Since then they have remained on the very closest and best terms, and the younger dog and cubs would have great play together round the compound. Often after lapping up their soup they would walk to the dogs and get their faces licked over by them, using the dogs as a napkin, for, until nearly seven months old, they never cleaned their faces by means of their paws, as cat kittens do, but, when the dogs were not present, would lick each other's face. Though the cubs were so extremely friendly with the two dogs—constantly lying down and going to sleep beside them—they would go for any other dog which came into the compound, and would also join the dogs in a race after one. While

at dinner one evening a neighbour called to see me; it was dark and he was attended by a servant carrying a lantern, and on hearing the sound of footsteps approaching the bungalow my dogs rushed out of the dining-room barking; both the cubs were in the room at the time, and one of them bounded out with the dogs, evidently joining them in their hostile exhibition. I much fear this incident interested me more than it did the late caller, who was naturally rather taken back by the sudden rush of two dogs accompanied by leopards, although like the dogs the cubs were perfectly friendly when he came inside the house.

On the first occasion the cubs saw goats, when little more than a month old, they showed much excitement and hostility towards them, and one day when a goat happened to be tied in the compound, they got out of their enclosure, rushed at once at it, one catching hold at the shoulder and the other behind, but their teeth were so short they were easily shaken off. After the cubs commenced a purely meat diet—of raw and cooked meat, when some three months old—a strong instinctive activity was noticed in their licking and eating moist earth—specially that of a red colour, and this they would do several times a day in a most persistent manner. It would be interesting to know whether this has been observed by those who may have brought up young tigers and leopards—if so, it would seem to point to the necessity of providing some fresh earth for these animals when confined in cages. The cubs are bad at tree-climbing, and very seldom in play go up on even a low tree, and when on one are almost as clumsy as a dog. I have never noticed them sharpen their claws against any tree; their power of sight is splendid, but their sense of smell is extremely deficient. When chasing each other, or one of the dogs in play, they always attempt, when going at full speed, to upset the play-fellow by striking his hind legs from under him, and when he falls, which he usually does, a spring is at once made at the neck, and he is then worried to an imaginary death.

G. S. RODON, Major.

Dharwar, 17*th August*, 1897.

No. XII.—SNAKES AT TRINCOMALEE.

While at Trincomalee during the dry season, from July-October, I was much struck by the frequency with which the Russell's Viper (*Daboia russellii*) was found. At the back of the Naval Hospital the jungle comes down closely and is very thick, and here many were killed in the verandahs, bath-rooms, and one in a bed-room; they were all, however, small, none being over 18 inches long.

Cobras (*Naja tripudians*) were occasionally killed, and one curiously was caught alongside the Flagship while attempting to get on board, the ship being

then half a mile from the shore ; it was 14 inches long, and was well marked. As snakes frequently find their way on board ships, particularly the true water snakes, *Hydrophidæ*, it is well to remember the venomous nature of these visitors, but it is my first experience of a cobra there.

One day, on shore, I saw a full-sized cobra strike a lizard, *Varanus draccena*, the snake was frightened away, but the victim died in about two minutes, the lizard being over four feet long.

P. W. BASSETT-SMITH, R.N.

No. XIII.—SEEDLING ORANGE TREES.

From published statements it appears that Orange Trees, for fruit-bearing purposes, are frequently raised from seed in America. In this country the usual practice is to sow the seeds of the citron, *Jumburi*, and graft on that stock, by the process termed "budding," the variety of Orange selected.

In 1888 I sowed seeds of the best Nagpur Cintra Oranges, and one of the trees raised has given produce. The fruit of the seedling has more numerous seeds, a deeper colour of pulp, a stronger inner stem (endocarp), and a more abundant bitter in the skin. It is nearly equal in size with its parent, and some of the fruit is tight-skinned, other specimens have loose skins. As a fruit-tree this seedling is decidedly inferior to its parent.

For the purpose of obtaining improved varieties it is desirable to raise trees from seed of superior oranges, and those which prove inferior may be grafted with approved kinds after the natural fruit has been produced.

G. MARSHALL WOODROW.

No. XIV.—THE COMB DUCK OR NUKHTA.

With reference to Mr. E. C. Stuart Baker's remark on page 175 of the present volume, that the Comb Duck probably occurs throughout Burma, I may mention that on 23rd March last I got three close to Kyauksè (30 miles south of Mandalay) out of a flock of 24, and saw some in the same neighbourhood on 29th May and again in August. They were, on all occasions, found feeding in cultivated rice when the fields were fully irrigated. Their flight strikes me as being decidedly heavy and not over fast.

They are, or were, also common in Yamèthin, where they breed.

J. H. SEWELL, MAJOR.

ALLAHABAD, *November*, 1897.

No. XV.—DOES THE BROWN BEAR HYBERNATE ?

I have lately returned from shooting in the Himalayas, but regret to say that I could find out nothing reliable regarding the hybernation of the Himalayan brown bear (*Ursus arctus*). Everyone, from whom I made

enquiries, agreed that the Himalayan black bear (*Ursus torquatus*) does not hybernate, as these animals are frequently seen during winter round the villages, and I was told that they occasionally break into unoccupied houses to look for grain. My informants, on the other hand, all insisted that the brown bear does hybernate for five months, but none of them had ever actually found one asleep. The fact is at Chamba, where I was shooting, nearly all the villagers in the high hills leave during the early winter for lower and warmer parts, and those who stop do not go up into the mountains when once the snow has fallen, and so have no real opportunity of seeing brown bears, if these were about. I drew attention to the fact that the brown bear in captivity does not sleep during winter, and they all said "of course he does not, because he cannot get the particular herb which he always eats to send him to sleep." One of my shikaries told me that once upon a time there was a certain villager who actually saw a brown bear carrying in his mouth some herbs ; he followed it to a short distance to a cave, and on arriving, the bear eat up the herbs and then lay down and went to sleep. The villager then returned to the place where he first saw the bear and found a piece of the herb, which he took home and divided amongst his family. They all, including himself, eat of it and they all went to sleep and did not wake up for four months (saving money by this). The following autumn this same villager saw the same bear rooting about, and, suspecting he was getting the sleeping herb, watched him; but the bear somehow knowing and resenting this, selected this time a poisonous herb, similar in appearance to the other. This the man gathered after the bear had gone away and divided it with his family; the result being that they all died.

It seems to me a very strange thing, if the brown bear does hybernate for some five months every winter, that absolutely no sign of the instinct should be observable in the young of this species when captured. I intend to return to Chamba next March, when I shall renew my enquiries.

DHARWAR, *December*, 1897. G. S. RODON, MAJOR.

No. XVI.—THE "KOL-BAHLU," AND THE INSTINCT OF FEAR IN WILD ANIMALS.

Captain Betham in the November issue of our Journal asks for information in the matter of the "Kol-Bahlu," a subject in which I specially interested myself some years ago. That interest extended to stalking the melodious jackal at any reasonable hour of the day or night and endeavouring to ascertain the cause of his discontent. On at least two occasions I found that the excitement was caused by a tiger, and I had a good opportunity of examining the proceedings. The tiger took no notice of the jackal, who also showed no signs of fear, although he kept at a respectful distance, say 15 to 20 yards. Occasionally he would utter the weird cry we are all familiar with, and then sit down or stroll around in an unconcerned manner. On another

occasion I was much puzzled at seeing two jackals wildly howling in dense forest, and as they perpetually gazed upwards it was not until, in the dusk of the evening, I observed a large python in a tree overhead that I could understand the occurrence. Jackals run to bay by dogs will often make this noise, and their dying cry, when shot, is frequently in this language. Altogether, I think there can be no doubt that, as a rule, it is a warning note of danger by the individual and perhaps a call for assistance. Probably also it is employed in the breeding season, and this would account for hearing it in civilized localities where there are no excursions and alarms. Natives assert that this is the case, and I have proved the veracity of the statement in one instance by having the jackal shot—it was a slut in season. In some jungle districts not a week passes without hearing the familiar cry of the "Kol-Bahlu." It should be remembered that the instinct of all wild animals leads them to keep the dangerous object under observation and not to fly wildly from it. The sole exception being when the danger is so far-reaching as man has proved himself to be. Deer of all kinds will remain in the vicinity of a tiger or panther as long as possible though they will not dog his retreat. It would seem as if the larger carnivora do not relish a wild charge into a herd of observant deer, and that the latter know full well that the charge would at once follow if they turned their backs on the enemy. I have seen a sambhar hind belling at a tiger within 25 yards and refusing to move; and a chital stag standing even closer and loudly expressing his disapproval. In the first instance the tiger was eating a wild boar and in the second a buffalo. In the same way, jackals having encountered a danger will, for the sake of safety, keep it under observation. The jackal possesses a marked sense of humour. I was one evening observing the remains of a goat which had been killed by a panther when some jackals appeared on the scene and at once fell to with an appetite. A temporary disagreement followed by a sharp fight ending in one being driven off. It sat at a short distance for some time and, when the attention of the others was fully engaged, rushed towards them with growls, bounding in quite an unusual manner. So good an imitation was it of a panther's charge that all the jackals fled with bristling coats. The practical joker then came in for his share of the feast. It is beyond doubt that wild animals are to a great extent judges of the intentions and humour of others without direct communication. The smaller carnivora know well whether the owner of a half-eaten kill has finally relinquished his claim or not; the deer can tell if a prowling tiger is on the hunt or merely taking a constitutional. In the first case a glance or a sniff will send the hungry hyena or jackal away with hair on end, and the satisfied roaring of a well-filled tiger will elicit no warning cries from the deer in the vicinity. The law of the jungle is more a fact than a romance, and we dense mortals learn but little of it even after a lifetime spent in the haunts of big game.

S. EARDLEY-WILMOT,

LUCKNOW, *December*, 1897. Conservator, Oudh.

No. XVII.—THE BREEDING OF THE COMB DUCK.

In Mr. Stuart Baker's valuable paper on Indian Ducks and their Allies, in the last number of the Journal, I notice the remark that this duck "is one of those which invariably resort to trees for nesting purposes." The following incident will show that this is not invariably the case. On the 30th of August, eighteen years ago, I was wandering about with my gun on the banks of a small brackish stream, near Kharagora, when a female Comb Duck got up and went off. I fired and missed her. She flew on for some distance, then turned and came back straight for me, and I killed her. She was handed over to the cook, and in the course of the day he came to say that he had found an egg in her. It was ready to be laid and there was no appearance of any more, so I concluded that the bird had made its nest and laid all its eggs but one when it had the misfortune to fall in my way. Next day I took two men with me to the place and began a systematic search for the nest. There were scarcely any trees in the neighbourhood, but many patches of rank rushes, and among these I hunted long without success. At last one of my men, who was on the other side of the stream, signalled to me and pointed to a hole in the bank, which at that part was quite perpendicular. I crossed and, looking into the hole, found sixteen eggs which exactly matched the one taken out of the body of the bird. They were lying on a bed of twigs and quill feathers of some large bird, with a little lining of down and some fragments of a snake's skin. The hole was about five feet from the ground and two feet deep, the entrance being about 9 inches wide by 6 deep. The hole went into the bank quite horizontally, and there was nothing in the way of a ledge to alight on at the entrance, so the bird must have popped in as a pigeon does. Mr. Stuart Baker says that "their flight has been variously described," but I think such a feat fully justifies his own opinion that the Comb Duck is not exactly a clumsy bird. I believe that two of those seventeen eggs are now in the museum of the Bombay Natural History Society. I set twelve of them under a hen, but they met with an accident by a wild cat.

E. H. AITKEN.

DALHOL, 15*th January*, 1898.

No. XVIII.—THE KOL-BHALU.

The correspondence quoted on pages 310 and 311 of this volume of this journal brings forward once more for consideration the peculiar cry of the "Kol-Bhalu." I am able to add, in an important manner, to the evidence already recorded in favour of this brute being a jackal.

Two mornings ago while riding through one of the finest Reserves in this Forest Division I observed two jackals cross a "fire break," which I was inspecting, about 30 yards in front of me. They were seen by a "Brinjara"

dog of mine, who gave chase, with the result that a big greyhound followed more expeditiously. I took little notice of the incident, as the country was not rideable. A few minutes later I recognised the bark of my greyhound followed immediately after—to my surprise—by the well-known cry of the Kol-Bhalu.

I have always been anxious to ascertain what this animal was, so lost no time in running to the spot. On arrival I found a jackal "at bay" with the greyhound barking on one side and the "Brinjara" dog silent on the other. On seeing me the jackal gave utterance to that weird well-known agonizing cry and tried to escape, charging both dogs alternately.

Being now very anxious to secure the skin, I followed on foot to a "nulla," 100 yards off, where the jackal was knocked down by the greyhound for the fourth time and brought to as tandstill. Again the brute gave vent to its characteristic cry. I was at this time not more than ten paces off. Up to this point in the proceedings the "Brinjara"—a young dog—refused to tackle, but seeing the greyhound, at my direct instigation, "go in," hesitated no longer, with the result that a very fine full-grown male jackal, apparently in the prime of life and in first rate condition, was brought to bag. There was, as far as I could see, no distinguishing feature about this jackal whatever, and this particular case does away, to a great extent, with the supposition that the Kol-Bhalu is an aged, toothless, and mangy solitary rambler, and while showing that he is in no hurry to escape from dogs, also does away with his supposed invulnerability from this source of attack.

It is a trifle mysterious therefore why one jackal out of hundreds should develop quite a distinct call, unless we assume that the formation of its vocal organ is different. At present, however, there are no grounds for this assumption, and being absolutely ignorant of the anatomical structure of jackals I am unable to throw further light on the matter.

The fact remains that there is not only something very peculiar in the cry of the Kol-Bhalu, but that the cry is sometimes productive of peculiar results.

I can recall two instances in particular which indirectly tend to corroborate the assertion often made by excellent native shikaris and by forest guards, that the Kol-Bhalu is the forerunner of a panther and tiger.

On one occasion near Mandvi (Surat) its cry was followed shortly after by the appearance of a panther in the "kill." As this "kill" was the property of the panther—inasmuch as a right had been established to it on well-known sporting principles—it is of course quite possible the panther would have turned up without the cry.

On the other occasion in Baglan (Nasik) the Kol-Bhalu's cry was followed by the roaring of a panther within 100 yards of my tree. This panther refused to rise "to the bait."

From the first case it looks as if the panther refused to take the warning, and from the second, as if having made a mental note of the warning, he felt

called on to give vent to his lively disgust at my very close proximity to an otherwise approachable live goat! I put this theory forward for what it is worth.

PUNCH MAHALS, W. A. WALLINGER.
GODHRA, 19*th December*, 1897.

P.S.—Since writing the above I have been asked whether the Kol-Bhalu killed showed any signs of rabies. I certainly think not, but the point will be cleared up definitely if in the course of time neither of my dogs develop symptoms. The greyhound, in particular, was badly bitten.

W. A. W.

No. XIX.—ON THE DISTRIBUTION OF THE BLACK-CAPPED KINGFISHER (*HALCYON PILEATA*).

With reference to my note on page 148 of the present volume, the Kalyan skin of the above-mentioned bird has been carefully compared by Mr. Bowdler Sharpe and myself with the large series of typical Malayan specimens at South Kensington, and we could detect no such aberration from type as was discovered in the case of the specimens of *Halcyon* (*Sauropatis*) *chloris* collected by me in Ratnagiri, of which Mr. Sharpe had made a sub-species. The reason I suggested for *Halcyon pileata* remaining true to type, was that it was probably only a *temporary* visitor to the West Coast of India, whereas *Halcyon chloris* is undoubtedly a *permanent* resident on the West Coast.

G. W. VIDAL.

LONDON, 7*th January*, 1898.

No. XX.—OCCURRENCE OF THE LESSER FLAMINGO (*PHŒNICONAIAS MINOR*) NEAR BOMBAY.

It is, I think, worthy of record that, on the 26th instant, I shot a specimen of the above-named bird in the Thana creek, near the old fort of Bassein, about 20 miles from Bombay. Neither Barnes, Jerdon, Hume nor Baker speak of it as occurring in this part of the country. The specimen, which has been added to the Society's collection, agrees with the description given in "Stray Feathers" as 944 bis: (Vol. I, page 400), but does not agree as regards colour with the description given by Mr. Baker on page 8 of the present volume of this Society's Journal. In my specimen, which is a full-grown male, there is no pink colour anywhere except under wings.

J. M. MASON,
Curator, Bombay Natural History Society.

BOMBAY, 27*th January*, 1898.

PROCEEDINGS

OF THE MEETING HELD ON 6TH DECEMBER, 1897.

A meeting of the members took place at the Society's rooms, on Monday, the 6th December, 1897, Capt. A. J. Peile, R.A., presiding.

NEW MEMBERS.

The election of the following new members was announced:—Mr. P. McCann (Bombay); Mr. F. W. Bickel (Bombay); Capt. H. F. Vanderzee, R. A. (Cawnpore); the Very Rev. Dr. Paul Goethals, S. J., Archbishop of Calcutta (Calcutta); Mr. E. M. Coventry, I. F. S. (Montgomery); Mr. Kenneth Rushton (Ahmednager); Lieut. A. H. Wilson (Jhansi); Mr. W. D. Cumming (Persain Gulf); Mr. F. D. Maxwell (Ma-ubin, Burma); Mr. E. R. Hunt (Sylhet); Mr. M. M. Mackenzie (Chapra); Mr. G. B. Allen (Cawnpore); Hon. P. Thesiger (Bombay); Mr. Charles Merrony (Bulsar); Mr. E. H. Young (Rutlam); Mr. G. Filmer Guy (Bombay); Mr. F. O. Gadsden, R. I. M. (Bombay); Mr. O. Lindgren (Debrugurh, Assam); and Lieut. H. G. Stansfeld (Rangoon).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting:—

Contribution.	Description.	Contributor.
1 Koel (alive)	*Sydynamis honorta*	Col. Gerald Martin.
A Number of insects from China	.....	Mr. P. McCann.
2 Monitors (alive)	*Varanus bengalensis*	Mr. R. H. Vincent.
1 Palm-Civet (alive)	*Paradoxurus niger*	Mr. J. G. Counsell.
2 Gaurs' Heads	*Bos gaurus*	Deposited by Major A. Fraser.
1 Chital's Head	*Cervus axis*	
Land and Fresh Water Shells	.....	Mr. Lawson Morgan.
Sea Shells	.....	Mr. E. H. Aitken.
A Collection of Sea Fish	.....	Dr. Bassett Smith, R. N.
Canarese Scorpions	.....	Mr. T. R. D. Bell.
1 Lizard (alive)	*Cygosoma punctatum*	Mr. S. R. Arthur, I.C.S.
1 Snake (alive)	*Tropidonotus piscator*	Mr. R. H. Vincent.
Horns of Schomburgh's Deer.	*Cervus Schomburghi*	Mr. H. Slade.
4 Snakes from Japan	.....	Lord Dormer.
Land and Fresh Water Shells	.....	Mr. J. A. Betham.
1 Hippopotamus' Skull	*Hippopotamus amphibius*	Mr. Muncherjee D. Talathi.
1 Short-eared Owl	*Asio accipitrinus*	Mr. C. Merrony.
1 Dhaman (alive)	*Zamenis mucosus*	Mrs. Lawrence.
1 Snake (alive)	*Lycodon aulicus*	Mr. C. Merrony.
2 Indian Monitors (alive)	*Varanus bengalensis*	Do.
Land and Fresh Water Shells	.....	Mr. Poh Hla.
1 Panther Cub (alive)	*Felis pardus*	Mrs. N. Prideaux.
1 Daboia (alive)	*Viper russellii*	Mr. W. L. Cameron.
Butterflies from Jamrud	.....	Capt. F. J. Barton.
1 Malabar Spiny Mouse	*Platacanthomys lasiurus*	Mr. H. Wapshare.
A Number of Wild Duck, mounted	.....	Mr. Charles Maries.
8 Floricans' Eggs	*Sypheetides auritas*	Mr. Charles Gray.
1 Forest Eagle-owl (alive)	*Huhua nepalensis*	Mr. W. J. H. Hunter.
1 Rose-ringed Paraquet	(*Deposited*)	Do.
1 Snake	*Pseudocyclophis olivaceus*	Mr. J. A. Graham.

CONTRIBUTIONS TO THE LIBRARY.

Catalogue of Birds in the British Museum, Vol. XXVII., in exchange.
Dejean's Catalogue of Coleoptera, from Lord Dormer.
British Plants, Vol. I. (Withering), from Mr. S. Wellington.
Fauna and Flora of Palestine, from Prof. H. Littledale.
Vires Plantarum Malabaricum, from Dr. Dalgado.
A number of Photographs of Indian Grasses from Mr. G. M. Woodrow.
A Photograph of Bears, from Mr. R. H. Heath.
Memoirs, Geological Survey of India, Vol. XXVII., Part II., from Government.

PAPERS READ.

The following papers were then read and discussed :—

1. Camping in Chamba, by Harold Littledale, M. A.
2. A new *Curcuma* from the Deccan, by Surgeon-Captain D. Prain.
3. Notes on a species of *Colias* found in Ladak, by H. J. Elwes, F.R.S.
4. A probable Hybrid between the Scarlet-backed Flower-pecker and the Fire-breasted Flower-pecker, by E. C. Stuart Baker, F.Z.S.

Miscellaneous Notes :—

a. The Protective Power of Scent in Animals, by N. C. Macleod.
b. Speed of Flight in Butterflies, by Surgeon-Captain S. E. Prall, I.M.S.
c. The Migration of Butterflies, by Surgeon-Captain S. E. Prall, I.M.S.
d. Curious Accident to a Palm-Civet, by A. L. Butler.

J. G. Keulemans del. Mintern Bros. Chromo. 4th London.

THE LARGER WHISTLING TEAL.

Dendrocygna fulva.

¾ Nat. size.

JOURNAL

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INDIAN DUCKS AND THEIR ALLIES.

By E. C. Stuart Baker, F.Z.S.

Part IV, with Plate IV.

(*Continued from page 367 of this Vol.*)

Genus DENDROCYCNA.

The genus *Dendrocycna*, or *Dendrocygna*, as most of us would probably still prefer to call it, contains our two widely-known species of Whistling Teal as well as seven others, some of which are found in every continent except Europe.

Whistling Teal are amongst the few *Anatidæ* who perch constantly on trees and also breed on them. The sexes are similar in plumage, though the female is often slightly smaller than the male. Many systematists used to consider that they were allied more to the *Anserinæ* than to the *Anatinæ*, and in many ways they do clearly approach the former, more especially, perhaps, in the formation of the legs and bills.

They are non-migratory ducks, or only so in a very local way.

Key to the Species.

a. Upper tail coverts whitish, sometimes marked with black ... ... (1) D. fulva.

b. Upper tail coverts uniform chestnut ... (2) D. javanica.

15. Dendrocygna fulva.

The Greater Whistling Teal.

Dendrocygna major. Jerdon, "Birds of India," III, p. 790; Hume, "Nests and Eggs," p. 640; *id*, "Str. Feath.," III, p. 193.

Dendrocygna fulva. Hume and Davis, "Str. Feath.," VI, p. 488; Hume, "Str. Feath.," VII, p. 463; VIII, p. 115; Legge, "Birds of Ceylon," p. 1069; Hume and Marshall, "Game Birds," III, p. 119; Hume, Cat., No. 953; Parker, "Str. Feath.," IX, p. 487; Oates, *ibid*, X, p. 245; *id.*, "Birds of British Burmah," II, p. 274; Barnes, "Birds of Bombay," p. 399; Hume, "Nests and Eggs" (Oates' ed.), III, p. 286.

Dendrocycna fulva. Salvadori, "Cat., B. of B. Museum," XXVII, p. 151.

Description of Adult.—"Head, neck, and lower parts deep reddish-ochraceous, passing into cinnamon on the flanks, where the longer feathers have a broad mesial stripe of pale ochraceous; crown ferruginous; nape with a distinct brown-black stripe, commencing at the occiput; middle of the neck whitish, minutely streaked with dusky on the edges of the feathers; prevailing colour above brownish-black, the dorsal and scapular feathers broadly edged with cinnamon colour, giving a barred appearance; lesser wing coverts chestnut; upper and under tail coverts buffy-white; quills and tail dark brown" (Salvadori).

The bill varies from dusky black, black on the terminal third and slatey at the base to dusky throughout, merely tipped black, and much shaded with bluish-lead colour at the base and basal half. In the same way the legs and feet vary from quite a pale, dusky plumbeous more or less of a blue tint to almost black. According to Monill the legs are bright slatey-blue, but personally I have seen no Indian birds with brightly tinted legs. Claws black; the irides are light to dark brown. "Length, 18-20 inches; wing, 8·10-8·90″; tail, 2·2″; culmen, 1·66-1·95″; tarsus, 2·10-2·4″; middle toe, 2·30-2·8 inches" (Salvadori).

Jerdon gives the length as 21 inches and wing 9¼ inches. The largest I have seen had the wing 9·20 inches, which is practically the same.

The female.—Only differs from the male in being slightly smaller; length, 17-19 inches; wing, 7·85-8·25 inches. A female obtained by Capt. Shelley from Nyasaland measured, wing 9·1 inches, tarsus 2·1″, and culmen 2·2 inches. This gives a larger bird, with proportionately even

larger bill, than any Indian bird which I have seen or of which I can find the measurements. Three other birds have been also obtained in Nyasa.

Birds of the first year are duller and paler, the upper tail coverts are narrowly edged with brown, and the wing coverts are a dull chestnut brown.

Young in down.—"Upper parts greyish-brown; lower parts whitish; a white band across the occiput, interrupted by the brown band which runs along the hind neck; a brown band from the ears to the hind neck; no white patches on the sides of the head; a whitish band across the wing" (Salvadori).

Hume gives the weight of an adult male as 1 lb. 12 oz. and that of a female as 1 lb. 10 oz. I have shot a male which weighed 2 lbs. exactly, and which was a very fine heavy bird. I have never weighed a female or, at least, recorded any weights of such.

The Greater Whistling Teal has its head-quarters, within Indian limits, in Eastern Bengal, where in parts it is exceedingly numerous; thence it extends into Assam, where however it is not common, and seems gradually to become less common towards the West and North of the Empire and to extend a very short way to the South. Mr. C. B. Sherman said that he found it very common in Travancore, but it is most probable that he mistook the common Whistling Teal for this bird. Jerdon also found it fairly common in some parts of the Deccan. As regards Burmah, Oates in "Birds of British Burmah" writes:—"The larger Whistling Teal is comparatively a rare bird in Burmah, except in the Northern portions of Pegu, where I found it very abundant in the Engmah Swamp, twenty-five miles south of Prome. Capt. Wardlaw Ramsay procured it at Tonghoo, and I observed it several times in the paddy-fields near Kyeekpadien in Southern Pegu during the rains. I can find no record of its occurrence in Tenasserim or Arrakan."

He then goes on to say that it is found in Ceylon, but he does not mention his authority for this statement, and I cannot but think it is a mistake, for I can find no record of its occurrence anywhere in that Island. In "Stray Feathers" (*loc. cit.*) he says that the larger Whistling Teal is found all over the Province of Pegu, but is less common than the smaller species.

Outside India its distribution is very remarkable. Salvadori thus describes its habitat:—"America (from southern border of the United

States to Mexico) and then from Venezuela and Peru to the Argentine Republic, Africa South of the Sahara, and Madagascar."

Capt. Shelley reports (*Ibis*, Vol. VI, No. 21, p. 28) four birds from Lake Shirwa in Nyasaland, mentioning that it is the first instance he knew of in which the birds had been found so far south.

The distribution of this duck is the more remarkable when we consider that it is not a migratory bird, or at all events only so in a partial manner, as influenced by the want of water, etc. Thus it is a resident inhabitant of various tracts of country, large in themselves, but very widely separated from one another, yet never, as far as is known, occurs in the intervening parts.

Unlike *D. javanica* this bird is usually found in rather small flocks; even in Jessore and Kulna, where it is perhaps more abundant than in any other portion of its range, I seldom noticed it in flocks of much over twenty, and never, I think, over forty. Generally there were some dozen or fifteen members to each flock. Of course, in some bheels and lakes where they are especially numerous, several small flocks may be seen feeding together, forming a total of 100 birds or more, but on being disturbed it will be found that as a rule they, though rising *en masse*, soon divide again into parties.

They are wilder birds than their smaller cousins, and also stronger and quicker on the wing; indeed, when once well started they are no mean fliers, and require a straight gun to knock them over. One cannot well describe the difference in the voice of the two Whistling Teals; but it is recognizable, and I think consists in the bigger bird having a shriller whistle than the other, though it is not such a noisy bird. I doubt if they perch as much as *D. javanica* does; the latter bird often takes to trees in the day-time without any apparent purpose except to rest, but *D. fulva* does not seem to do this. Of course both birds, when perching, choose large boughs and branches, as they have no great grasping power and could not retain their hold on small ones, especially if there was any wind to sway them about. As Hume remarks, this Whistling Teal is far more often seen on land than is the smaller species, and he also notes their goose-like gait. Their legs are, as we all know, set forward much as are those of geese, and in consequence they naturally walk freely and well as do those birds. I have noticed them resting during the heat of the day on the spits of grass-covered land

which run far out into the larger bheels. One or two observers have said that they are more river and clear water frequenters than are others of the genus, but this I have not myself confirmed. Every large bheel and expanse of water which had cover on it contained more or less of these birds, and many a tiny tank or rush and weed covered back-water held its flock ; but I have never yet met with them on the open rivers of the Ganges and Brahmapootra, though I have visited them often, and though these run through their favourite haunts.

These ducks, or teal, are practically as omnivorous as is the domesticated duck, and will eat almost anything they can get hold of, preferring perhaps a vegetarian to a meat diet.

I can give no thrilling accounts of shooting these teal, as they are not considered game in Bengal, and when we do shoot them we do not talk of it. Of course a good many are shot for the servants, boatmen, etc., who enjoy them immensely, and the fishier they are the more tasty they consider them. I have noticed no difference in the flavour of the two species of whistler, and cannot say I think much of either ; they do not make bad curry or muligatawny soup when one can get nothing else, and I *have* eaten them in preference to the domestic *moorghi*, but at this point my praise of them as an edible quantity must end.

I took a few nests of this teal in Rungpur, where however the bird was not common, one in Nadia, and a few in the Sundarbans. My first nests were all taken in the latter place, and were nearly all placed on small trees, often babool or similar ones, standing on tiny islands in the centre of large bheels. With one exception I think the birds had made the nests themselves ; they were very roughly put together of twigs, sticks and grass, and in a few cases covered, one can hardly say lined, with dirty masses of weeds. They averaged some 18″ across and were placed, not so often in forks, as on tangles of branches ; sometimes, of course in forks, and at other times where the first few big branches sprung from the bole of a large tree. One nest was placed in the crown of a date palm—one of a small clump which stood on a little hillock where there had been built the dirty and desolate little hut of some fisher family. This had been deserted, probably the former year, and the Whistling Teal reigned over the knoll and its contents.

One nest, from its size and construction, must have been made by a fishing eagle, numbers of which breed in these same haunts,

and doubtless also vary their usual diet with a duckling every now and then.

In Nadia I took one nest of this species only, and I do not remember seeing any more of these birds in that district. Krishnaghar, the head-quarters town of Nadia, evidently once boasted a sporting community, as there is a race-course, and a good one too, about a mile-and-a-half from the station. Dotted here and there about the centre and on the outskirts of this race-course there are a number of small tanks, all densely covered with weeds and surrounded by a thick fringe of bushes and trees which afforded good cover to hare, jackals, and now and then a leopard. Overhanging one of these tanks, and encroaching into the water itself, was a fine banyan tree, and over the water and resting on a number of branches which crossed and recrossed one another a pair of Whistling Teals had made their nest. It was quite an ideal place for a nest ; the branches projected well over the deep tank and, though supported by the numerous roots which had grown down from them, were yet not strong enough to bear the weight of a man. In addition to this the brambles were so fearfully dense all round the tree that it was an awful business to get to it. Eventually after two visits had been made, we cut a narrow pathway through the jungle and sent an adventurous, small boy up into the tree, who succeeded in clambering out to the nest and letting the eggs down in his puggree.

In Rungpur I found them selecting big trees and generally making their nests high up in them, some thirty feet or so from the ground. One nest I took from a large hollow in a dead tree. All the nests I saw in this district were made in trees growing beside the ditches of which I have already spoken when describing the Cotton Teals' nest.

I have never seen their nests on the ground, but any one hunting for their nests should not overlook the fact that they may be found to make their nests thus.

Barnes, *vide* his article on "Nesting in Western India," found this bird breeding at Hyderabad in Sind, and saw one nest which was placed in a babool tree in the very centre of a large and deep jhil. Barnes doubted the authenticity of the eggs in his collection on account of their small size, and says that they measured 1·9″ × 1·6″. This is smaller than usual but not remarkably so, and the difference in the size of their eggs is not half so great as is that between the two species of birds themselves.

The only note in Oates' edition of Hume's " Nests and Eggs " is of a nest found at Saugor, C. P., and taken from a large hollow in an old tree. The hollow was well lined with twigs, grass, and a few feathers. The eggs, seven in number, varied between 2·12″ and 2·25″ in length and between 1·65″ and 1·75″ in breadth. They breed in most places in July and August; in Nadia I took the nest at the end of June—I forget the date—and in Rungpur they breed principally in August, a few in September.

I have never taken more than ten eggs from any nest, and think 6 to 8 is the number most often laid, and I have taken four quite hard set.

I have noticed that there is a very general tendency to over-estimate the number of eggs laid by all game birds whether land or water: why this should be so I cannot tell, but that it is so cannot be doubted. Thus the majority of quails lay four eggs, few more than six; jungle fowl lay five or six, sometimes eight or more, but this is the exception; bush and bamboo partridges almost invariably four or five. Of nearly all these birds, writers,—generally anonymous, at other times good sportsmen but bad observers—have noted their laying double the number, and put that down as the normal number in a clutch.

After this digression to return to the Whistling Teals' eggs. They vary in no way from those of the smaller bird, though Oates says that they are perhaps of superior smoothness. This has not struck me, and I certainly could not discriminate between a small egg of *D. fulva* and a large one of *D. javanica*. When first laid they are a pure pearly white, often showing a slight gloss; this gloss goes off very quickly, and soon the eggs take a very faint greyish or yellowish tint, the shade depending, I think, on the water the parent bird frequents and the material of which the nest is made. I have a clutch of eggs taken from a nest made principally of, and lined entirely with, rank weeds, and their eggs are faint, but distinct, yellowish underneath and pale greyish above.

The normal shape of the egg is a very broad regular oval, but little smaller at one end than the other. Abnormal eggs are generally longer in shape, but I have seen none at all pointed. They are fine and smooth in texture, but inclined to be chalky and not very close grained.

Twenty-five of my eggs average 2·09″ × 1·69″. The smallest I have ever taken was 1·84″ × 1·56″ and the largest 2·40″ × 2·01″; but neither of these are now in my collection.

16. Dendrocygna javanica.

The Lesser or Common Whistling Teal.

Dendrocygna arcuata. Hume, "Stray Feathers," I, p. 260; *id*, "Nests and Eggs," p. 639; *id.*, "Stray Feathers," II, p. 315; Ball, *ibid*, p. 483; Oates, *ibid*, V, p. 169.

Dendrocygna awsuree. Jerdon, "Birds of India," III, p. 786.

Dendrocygna javanica. Hume and Davis, "Stray Feathers," VI, pp. 486, 488; Cripps, *ibid*, VII, p. 311; Hume, *ibid*, VIII, p. 71; Hume's Cat., No. 952; Legge's "Birds of Ceylon," p. 1069; Hume and Marshall, "Game Birds," III, p. 109; Bingham, "Stray Feathers," IX, p. 198; Park, *ibid*, p. 486; Oates, "Stray Feathers," X, p. 245; Oates, "Birds of British Burmah," II, p. 273; Barnes, "Birds of Bombay," p. 398; Hume, "Nests and Eggs" (Oates' ed.), III, p. 284.

Dendrocycna javanica. Salvadori, "Cat. of Birds, British Museum," XXVII, p. 156.

Description: Adult Male.—Forehead and crown brown, paler and reddish on the forehead and darkest on the occiput; remainder of head and neck pale fulvous-grey, paler on the cheeks and almost white on the chin and upper throat; this colour gradually changes into yellowish-grey or yellowish-fulvous on the breast, which again changes into the chestnut of the lower parts, and this again in its turn fades into the dirty, creamy-white of the lower tail coverts. Above the colour of the neck changes into brown on the scapulars and back, where the feathers are broadly margined with golden-rufous; rump black; upper tail coverts chestnut, tail brown, very narrowly margined with paler dingy rufous; lesser and median wing coverts chestnut, the latter sometimes mixed with ashy; greater coverts dark ashy, rarely splashed with chestnut next the primaries; quills black, the inner secondaries more brown and edged with dingy ash colour; flanks chestnut, the feathers sometimes centred paler; axillaries brown.

Irides dark brown; bill almost black to slatey-grey with the nail darker; feet slatey-brown to dull black. "Eyelids bright yellow" (Salvadori).

"The irides are deep brown; the eyelids bright yellow to pale golden; the legs and feet generally dark, at times somewhat pale plumbeous blue, often dusky in patches and on the webs and claws blackish; bill

plumbeous to pale dull blue at the base, shading to black at the tip, the bill in some having a greater extent of plumbeous, in others of black; the membrane between the rami of the lower mandible is generally pinkish" (Hume).

Length, 16″ to 17·5″; wing, 6·92″ to 8·04″; tail about 2·5″ to 3″; tarsus, 1·6″ to 1·92″; bill from gape, 1·7″ to 2·06″.

"Length about 18″; wing, 8″; tail, 2″; bill at front, $1\frac{1}{2}$″; tarsus, $1\frac{3}{4}$″; mid toe, $2\frac{3}{4}$″ (Jerdon).

Weight about 1 lb. to 1 lb. 6 oz.; the latter weight unusual.

Female.—Like the male, but perhaps averaging smaller.

The Young—"When just able to fly, do not differ very much from the adult, but are everywhere duller coloured. The margins to the feathers of the interscapulary region are inconspicuous and dingy fulvous, and the entire lower surface a rather pale, dull, fulvous-brown" (Hume).

There are few places in India where this very common bird may not be found, but outside our limits it does not extend very far. It is obtained throughout the Indo-Chinese countries and Siam, and in the Loochoo Islands, the Malay Peninsula, Sumatra, Borneo and Java. Mr. C. B. Ricketts obtained a specimen near Sharp Peak close to Foochow, and it has been obtained in one or two other occasions in China. The bird shot by Mr. Ricketts was killed in November.

The specimen said to have been brought from Lake Tschad in Central Africa, seems to have been the result of some mistake.

The Whistling Teal is, in many parts of India, a local migrant, visiting them only during the rains; and this we can well understand, knowing how many places in Northern and North-Western India change their character with the advent of the rains from utterly dry, burnt-up tracts to well watered, wet ones.

Cripps says that it is not found in Dacca during the cold weather, but this I know is not the case, as I have seen them there at that season, only they keep to the wetter portions of the district, and doubtless many do move to Sylhet, where there is never any want of swamps and bheels. In the same way many birds leave Cachar as the water subsides and go into Sylhet. In Bengal I think the question is entirely one of water-supply, and where the water is sufficient, there these teal will remain independent of the season. When, on the other

hand, the water fails them, they go off elsewhere. In Sind they are rainy-weather visitants only, and they also leave the Deccan in great numbers as the waters dry up at the end of the cold weather. It is found throughout the Terai, but does not ascend very high, and, most probably, Hodgson's specimen was not really obtained in Nepal.

Here in Cachar it is extremely common all the year round in the plains but never ascends the hills at all.

Hume, writing of this bird, says: "It is essentially a tree duck; it must have trees as well as water, and hence its entire absence from some pieces of water, in treeless parts of Rajputana for instance, where other species of ducks abound during the cold season. Yet it prefers level, or fairly level tracts to very broken hilly country, and again, though in some places, *e.g.*, at Tavoy, it may be met with in rivers in enormous flocks, it, as a rule, prefers moderate sized lakes and ponds to rivers.

"Owing to these preferences, there are many tracts, as for instance portions of the Deccan, where it is extremely rare."

This is quite true, but in Eastern India, more especially Bengal, nearly all the country is more or less well supplied with trees and also water, so that local migrations are not necessary and therefore not indulged in, except in the very narrowest sense of the word.

The same applies to Ceylon, where Legge describes them as permanent, but moving to and from certain places with the season.

Hume says that it seems to be a permanent resident only in districts which are *well drained* as well as possessing other attributes. This is certainly not the case in many or most parts of Bengal, where the birds are resident however ill-drained the district may be.

It is quite the exception for them to be seen in any number on rivers and open, *clean* pieces of water; they prefer tanks, backwaters, swamps and lakes, the latter especially when they are well covered with weeds or vegetation.

My first duck shooting in India was obtained in Jessore, and until then I had no idea of the vast numbers in which duck of different kinds assembled. Teal of sorts were common, and Gadwal, Pintail and many ducks also, but the Whistling Teal must have numbered at least 100 to each one of all the other kinds included. It was almost incredible the enormous flocks in which they assembled, thousands and thousands flew on every side of us as we shot, and the dull rumbling of their wings was

heard a mile away or more, even before they were disturbed. We did not of course shoot them, but we found them a horrible nuisance, for they were quite as wild as the other ducks, and whenever a careful stalk had enabled us to get almost within shot of a fat lot of Gadwal or nice flock of blue-wing Teal or other much-to-be-desired game, some wretched Whistling Teal was sure to pop out of an unnoticed piece of cover and make off with loud whistlings and whirring wings, followed by every other duck within two or three hundred yards. A few, perhaps, of the Whistling Teal might pass us within shot, but it was almost certain that the duck we wanted would not.

It is very difficult to estimate how many birds there were on the Moolna bheel when I first visited that grand shooting ground, but there must certainly have sometimes been *hundreds* of thousands on the wing at once.

Often when we approached some piece of water where the reeds and rushes grew so rank that we got right in before we fired, the Whistlers would rise at the shot in masses before us, almost carrying out that old figure of speech, "darkening the air." I was greatly struck on these occasions by the attitudes of the birds, which reminded me much of ancient prints on duck shooting, the birds with their long necks outstretched rising straight up for some height until they got fairly started, when they fly off parallel with the water, generally about 30 or 40 feet up and not very fast in spite of their noisy flight. Hume, Legge and many others have mentioned the rapidity with which they beat their wings, and have also noted the smallness of the result when compared with the amount of exertion used. When found in small flocks, that is to say, up to about fifty or so, on tanks, ponds and small pieces of water, they often fly round and round the place before leaving it, and more particularly is this the case when, there being no other water very close by, they are loath to quit the piece from which they have been roused. In the vast pieces of water in the delta of the Ganges, I did not notice this habit so much. When first disturbed and the birds get up all at once, it would seem that they form a flock numbering some thousands, but they soon divide into smaller ones, seldom numbering over two or three hundred, and then with a preliminary wheel or two fly off to some other part of the swamp. Why they should be so wild in the Sunderbans and yet so tame in most parts of their habitat I

cannot explain. They are not much shot at, as the inhabitants are nearly all fisher people who possess but few guns and who get their duck by driving them into nets and not by shooting them.

I have never in any part of Bengal known them to be so tame as to require stoning to induce them to leave a tree as Hume says is necessary in many parts, yet in Rungpur, Furreedpur and some other districts they are so confiding that to get a sitting shot would be a very easy feat were it desirable, and the birds do not fly until the last moment. They perch very freely on trees, even when not in the breeding season, but I think that, as a rule, they rest, when in flocks, on the water and not on trees, sometimes of course they do rest during the heat of the day on trees. Hume indeed says generally, and this habit again may be one of locality varying in the different parts it affects.

At night I think they roost almost invariably on trees, and even where they are shy and wild and feed in the evening and early morning, the middle of the night is probably passed roosting on trees. They very rarely rest on land, as do their larger brethren *D. fulva*, and I have never personally seen them thus actually on land. The only time I have seen a flock of any size on a tree was once when passing under a huge Banyan tree, a large flock flew out just overhead. I was riding when they started, but I remember that as they departed out of sight, I viewed the last of them from the ground on which I was reclining in a semi-sitting posture. I forget now which got out of sight first, the Teal or my pony, the latter a skittish T. B. Waler.

Banyan trees are very favourite resorts of this bird, because, doubtless, of the large horizontal branches which are so numerous and which give them good foothold without calling on the powers of grasping to any great extent. They are quick, strong swimmers and very good divers also, but I have not known them dive and remain under water, holding into weeds, etc., as some ducks do. As a rule, a wounded bird dives and scurries under water at a great pace for about ten to twenty yards and then reappears, once more to dive as the would-be catcher thinks that at last he has got it.

They feed on anything and everything, but bring up their young principally on animal food, and they themselves, in an adult state,

probably prefer vegetable food. They graze often in the rice fields, but only when the plant is very young, and I have seen them grazing on the coarse dhub grass which often grows on sandy spots at the edges of tanks and jhils in the cold weather.

I have found that they eat large quantities of a very small fresh-water snail; this has a very brittle shell and so is probably easily crushed and digested. These snails *might* account for the flavour of which the bird is unfortunately the possessor. Anyway, it is most rare to find a Whistling Teal fit to eat, though it is not an impossibility to get such a young bird just at the commencement of the cold weather being the most likely to furnish an edible dish.

Their note is described by their name and is a regular whistle, not very clear, rather sibilant, and by no means harsh or shrill. It is uttered constantly whilst on the wing, especially when first rising and during the first few wheels. I have also heard it during the breeding season give vent to a low chuckling, not unlike the lower garrulous notes of the Cotton Teal, but more nearly approaching the quack of a true duck.

No articles on ducks could possibly be complete without Hume's story of the Whistling Teal, Crows, Cat and Dogs, so it must be here quoted in full.

"I once saw a good large half-wild village cat spring down upon a duck, which was sitting on her nest, in a broad four-pronged fork of a mango tree. The duck did not whistle in the usual manner, she positively screamed; in a second the drake dashed at the cat, and to my surprise down came a black crow (*C. macrorhynchus*) not, as any one would have thought, to steal the eggs in the confusion, but to assail the cat with claws and beak as if his own homestead had been attacked. In less time than it takes to describe, the cat was squalling in her turn, and fled up one of the branches pursued closely by the drake and the crow, who were immediately joined by another crow, and the three made it so hot for pussy, that she sprung to the ground, where my dogs, aroused by the uproar above (the noise those two crows made was astounding), were awaiting her, and before I could interfere, and before she quite recovered the jump of some 35 or 40 feet, killed her outright. But the strangest part of the business was that the villagers assured me that this nest was the crow's own nest,

and that *they lent it every year*, after their young had flown, to the Whistling Teal. I should have verified this the next spring but left the Mynpooree district, and never again had a chance of visiting the spot."

Normally and typically both our Indian *Dendrocycnæ* build nests on trees or lay their eggs in their hollows; often, however, they make use of the deserted nests of other birds, and sometimes they build nests on or near the ground in reeds, grass, or even bushes. The recorded and authenticated instances of the common Whistling Teal laying its eggs in nests placed on the ground are not numerous.

Barnes, in Vol. I of this Journal, recorded the fact that in Neemuch he never found their nests on trees but always amongst rushes growing on the edges of banks.

Oates, in "Birds of British Burmah," says that he has "Frequently found its nest in Pegu in July and August, a mass of dead leaves and grass placed on a low thick cane-brake in paddy land and containing six very smooth white eggs. . . . Those nests I myself found were invariably situated as above described, on cane-brakes."

Jerdon also says that: "It generally, perhaps, breeds in the drier patches of grass on the ground, often at a considerable distance from water, carefully concealing its nest by intertwining some blades of grass over it."

Lastly, Legge notes in "Birds of Ceylon": "It sometimes builds on the ground among rushes or tussocks, and even in reeds, the nest half floating in water."

In "Game Birds" Hume's notes on the nidification of this species are very full and interesting, containing practically every known situation for the nest. Thus Capt. Butler took the nest from a tussock of grass, growing out of a dried stick fence; Mr. Doig and he took them frequently from creeper-covered tamarisk-jungle growing in water, and the former also found them placed on the tops of clumps of bull-rushes.

Mr. J. Davidson also found the nests on the ground in Mysore, where they were placed in tufts of grass which formed islands in the middle of weedy tanks.

Cripps found that in Dacca, Furreedpur and Sylhet they breed both on trees and on the ground.

Personally I have never seen a nest actually on the ground, but have taken one or two from situations very close to it. In Cachar at

the foot of the hills there is much broken ground often intersected by nullahs which widen out here and there into swamps and bheels. Here the Whistling Teal is in its element and has an enormous variety of sites to choose from. The one I have found most often selected is some clump of trees, generally babool or a stunted species of large-leaved, densely-foliaged tree which grows often actually in the water. When the rains are on, these small clumps form oases in the centre of a watery desert and, when the floods are at their height, shew merely a few feet of their crests above water, on one of which the ducks build their nest; a rough and ready construction of weeds, sun-grass and rushes, rarely lined with a few feathers. Sometimes a good many twigs are used, more especially when the nests are placed in babool trees, where, owing to the support being less compact, the nest itself is bound to be stronger and better put together. The situation next most often chosen as a site for the nest is up one of the arms of these bheels, which seldom, if ever, have deep water in them, but at the same time, from collecting moisture drained off the surrounding hills, are always wet and moist. In these places the canes, reeds and other vegetation grow to a great height, often 12 feet or more, and are so rank and tangled that their tops will bear no inconsiderable weight. When building the nest in one of these tangles the birds place it some two or three feet from the top, the density of which protects it greatly from rain, etc. The nest itself is of the roughest description, a mere thick, coarse pad of grass, reeds and perhaps a few creepers, measuring some 18″ to 24″ in diameter, and with no more depression in the centre than is caused by the birds constantly sitting in them.

Now and then the nest is found on trees close by villages and near some tank or piece of water. When on this kind of tree the nest may be placed either on one of the bigger forks or in a large hollow; and when in the former place, are quite well-built nests of twigs lined with grass and a few feathers. If, on the contrary, they are in the hollows, the nest is scanty and sometimes merely consists of the fragments naturally contained in the hole.

In Rungpur, I found nearly all my nests on trees, though very often they were not built by the birds themselves, but they used old crow's nests sometimes, old kite's nests frequently. I should mention that the crow's nests the birds used were always those

of *C. splendens*, and it seems to me very remarkable that this duck should find room to lay and hatch some six to a dozen eggs in a nest as small as that usually built by *C. macrorhynchus*, as this crow generally makes such a compact neat nest with very little waste room about it. I should imagine the jungle crow in Hume's anecdote given above must have been an extravagant, wasteful bird, or else have taken house-rent from the teal and charged per square yard of room.

Most nests are not placed at any great height from the ground, seldom over twenty feet or so, but I have taken one or two from far greater heights.

As regards the number of eggs laid, there is a good deal of difference in the maximum normal number as estimated by various observers.

Jerdon, Butler, Doig, Davidson, Cripps and I myself consider about 8 to 10 to be the normal number laid, though in Cachar the former number is the largest I remember taking. Oates gives six or seven, whilst Anderson says that ordinarily this bird lays a dozen.

Probably 8 to 10 is the number most often laid, and whilst in some districts, probably to the East, they may average fewer, yet, on the other hand, in some, more to the West, the average clutch may be somewhat larger.

The eggs are like those already described as belonging to *D. fulva*, that is to say, they are very spherical ovals, but little compressed at the smaller end, and in texture are very smooth and fine, but neither very close-grained or glossy, and somewhat chalky on the surface. They are nearly pure white, sometimes inclined to ivory-white, when first laid, but stain quickly and soon lose the faint gloss they sometimes show at first.

Hume in a footnote to "Game Birds" says that the lining membrane of this teal's egg is a delicate salmon-pink, and gives a faint rosy tinge to perfectly fresh unblown eggs. I have never, I am sorry to say, examined this membrane when fresh, and when dry it is of a dead grey-white. I should have said that the tint of eggs in the condition he describes was more of a creamy-yellow than rosy, but the shells are thick and have very little transparency, and as a rule the yolk gives no tint at all to the shell.

All my eggs come within the average given by Oates in Hume's "Nests and Eggs," *viz.*, length from 1·72″ to 2·0″ and breadth from 1·4″

to 1·6″. The average of 80 eggs taken by me is however larger and measures 1·89″×1·52″.

The duck is a very close sitter and will not move from her eggs until very closely approached, indeed she may sometimes be caught by hand. Mr. Brooks thus caught a duck on her nest which was placed at the bottom of a hollow in a dead stump.

The drake keeps much to the tree where the nest is, and spends much of his time alongside his mate on the nearest comfortable perch, but I have never been able to ascertain whether he assists in the incubation.

In different parts of the country they breed from late June up to September. In Eastern Bengal principally in July ; in West Bengal late July and early August ; in Western India later still. Barnes says that in Rajputana they breed in August and September.

In Ceylon it is one of the birds that does not alter its habits of breeding much, and there they lay in June and July.

Genus TADORNA.

This genus consist of two species, one of which has a wide range throughout Europe, Asia and Africa, and the other being confined to Australia, the Moluccas, and Papuan Islands. The male bird possesses a fleshy knob at the base of the upper mandible, which is highly developed during the breeding season.

17. TADORNA CORNUTA.

The Sheldrake.

Tadorna cornuta. Hume, "Str. Feath.," I, p. 260; *id.*, "Str. Feath.," VII, p. 492 ; VIII, p. 115; *id.*, Catalogue, No. 956; Hume and Marshall, "Game Birds," III, p. 136; Barnes, "Birds of Bombay," p. 400; Salvadori, "Cat. of Birds of British Museum," XXVII, p. 171.

Tadorna valpanser. Jerdon, "Birds of India," III, p. 794.

Description : *Adult Male.*—"Head and upper part of the neck dark glossy green ; round the lower neck a broad white collar ; a band of rich chestnut covers the upper part of the back, the space before the bend of the wing and the upper part of the breast ; remainder of the back, rump and upper tail coverts white ; scapulars black except the inner ones, which are white ; a band along the middle of the breast and belly dark brown ; sides and flanks white ; under tail coverts rufous ;

wing coverts white ; primaries very dark brown ; speculum on the secondaries green ; long inner secondaries with rich chestnut outer webs ; tail feathers white, tipped with black ; bill and knob at the base bright red ; irides brown ; legs, toes and their membranes fleshy-pink. Total length 24—26 inches, wing 13″, tail 5·2″, culmen 2·4″, tarsus 2″ " (Salvadori).

" In adults the bills are deep red ; the nail dusky ; the irides brown ; and the legs and feet fleshy-pink to fleshy-red, often more or less creamy on the front of the toes and tarsi."

" Length 23·5″ to 25·25″ ; expanse 41″ to 46″ ; wing 12·5″ to 13·6″; tail from vent 4·75″ to 5·5″ ; tarsus 2·1″ to 2·3″ ; bill from gape 2·2″ to 2·4″ ; weight 2lbs. 6oz. to 2lbs. 14oz." (Hume).

Female.—Differs from the male in being less brightly coloured, having no knob at the base of the bill, and in being smaller.

" Length 20·8″ to 22″ ; expanse 39″ to 42″ ; wing 11·75″ to 12·4″ ; tail from vent 4·2″ to 4·9″ ; tarsus 1·95″ to 2·07″ ; bill from gape 2·1″ to 2·2″ ; weight 2lbs. to 2lbs. 2oz." (Hume).

Young birds at the age when they arrive in India are duller-coloured than the adults, have the bills a dull brick-red, and the feet livid-fleshy.

Young birds of the year in August have the bill flesh-coloured ; the head and neck brown ; chin and front of the neck white ; inter-scapulars brown ; wing coverts white ; inner secondaries white edged with chestnut ; primaries black ; speculum becoming green ; all the under-surface white ; legs flesh-colour" (Yarrell).

Nestlings in down " Are dark brown above and white below, the white on the under parts extending to the forehead, sides of the head and neck, wings, scapulary region, and sides of the rump" (Seebohm).

During the summer the habitat of this bird extends from the British Isles throughout the whole of Northern Europe as far south as Central Germany and the south of the Caspian Sea, in Russia, South Siberia, Turkestan, Northern China and Japan. In the winter it ranges South to Northern Africa, South Asia as far as Northern India, South China, Japan and Formosa.

In India it is confined entirely to the northern portion, and even there it is by no means a common visitant, though it is common in Afghanistan and not rare in Baluchistan. Hume gives its southern limit as the 22nd parallel, and it extends as a rare visitant through

Scind, the Punjab, and the North-West Provinces and Oudh. In Bengal its occurrence is most rare; it has been obtained once or twice near Calcutta, and once again lately in the Calcutta bazaar.* Only recently Kashmir has been added to its habitat, a pair having been twice met with in that locality. This extremely handsome and conspicuous bird, although so little likely to be overlooked and having a wide *possible* range through Northern India, is yet but seldom met with, and is never or hardly ever, seen for any length of time in one locality. This, as Hume explains, is probably due to the fact that their natural habitat is not fresh water but the sea-shore, and the sea-shore where it is clean. Most of our shore is not clean, and very little of it is visited and well-known, so that even the few birds which do haunt it may well escape observation. The rest who make up their minds on India for a winter habitat are compelled to resort to the largest pieces of water they can find which have suitable sandy shores and churs on which they may walk about. They are essentially land and not water ducks, and may be found nine times out of ten strutting about or resting quietly on some sandy bank or shore. When disturbed they do not take to the water and thence to wing but at once rise into the air, uttering their shrill call as they first take the alarm, and once in flight they soon put a long distance between themselves and the cause of their disturbance. They are strong both on the leg and the wing; on the former their actions are decidedly more goose- than duck-like and they walk well, quickly, and in a very erect attitude. When flying, on the other hand, they approach more nearly the ducks, making less commotion with their wings than do the geese. I have never heard their note but it has been variously described, and is as far as I can make out a very similar cry to that of the Brahminy Duck in the breeding season but more shrill and high-pitched at other times. Hume calls it a harsh quack which he says might perhaps be called a whistle.

They dive well and swim well but are loath to take to either expedient, and it is only when severely wounded that they resort to it.

* Mr. Finn writes to me: "As to the occurrence of the sheldrake in the Calcutta bazaar, I have seen or got it several times since I came out here in 1894, and only to-day two dead immature birds were brought me. I have seen at least one more this winter from up-country."

From this it would appear that the sheldrake is not of such rare occurrence as has hitherto been considered to be the case, and that in spite of its conspicuous plumage it must be sometimes overlooked.

As they feed principally in shallow water their diving is not called into action, though they often retain their heads under water for long periods.

Hume on two occasions noticed birds " Washing and sluicing themselves with an energy and persistence that I have rarely seen equalled in any other species." He then also noticed that the birds remained with their head under the water quite as long at a stretch as any of the true ducks would have done.

Their food appears to be mainly animal and to consist of shell-fish, water insects, prawns and shrimps, and practically all or any of the small animal life found on the shores at low tide or in shallow water. A small amount of vegetable matter is doubtless eaten now and then, but merely as one takes vegetables with a meat diet.

Of course they are not good to eat; which of the animal eating ducks are? and Hume says even skinning has no effect. It is certainly not to be expected it would, as flavour, unlike beauty, is more than skin deep.

It does not breed with us, but does not go far for the purpose. It breeds extensively in Turkestan and thence through Russia to our own British coasts where it is common enough. It has been found breeding as far north as Iceland and Greenland, though not extensively in either country. As a rule it selects as a site for its nest some deserted burrow, it matters little to what it belongs or did belong, and places its nest at the bottom. It has been said to live in amity with rabbits and even badgers, and to have taken to burrows extenanted by foxes, the smell alone of which would have made most ducks require sal volatile and the rest.

Where there are no burrows available they will place their nest at the bottom of some natural hole or crevice in the shore or amongst the rocks.

They make a good substantial foundation for their nest of grass, reeds, sticks or any other similar material, and then make a luxuriant bed out of their own down in which their eggs are deposited. In Holland this down and the eggs form articles of no little commercial value, and special arrangements are made to accommodate the birds and induce them to give their patronage to certain spots. The sheldrake is fortunately fond of company when undergoing the worries of a family or the preparation for it. The Dutch therefore

select a suitable spot, for choice a natural breeding place of the duck, and construct neat burrows, slanting at the right angle and wide and deep enough to please the bird, yet not deep enough to balk their own desires. Left to itself the bird would as soon build in a 14-foot as in a 4-foot burrow, but it would be impossible to tackle many of the former and yet make money out of the collecting of the eggs and down, so the artificial burrows are made of about the latter depth. As soon as the eggs are laid the nests are rifled and the down and eggs taken away, whereupon the ducks once more reline their nests, not so well or thoroughly of course as they did their first, and lay a second clutch of eggs which they are allowed to hatch and rear in peace.

Normally they are said to lay from 8 to 16 eggs, but should the first clutch be taken they lay another and in this way the number may reach as much or more than thirty.

Hume says: "The eggs vary a great deal in shape, some are very round, some only moderately broad ovals. In texture the shell is very close and smooth, very like that of the nukhta's egg. In colour they vary from very nearly pure white to a pale cream-colour sometimes, shewing the greenish tinge of the mallard's egg."

"In length they vary from 2·45 to 2·75 and in breadth from 1·75 to 1·95."

"The young are hatched in from twenty-eight to thirty days, and are immediately led to the sea by the old ones."

Morris ("British Birds and their Eggs," III, p. 73) writes: "The eggs are ten or twelve, or even more, it is said thirteen or fourteen or even sixteen in number; but these in such cases may have been the produce of two birds. They are nearly perfectly white, having only a very faint tinge of green, and are smooth and shining. They are equally rounded at both ends."

"The hen bird sits, as is believed, from abouty twenty-six to thirty days, her mate keeping watch hard by and taking her place in the morning and evening while she picks up some food."

"The young, when hatched, are either carried by their parents in their bills to the water, or soon make their way thither themselves. They hide themselves away at the approach of danger, the old birds conscious no doubt that they are able thus best to find security, flying off themselves."

Genus CASARCA.

The genus *Casarca* consists of four species, of which four the widest spread is the well known Indian Brahminy. Of the others *C. cana* is confined to South Africa, *C. variegata* to New Zealand, and *C. tadornoides* to Australia and Tasmania. Of the four also the Indian is the only migratory one, the others being local residents or only locally migratory. The bill differs from that of *Tadorna* in being no broader or narrower at the tip than at the base. The camellæ also are more prominent at the base of the upper mandible, whereas in *Tadorna* they are more developed towards the tip.

Both sexes have a rudimentary spur on the shoulder (carpal joint).

18. CASARCA RUTILA.

The Ruddy Sheldrake or *Brahminy Duck.*

Casarca rutila. Jerdon, "Birds of India," III, p. 791 ; Hume, "Stray Feathers," I, p. 260 ; Adam, *ibid*, p. 401 ; Hume, "Nests and Eggs," p. 641 ; Ball, "Stray Feathers," II, p. 437 ; Hume, *ibid*, III, p. 193 ; Butl., *ibid*, IV, p. 28 ; Scully, *ibid*, p. 198 ; Fairbank, *ibid*, p. 264 ; Butl., *ibid*, V, p. 234 ; Hume and Davis, *ibid*, VI, p. 489 ; Hume, *ibid*, VIII, p. 115 ; Scully, *ibid*, p. 362; Hume and Marshall, "Game Birds of India," III, p. 123 ; Oates, "Stray Feathers," X, p. 245 ; Salvadori, "Cat. of Birds of British Museum," Vol. XXVII, p. 177.

Tadorna casarca. Legge, "Birds of Ceylon," p. 1070, p. 1222, Appendix ; Oates, "Birds of British Burmah," II, p. 277 ; Hume, "Nests and Eggs" (2nd Ed.), III, p. 280.

Description : *Adult Male.*—Whole head and upper part of the neck buff, changing gradually into bright orange-brown at the base of the latter. Scapularies and back, flanks, and whole lower plumage rather bright orange-brown, lower back finely vermiculated black and rufous ; upper tail coverts and tail black. Wing coverts white, quills black, secondaries glossed rich green on the outer webs forming a well defined speculum. Hume says that the speculum may be either bronze or green, but I have personally seen none of the former colour.

Inner secondaries light buff more or less tinged with rufous on the outer web and principally grey on the inner. Axillaries and under wing coverts white.

In the breeding season there is a black collar at the base of the neck usually very indistinct in Indian birds and often absent.

Bill and feet black, irides rich brown.

" Length 24·5″ to 27·0″ ; expanse 48·0″ to 52·5″ ; wing 14·25″ to 15·5″ ; tail from vent 5·4″ to 6·3″ ; tarsus 2·3″ to 2·7″ ; bill from gape 2·2 to 2·4″ ; weight 3 lbs. to 4 lbs. 4 oz." (Hume).

In the cold weather the majority of the drakes have their white wing coverts much suffused with rufous. Hume had specimens practically having their wing coverts and lower plumage concolorous.

Adult Female.—Differs in being smaller, and in having the head paler and "In having (at any rate during the cold season) the whole anterior portion of the head white" (Hume). The black collar is never assumed.

" Length 21·75″ to 24·0″ ; expanse 42·5″ to 47·75″ ; wing 12·36″ to 14·0″ ; tail from vent 5·06″ to 6·0″ ; tarsus 2·12″ to 2·4″ ; bill from gape 2·0″ to 2·3″ ; weight 2 lbs. 1 oz. to 3 lbs. 5 oz." (Hume).

Young of the first season.—Generally like the female but rather duller, the scapulars and upper back vermiculated brown and pale rufous ; the inner secondaries brown more or less vermiculated with reddish-buff, more especially on the inner web ; tail with narrow obsolete bars of rufous and distinctly tipped with the same.

In India many birds are met with in a transition stage between this and the fully adult plumage. I have now a fine young male before me with adult scapulars, but the back shews fine vermiculations of brown, the tail and inner secondaries are those of the young bird, and the whole lower plumage has the feathers very faintly and indistinctly tipped paler.

In this bird the feet are purplish-black, irides bright brown, and bill slatey-black.

" *A nestling* brought from Tso-mourari is mostly white, marked on the upper surface with blackish-brown, and with here and there a fulvous tinge" (Hume).

The Brahminy is not a bird of very Northern latitudes even during the breeding season. In summer it is found in Spain, though in small numbers only, throughout Southern Europe and Northern Africa, and thence through Asia Minor, Turkestan, Afghanistan and extreme Northern India at altitudes over 10,000 feet, through China to the North and Japan. It has been recorded from nearly all North European countries including Great Britain, but nowhere as anything but

rare. In 1892 Messrs. Pearson recorded it from Iceland in the *Ibis* for 1895, p. 247, and the same year it was recorded as having been seen in 1892 even further North than this, *viz.*, in the Upernivik district of Western Greenland by Dr. Van Höffen, who was naturalist to the Drygalshi Expedition of 1892-93.

In winter it resorts to the plains of India, Northern Burma, South China, and Japan and Formosa. In India the only places from which it has not been recorded are such as do not afford sufficient water, and they are practically unknown in the waterless tracts of portions of Scind and Rajputana. From as far south as Ceylon they are noted as not uncommon. Legge in the Appendix to the "Birds of Ceylon" says: "This Sheldrake can no longer be relegated to the doubtful or unprocured species in the Ceylon lists. Mr. G. Simpson of the Indian Telegraph Department has lately sent a portion of the skin of a male, shot by him in the Jaffna district, to Mr. Parker for identification. He likewise furnishes a description of the bird, which has been forwarded to me, and there is no doubt about the matter. The wing of the example in question measures 14·75 inches. Mr. Simpson says they are not uncommon in the cool season in the Jaffna Lake, near Pooneryn, and on the Delft, Palverainkadoo and Mullaittiru lagoons. They are, he finds, very wary, flying high when disturbed and uttering a note like "*conk, conk.*"

To Southern Burma it is a very rare straggler and I can find none but anonymous records of its occurrence there.

Oates observes (in *loc. cit.*): "The Brahminy Duck is a visitor to the province from October to March. It is very abundant in the large rivers of Pegu; but Mr. Davison did not observe it in Tenasserim. It is probably common in Arrakan, whence Mr. Blyth received it."

Like Mr. Inglis I have found the Ruddy Sheldrake a rare bird in Cachar and not common in East Sylhet, where the rivers are too muddy, and are wanting in suitable sandy banks and churs. In South and West Sylhet they are much more common, for there the rivers begin to widen out into fine clear streams.

In Orissa it is not uncommon to find this bird on the salt backwaters and pools, and even on the shore itself. It is very common on the Chilka lake, and I have seen it on the brackish, tidal waters of the Sunderbans.

Except in midwinter they are to be met with in considerable numbers in the lofty valleys of the Himalayan rivers, in Kashmir and at other equally lofty elevations and from thence down to the level of the plains. In Kashmir they appear to be met with more or less throughout the cold season, but, probably, desert the higher valleys of the Himalayas during the coldest period.

Hume says "They arrive in flocks and before leaving in April gather again into these, but during the winter they are almost invariably seen in pairs. Often several pairs may be seen congregated in the same place, but even then each pair comes out distinct on any alarm and acts on its own behoof and without reference to the others."

In Bengal and further south probably few people see them in flocks even when they arrive or when about to depart, as the flocks seem to break up soon after their arrival in Northern India, and the pairs then make their way to their final destination, free from the influence of the birds they started with. In Northern India the first few birds arrive as early as—perhaps even earlier than—the end of September and then work slowly South arriving in Central India and adjoining provinces at least a month later, nor are they common in Bengal until early November. In Southern India they are rare before the end of that month. The latter they leave again in the end of February and early in March, by the middle of that month nearly all have left Lower Bengal, the Central Provinces and Central Bombay, and by the beginning of April they are just thinning in Northern India and most have gone before May sets in. They have been of course recorded throughout that month, and even in Bengal I once saw a pair in the end of April, but these are, I think, but mere examples of the exceptions that prove the rule.

The Brahminy is not an object of sport with Europeans, save for those whose motto is "Kill what, when, and where you can;" this principally because, even when divested of its tough and greasy skin, he is not worth eating unless with an extra dose of the hunger sauce. He is, however, well worth while to shoot, or try to shoot, if you are not an old hand at duck-shooting, for by the time you have learnt to circumvent and bring to bag "Chakwa and Chakwi" you may rest satisfied that you have learnt most of the arts necessary to render stalking ducks and geese a successful pastime. They are, as is almost

universally admitted, the most cute and difficult of approach of all their tribe. Possibly the crow alone exceeds them in their aptness for learning the range of a gun; they will nearly always allow of an approach within two hundred yards, often within one hundred and fifty yards, and this with such a devil-me-care, unconcerned look about them that one would imagine a closer approach to be an act of very little care indeed. Anybody who attempts to work on this presumption will soon find out their error; should the stalk be made with some, yet insufficient, care, the Brahminy will allow you to come some few yards further and then leave for another and better land (or water). On the other hand, should the stalker be so careful as to keep well enough hidden to entirely evade the watchful eye, he is not allowed to approach any nearer at all, but is given the benefit of the doubt, and all he will find of the bird when he arrives will be the impressions of its feet in the sand.

Practice may sometimes be had on the larger rivers where they are plentiful with one of the modern small bore rifles, with which one ought to be able to kill at two hundred yards; very soon, however, they learn to fix the range even of these weapons and new ground will have to be sought for for future shooting. Hume writing of this form of shooting the Brahminy says: "After being at this game a few days and killing five or six, not a Brahminy in the neighbourhood will let you approach within a quarter of a mile, and thenceforth they give you so wide a berth that they interfere very little with fowling."

It is decidedly a bird of clean, clear water predilections, and may generally be found in the larger rivers on the wide sand churs which form each cold weather as the waters sink. They like such as are clean stretches of sand, devoid, or almost devoid, of vegetation, and they keep much to the land though not so exclusively to it as the common Sheldrake. Of course where there are no rivers the Brahminy does not disdain any ordinary lake or large piece of water, but he eschews such as have much jungle about them and have their shores all more or less clothed with the same or with growing crops, unless the latter are very young and short. Small dirty ponds and weedy tanks he will have nothing to say to except when in the direst distress, nor will he willingly frequent small nullahs and rivers with muddy banks. Even where there are fine open pieces of water he will always leave these and resort in

preference to sandy tanks and churs, should such be in the vicinity, though he may visit the former now and then to feed.

The bird has been frequently tamed and becomes very domesticated. Some writers, Hume amongst them, speak well of their character under such circumstances, and say that they are gentle and forbearing to other ducks which may be sharing their captivity. Mr. Finn, however, says that, from what he knows of it "It is by no means the gentle and inoffensive bird in captivity that Hume makes it, but is decidedly ill-conditioned and given to persecuting other water-fowl." Everyone knows the legend about the Brahminy which is supposed by the natives to account for only two birds being generally found together. They are supposed to be inhabited by the souls of lovers who have sinned. Once two lovers who were prevented from marriage by their parents, determined to take the matter into their own hands and risk the displeasure of the gods. Eventually the lady escaped from supervision and went straight to her lover who was awaiting her, but they enjoyed their liberty only for twenty-four hours, for the next night they were changed into Brahminy ducks and were condemned ever to keep on opposite sides of the stream, and though they were allowed to speak to one another and to ask if they might come, the other was forced ever to reply in the negative. Hume ridicules the legend and says he has never met a native who had heard of it; all I can say is that I have repeatedly.

At night, when feeding, the birds will often wander far apart, and may be heard calling to one another in their short dissyllabic notes which are rendered by the natives into "*Chakwi shall I come*," "*No Chakwa*" and then "*Chakwa shall I come*" with the reply "*No Chakwi.*"

The Hindustani words for these questions and answers are not at all unlike their notes which are loud and resonant, far more goose- than duck-like in their character. Elliot, Pallas, Jerdon, etc., syllabalise it as á-oung, others as conk, conk; perhaps a combination of these two into à-onk gives as good an idea of the note as any other accumulation of letters.

They are good swimmers as well as quick and agile divers, but do not seem to be able to keep under water long, nor do they appear to ever attempt to conceal themselves under water. On the wing they are decidedly strong, but are noisy risers though not slow ones. The

movements of its wings are less rapid than the majority of the *Anatidæ* and give one the impression that its progress is far slower than it really is. They are good walkers, and though generally their movements are marked more by their dignity and deliberation than haste, they are capable of very good performances as pedestrians. Their attitudes on land are more those of geese than of ducks.

They are not at all shy birds, nor are they at all wild in the ordinary acceptation of the word. They object to anyone coming within shot, but when outside that distance seem to have nothing to say against being watched and remarked upon. I was introduced to Chakwa and Chakwi in the Santhal Parganas a very short time after I came to India. I was engaged in camping across the district and generally riding ahead of my belongings would arrive at the next camping ground some hours before they came up. One of these grounds was on, or close to, the sandy banks of a river, and of course the interval between arrival and breakfast was filled up by strolling about. Two Brahminy ducks soon attracted my attention, and though I was within about one hundred and fifty yards they took no notice of me but sat on one leg basking in the sun and now and then uttering a single low *conk*, not a note of alarm but one which seemed to me at the time to be of overweening pride and misplaced confidence. Later on I found out where these qualities should have been looked for. I strolled back to camp, the birds still ejecting their cries at me as I went my way. A gun obtained I strolled back and was greeted by the birds with the same ejaculation. Then I prepared to stalk and waiting until the birds were not looking sank out of sight into some stubble ; the Brahminies got up and flew off.

The next pair I came across spotted me just as I had got through the first half of a stalk, and the third must have seen me all the time, getting on the wing when I was still twenty or thirty yards too far to shoot.

Hume gives a most excellent example of their fearlessness under what they consider proper circumstances.

" At Allahabad at the sacred juncture of the Jumna and Ganges I noticed during a great fair, which is held on a spot of sand, at whose apex the rivers meet, two pairs of these ducks, placidly performing their own ablutions just opposite where some 200,000 people, densely packed, were bathing. The hum, the roar, I should say, of the mighty multitude sounded a mile off like the surge of wind and waves in stormy

weather on a rock-bound coast—scores of boats conveying the richer pilgrims to a shallow of special sanctity, a hundred yards below the point, were ceaselessly plying backwards and forwards crowded and crammed with human beings,—hundreds of gaudy flags were fluttering from the topmost points of gigantic bamboos planted near the water's edge,—yet totally regardless of sounds and sights that might have startled the boldest bird, the old Brahminies dawdled about the opposing bank of the Ganges, distant barely five hundred yards from the clamorous struggling rainbow-coloured mass, as though the vagaries were no concern of theirs and signified no more than a convocation of ants."

They are very carnivorous and will take almost anything they can get including fish, flesh, and all kinds of grain, water weeds, seed and growing crops, in which they are sometimes found grazing like geese. There can be little doubt also that they sometimes fall so low as to take to offal.

Their flesh is distinctly bad, on a par with that of the Whistler and the Cotton Teal at their worst, and little better than that of the White Eye or Shoveller.

The Ruddy Sheldrake though an emigrant from the plains of India is yet amongst the few ducks which breed within our limits, as it frequents many of the lofty valleys of the Himalayas for this purpose. It has not been found breeding there below 10,000 feet, and Hume says its nest has been taken as high as 16,000 feet.

In Southern Russia, Asia Minor and Central Asia the normal site chosen by this duck is either the deserted burrow of some animal or a natural crevice or hole in a mountain side or bank, sometimes on level ground. In the Himalayas the Brahminy breeds more or less in company, though the nests may be some distance apart. They are here generally placed in holes or crevices in the high cliffs overhanging streams or lakes, generally close to but at other times some distance from them. The nest-holes are often at very great heights from the ground, and as the nestlings have been seen on the water when very young indeed, it follows of necessity that they are taken there by their parents.

The Ladakhis say that they are carried in the feet, and this I think must be the case, though Hume on the contrary considers it more likely that they are carried on the backs of the old birds. His argument is that the feet are not adapted to grasping, but if a strong adult bird could not grasp, with sufficient strength, to hold up a nestling, how could the

same nestling have sufficient grasping power to maintain its position on the old bird's back during flight.

Occasionally they breed in very remarkable situations. Hume says that they "lay in holes in trees and even fallen logs, and in deserted nests of birds of prey." Tristram found it breeding in a cliff in Northern Galilee amongst Griffon Vultures in May, and in the Eastern Atlas associating with the Raven, the Black Kite and Egyptian Vulture.

"So too in Ladakh its nests have been found associated with one of the Thibetan Raven."

He also quotes Prjevalsky as follows:—"They build in holes and clefts in the ground and sometimes even in the fire-places of the villages deserted by the Moguls, and in the latter places the females, while hatching, get almost black with soot."

Then again Messrs. Elwes and Buckley say that in Dobreedscha the bird sometimes lays its nest in a hole in the centre of a cornfield where naturally it is not easy to find.

The nest itself seems to be much like that of the common Sheldrake, a mass of twigs, &c., lined with down; sometimes however, it is found to consist almost entirely of down and feathers, and altogether it appears to be less bulky and to have fewer materials other than those just mentioned. Strange to say I can find no record anywhere of the depth of hole most often resorted to for nesting purposes, but from what has been written it would seem to matter little to the bird how deep or shallow it was, provided the situation proved convenient.

Within our limits, and probably everywhere else also, the birds commence to lay in May, and nestlings just hatched have been seen and procured well on into July in India, Thibet, Ladakh, and even in Southern Russia.

Different writers give the number of eggs laid as varying between six to ten, but eight appears to be the number most frequently laid.

I have seen no eggs of this species, but eggs sent to Hume from South Russia are described by him as being moderately broad ovals, slightly pointed at one end. The colour is said to be a creamy or ivory-white, and the shells very smooth and comparatively thin.

They varied in size between 2·4″ and 2·7″ and in breadth from 1·7″ to 1·9″, but, as he says, a larger series would probably shew a wider range of difference.

(To be continued.)

West, Newman chromo.

WESTERN HIMALAYAN BUTTERFLIES.

A LIST OF THE BUTTERFLIES OF MUSSOORIE IN THE WESTERN HIMALAYAS AND NEIGHBOURING REGIONS.

By Philip W. Mackinnon, F. E. S., and Lionel de Nicéville, C. M. Z. S., F. E. S., etc.

(*With Plates U, V, and W.*)

[*Concluded from page* 389 *of this Vol.*]

Family PAPILIONIDÆ.

Sub-Family Pierinæ.

215. Leptosia xiphia, Fabricius.

Found in the Dun only commonly almost throughout the year.

216. Delias belladonna, Fabricius. Plate V, Fig. 19, *pupa*.

In the Trans. Ent. Soc. Lond., 1889, p. 344, de Nicéville expressed the opinion: "That it is more than probable that there is only one species of this group, *D. belladonna*, Fabricius, and that to prove it, it is only necessary to bring sufficiently large material together to connect all the described forms." This material exists in Mackinnon's collection, and, as far as our area is concerned, there is obviously only one species, which is exceedingly common on the Nag Tiba range, north of Mussoorie, at about 8,000 feet elevation, from April to July. In Mussoorie it is usually a rare insect, but in May, 1888, May, 1894, and May, 1895, it was very plentiful. In a few minutes specimens of all shades of colour, from very dark, almost black, examples (typical *D. belladonna*), through yellowish-white ones (typical *D. sanaca*, Moore), to the palest form (*D. flavalba*, Marshall) could be caught. It may be noted here that the two last-named forms are strictly confined to the Western Himalayas. Mrs. Robson found the larva feeding on the leaves of *Loranthus longiflorus*, Desr.; Mackinnon found it on *Loranthus vestitus*, Wall., both Natural Order *Loranthaceæ*. Males are far more often captured than females, and may usually be easily distinguished from the females by the bright yellow inner margin of the hindwing on the upperside, which coloration is absent in the opposite sex. The female is duller coloured than the male, and the whole upper surface is suffused or irrorated with yellowish scales.

217. Delias eucharis, Drury.

Recorded from Mussoorie as "*Pieris*" *epicharis*, Godart, by Kollar. It is very common in Dehra Dun from July to February.

218. Catopsilia crocale, Cramer.

Both true *C. crocale* and the dimorphic form, *C. catilla*, Cramer, occur commonly in Mussoorie from July to October, and in Dehra Dun throughout the warmer months of the year.

219. Catopsilia pyranthe, Linnæus.

True *C. pyranthe* is not very common in Mussoorie in the rains, the dry-season form, *C. gnoma*, Fabricius, even less so. In the Dun both forms are common in their respective seasons. The larva feeds in the Dun on *Cassia Tora*, L., Natural Order *Leguminosæ*.

Genus Terias.

Mackinnon's collection contains but few specimens of the genus *Terias*, so when de Nicéville visited Mussoorie and the Dehra Dun in September and October, 1895, that is to say, just at the end of the rainy season and the commencement of the dry season, he set a native collector to work to catch specimens of the genus, and he brought in 111 specimens from Mussoorie and 120 from the Dun. It would have been quite easy to have caught many thousands, as the ground (especially in the Dun) was literally covered with them, a hundred *Terias* would be seen to a single specimen of all the other species of butterflies on the wing at that time. All these specimens were sent to the late Captain E. Y. Watson, who has specially studied the genus in the British Museum and in India, and written two highly interesting papers on them in the Journal of the Bombay Natural History Society, vol. viii, p. 508 (1894), and vol. x, p. 280 (1896). The results of his determinations of these specimens are given below.

220. Terias hecabe, Linnæus.

This is the commonest species of the genus in Mussoorie and the Dun, seventy-two specimens from the former and thirty-eight from the latter having been procured. Both sexes may typically be known by the outer black border on the upperside of the forewing forming a large quadrate patch on the inner margin, with a well-defined outer black border to the hindwing, the markings of the underside are blackish (not ferruginous), and there is no apical ferruginous patch to the forewing. Many of the Mussoorie specimens are very

large, and appertain to the form which has been named *T. hecabeoides* by Ménétriès. All these specimens belong to the rainy-season broods. The dry-season broods are represented by a large number of specimens which bear the name of *T. excavata*, Moore. On the upperside they are very similar to typical *T. hecabe*, except that the marginal band on the upperside of the hindwing is narrower; but differ on the underside in having all the markings ferruginous instead of blackish, with a more or less distinct ferruginous patch at the apex of the forewing. Capt. Watson says that he considers *T. simulata*, Moore, *T. contubernalis*, Moore, *T. patruelis*, Moore, *T. fraterna*, Moore, and *T. kana*, Moore, would apply equally well to this form as *T. excavata*, and he is quite unable to draw a line between them. Some of the specimens might be called *T. merguiana*, Moore, which typically has the inner edge of the black patch at the anal angle of the forewing on the upperside running obliquely outwards to the inner margin, but which is useless as a distinctive character, as the patch varies in shape on the opposite wings of the same insect in some cases. Lastly, we have twelve males and three females from Mussoorie and a pair from Dehra Dun which we have called *T. fimbriata*, Wallace, originally described from "Mussooree"; it apparently representing the extreme dry-season brood of *T. hecabe*. On the upperside of the forewing the black marginal band is usually narrow, its inner edge evenly curved, gradually decreasing from the apex to the inner angle, and with no deep sinus between the median nervules (this sinus is just traceable in some specimens); the marginal black band on the hindwing is reduced to a fine thread or is absent altogether, in which case it is replaced by black dots at the ends of the veins; on the underside the markings are ferruginous, and there is usually an apical ferruginous patch to the forewing. Capt. Watson includes under this form certainly *T. apicalis*, Moore, and also most probably *T. simplex*, Butler, *T. asphodelus*, Butler, *T. narcissus*, Butler, and *T. irregularis*, Moore. In Dr. A. G. Butler's latest revision of the genus *Terias* (Ann. and Mag. of Natural History, seventh series, vol. i, page 69, n. 38 (1898), which has been published since this article was put in type, he gives the India species as *T. suava*, Boisduval, restricting *T. hecabe* to South China from Hong-Kong to Tonkin, including the island of Hainan. Dr. Butler gives *T. kana* full specific rank (l. c., p. 73, n. 42), but he has not seen the type.

Watson says *T. kana* is a synonym of *T. hecabe* after examining the type specimens in the Indian Museum, Calcutta.

221. Terias andersonii, Moore.

A single male example was captured at Mussoorie. This is the most westerly point from which we have obtained this very distinct species. Dr. Butler (l. c., p. 70) says that it is inseparable from *T. excavata*, Moore, which is a dry-season form of *T. suava*, Boisduval, but he has not seen the type specimens of *T. andersonii*.

222. Terias libythea, Fabricius.

This is very common in our area, we obtained five specimens from Mussoorie and twenty-five from the Dun of the dry-season form, typical *T. libythea*, of which *T. rubella*, Wallace, is a synonym, and six from Mussoorie and eleven from the Dun of the wet-season form, *T. drona*, Horsfield, of which *T. senna*, Felder, is a synonym. These Western Himalayan specimens do not appear to call for any special remarks, they are quite normal.

223. Terias venata, Moore.

A single male only obtained at Mussoorie.

224. Terias læta, Boisduval.

Recorded from " Landoor " by Butler. No specimen of the typical rainy-season form, which has the underside deep rusty-red, has been obtained in our area, but we have one specimen from Mussoorie of the drier season form, *T. jœgeri*, Ménétriès, which has the underside flesh-coloured, and one from Mussoorie and three from the Dun of the still drier season form with the underside yellow, which Capt. Watson identifies as *T. vagans*, Wallace. In the Dun it is extremely common in November and December.

225. Colias fieldii, Ménétriès.

Very common in Mussoorie from February to November, especially so in March. The female has been observed ovipositing on *Indigofera Dosua*, Ham., var. *hetherantha*, Wall., Natural Order *Leguminosæ*. The butterfly is found in the Dun in every month except the three coldest.

226. Colias erate, Esper.

Not rare in Mussoorie from March to May. A white dimorphic form of female is also found rarely. It is scarce in the Dun in the early spring.

227. Colias ladakensis, Felder.

Obtained rarely at 17,000 feet only in July on the Nilung Pass.

228. Gonepteryx rhamni, Linnæus.

Very common in Mussoorie from April to November. The larva feeds on *Rhamnus dahuricus*, Pall., Natural Order *Rhamneæ*.

229. Goneptreyx zaneka, Moore.

Rare, occurs in Mussoorie and in the interior from April to August.

230. Aporia soracta, Moore.

Occurs in vast numbers for a very short time in April and May in Mussoorie, and in the interior. The larva feeds on *Berberis Lycium*, Royle, Natural Order *Berberideæ*. It is about 1·15 inches long, of a brown colour, covered with fine and soft hairs. The pupa varies much in colour, some are reddish-brown, others almost white.

231. Aporia nabellica, Boisduval.

Very rare, obtained only at 12,000 or 13,000 feet elevation on the slopes of the hills above the Baspa Valley and on the Borenda Pass in July and August.

232. Aporia phryxe, Boisduval.

This is the palest form of the *Metaporia* group of the genus *Aporia*, and is somewhat rare in Mussoorie, much more so than *A. caphusa*, Moore, but occurs at the same time.

233. Aporia caphusa, Moore. Plate V, Figs. 20*a*, 20*b*, *larva*; 20*c*, *pupa*.

During May and June this butterfly occurs in enormous numbers at Mussoorie (whence it was originally described) on the tops of hills and in shady ravines. The larva feeds on *Berberis nepalensis*, Spreng., Natural Order *Berberideæ*, and resembles that of *A. soracta*, Moore, but is larger. It is dichroic, one form is reddish-brown, the other is green. Fig. 20*b* was drawn from a specimen preserved in glycerine, which had greatly shrunk, it should have been as long and slender as Fig. 20*a*. The pupa, which is very similar in shape to that of *A. soracta*, is greenish-yellow with black markings. The drawing represents it in an unnatural position hanging free from a stick instead of being bound to it closely and longitudinally by a median girth. In May, 1894, Mr. Mackinnon wrote :—"The larvæ of *A. caphusa* are gregarious, and to pupate burrow under the dry leaves at the foot of their food-plant, the pupæ being also

gregarious. The larvæ spin a joint feeble web, and lie together in communities of ten or more. They feed at night only. Colour when full-grown dirty brown, head black, each segment with a dorsal longitudinal dark brown stripe; the larva is thinly covered with weak white hairs. Just before pupation the colour turns to a light green, with the head and stripes as before."

234. Aporia agathon, G. R. Gray.

In de Nicéville's collection is a single quite typical male example of this species taken at Mussoorie in May. It is a noteworthy fact that three such closely-allied species of the genus should all fly together in the station of Mussoorie. It is the darkest coloured of the three.

235. Pieris canidia, Sparrman. Plate V, Fig. 21, *pupa*.

Common both at Mussoorie and in the Dun almost all the year round.

236. Pieris brassicæ, Linnæus.

Very common both in Mussoorie and less so in the Dun in March, but not found in any great numbers later in the year, although an occasional specimen may be seen in almost every month. In gardens in Mussoorie in the spring the larva does great damage to cabbages (*Brassica campestris*, L., var., Natural Order *Cruciferæ*), so much so that boys have to be continually employed in picking them off.

237. Pieris melete, Ménétriès.

Occurs sparingly in Mussoorie in May and June, and a few ragged specimens have been brought in by collectors from the Nila and Bhilung Valleys in July and August.

238. Parapieris callidice, Esper.

Found in our area at high elevations only far in the interior near the snows, in the Nila and Baspa Valleys, and from the Nilung village, all at about 12,000 feet elevation, in the months of July and August.

239. Belenois mesentina, Cramer.

Rare in Mussoorie in May, taken on Nag Tiba at 10,000 feet elevation in November, very common throughout the warmer months and the autumn in Dehra Dun.

240. Huphina nerissa, Fabricius.

More generally known in India as *H. phryne*, Fabricius, and so recorded from "Landoor" by Butler. Rare in Mussoorie; very com-

mon in the Dun almost throughout the year, especially the rains' brood which flies in August and September.

241. Appias lalage, Doubleday.

Very common in Mussoorie and on the adjoining hills in April and May. The sexes here differ but slightly, the dry-season form of the female being alone found. The butterflies seem always to be flying from east to west, this observation having been made at two places more than twenty miles apart.

242. Appias libythea, Fabricius.

In Colonel A. M. Lang's collection is a single female taken at Mussoorie on 17th June, 1868, at 7,000 feet elevation.

243. Nepheronia hippia, Fabricius.

Occurs rarely in the Aglar Valley below Mussoorie in August and September; very common in the Dun from August to December. The female is dimorphic, the commoner form has the basal internervular streaks of the hindwing on the upperside concolorous with the rest of the surface, the rarer form has them yellow.

244. Ixias marianne, Cramer.

Is common in Mussoorie and in the Dun in September and October.

245. Ixias pyrene, Linnæus.

Brought in by collectors from near the Baspa Valley at a considerable elevation in August. The female has no yellow markings whatever on the upperside, being simply black and white, thereby agreeing, except in its smaller size, with typical *I. evippe*, Drury.

246. Teracolus (*Callosune*) etrida, Boisduval.

Very rare in Mussoorie, one specimen each taken in April and May, three in August and September.

Sub-Family Papilioninæ.

247. Troides (*Pompeoptera*) æacus, Felder.

Very common in a valley to the north-east of Mussoorie in Tehri Garhwal in May, flying high up amongst the flowers of the wild horse-chestnut tree, *Æsculus indica*, Colebr., Natural Order *Sapindaceæ*. This is probably the most westerly point of its range, to the east it reaches China and Siam.

248. Papilio (*Menelaides*) aristolochiæ, Fabricius.

Found rarely in the Dun in April and October.

249. Papilio (*Pangerana*) aidoneus, Doubleday.

A single male taken in Mussoorie in April, and a few in Tehri Garhwal in May. This is the first record of the occurrence of this species so far to the west.

250. Papilio (*Byasa*) latreillii, Donovan.

Fairly common in May in the valleys to the north-east of Mussoorie. Rothschild appears to doubt its occurrence in our area, but it does so undoubtedly.

251. Papilio (*Byasa*) ravana, Moore.

Common in Tehri Garhwal in April and May.

252. Papilio machaon sphyrus, Hübner.

Very common all over the hills right up to the frontiers of Thibet, where it meets and merges into the aberration *P. ladakensis*, Moore, and flies from April to November, in the lower and warmer regions, being at least double-brooded; in the cold and higher regions it is single-brooded. The tails of those from the Nilung Valley vary greatly in length; some specimens have hardly any, while others have them very long, as long as in typical *P. machaon*, Linnæus. In Mussoorie the larva feeds on a species of *Heracleum*, Natural Order *Umbelliferæ*. The butterfly is found sparingly in the Dun also, from whence ("Dhoon") it has been recorded as var. *asiaticus*, Ménétriès, by Felder.

253. Papilio (*Orpheides*) demoleus, Linnæus.

Better known as *P. erichthonius* (*erithonius*), Cramer, in India. Occasionally taken in Mussoorie; occurs in the Giri Valley in the Nahan territory in November; and is very common in the Dun from March to November.

254. Papilio (*Charus*) helenus, Linnæus.

A single male specimen taken in the Dun in April. This is the most westerly point from which it has been recorded.

255. Papilio (*Sainia*) protenor, Cramer. Plate W, Fig. 23, *larva*.

Very common in the low valleys about Mussoorie in company with *P. polyctor*, Boisduval, from March to October. Specimens of the spring brood which fly in March and April are very small as compared with those of the rainy season. The larva feeds on *Zanthoxylum alatum*, Roxb., Natural Order *Rutaceæ*, is green with a yellow collar and brown lichen-like markings. Some pupæ are coloured like rough

bark, others are uniformly green. It has been recorded from 'Massuri" by Felder.

256. Papilio (*Panosmiopsis*) boötes, Westwood.

Rare in Tehri Garhwal in May. Mr. de Nicéville has two males only from Tehri Garhwal, both taken in May. One has the tail broad, half as broad again as the other, and the red colour at the base of the hindwing on the underside much restricted, not reaching to the origin of the first median nervule, this being typical *P. janaka*, Moore. The other has the tail longer and narrower, the red colour extending along the abdominal margin nearly as far as the anal red spot—this latter specimen being, therefore, typical *P. boötes*, Westwood. As in all other respects the specimens agree very closely, it appears probable that *P. janaka* and *P. boötes* are really one and the same species, as Mr. Rothschild suggests. He gives Assam as the only habitat for *P. boötes*, and Sikkim only for *P. janaka*.

257. Papilio (*Laertias*) sakontala, Hewitson.

Originally described from Sylhet, and recorded from the Naga Hills by Mr. W. Doherty.* Mr. de Nicéville has seen a specimen from Sikkim in the late Mr. Otto Möller's collection, now in the possession of the Hon. Walter Rothschild. In the collection of the Indian Museum, Calcutta, is a single male from Mussoorie, and in that of de Nicéville another male from Dehra Dun, which is the most remarkable of the three, as it has the usual discal series of white spots on the upperside of the hindwing almost entirely obliterated, they are represented only by an irrorated clump of whitish scales in each interspace where the macular band should be. Mr. de Nicéville has but little doubt that this so-called distinct species is only an atavistic form of *P. polytes*, Linnæus, but it is kept distinct in deference to Mr. Rothschild's opinion as expressed in his paper in "Novitates Zoologicæ," vol. ii, pp. 343, n. 124 (1895), entitled "A Revision of the *Papilios* of the Eastern Hemisphere, exclusive of Africa."

258. Papilio (*Laertias*) polytes, Linnæus.

Very common in the low valleys near Mussoorie from April to October, and in the Dun almost throughout the year. The females are of three forms—I, like the male; II, which mimics *P. aristolochiæ*, Fabricius; III, which mimics *P. hector*, Linnæus, although that

* Proc. Zool. Soc. Lond., 1891, p. 250.

butterfly does not occur in the area treated in this paper. We have a single specimen taken in the Dun in July, which is exactly intermediate between Forms II and III, as it has the yellowish-white markings on the upperside of the forewing as in Form III, and a small patch of white in and beyond the discoidal cell of the hindwing on the upperside as in Form II. In Dehra Dun one of the food-plants of the larva of this species is *Murraya Kœnigii*, Spreng., Natural Order *Rutaceæ*.

259. Papilio (*Cadugoides*) agestor govindra, Moore. Plate V, Figs. 22*a*, 22*b*, *larva* ; 22*c*, 22*d*, *pupa*.

Common in Mussoorie in March, April, and May, and very easy to capture, as it returns repeatedly to the same spot even if temporarily driven off. The female lays her eggs on the young leaves of *Machilus odoratissima*, Nees, Natural Order *Laurineæ*, about the end of April. The larva is at first of a reddish colour, but very soon turns black and white, and lies on the upper surface of a leaf, where it greatly and protectively resembles a bird's dropping. After the last moult it assumes the handsome appearance shewn in the figures. The pupa is found in June, the imago emerging the following spring. Felder records *P. agestor* from "Masuri." Recorded by M. Oberthür from "Chukrata."

260. Papilio (*Chilasa*) clytia, Linnæus.

Not rare in Mussoorie in the spring and summer, and in the Dun from the spring to the autumn. The butterfly is dimorphic in both sexes, the streaked form with pale markings generally known as *P. dissimilis*, Linnæus, and the dark fuscous unstreaked form generally known as *P. panope*, Linnæus, both occurring in Mussoorie and the Dun. The larva, which strongly resembles that of *P. agester govindra*, Moore, feeds in the Dun on *Litsœa sebifera*, Perf., Natural Order *Laurineæ*. The pupæ of both are also very similar, being remarkably like broken-off twigs of dead wood. Felder records a var. of *P. dissimilis*, Linnæus, and *P. panope*, Linnæus, both from "Masuri."

261. Papilio (*Sarbaria*) polyctor, Boisduval. Plate W, Figs. 24*a*, 24*b*, *larva* ; 24*c*, 24*d*, 24*e*, *pupa*.

Very common in the low valleys about Mussoorie from March to October, wherever the food-plant of the larva, *Zanthoxylum alatum*, Roxb., Natural Order *Rutaceæ*, is plentiful. A few specimens are taken every year in the station of Mussoorie at about 6,000 feet

elevation. The small specimens of the spring brood, which have been named *P. peeroza* by Mr. Moore, are of course found in the same spots where the butterflies of the larger rains' broods are found.

262. Papilio (*Achillides*) arcturus, Westwood.

Rare in May in Tehri Garhwal.

263. Papilio (*Pazala*) glycerion caschmirensis, Rothschild.

Plate W, Figs. 25*a*, *larva*; 25*b*, 25*c*, *pupa*.

Very common in Mussoorie at about 5,000 feet in March and April. The larva feeds on *Machilus odoratissima*, Nees, Natural Order *Laurineæ*, and its transformations have been described by Mrs. Robson in Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 497 (1895).

264. Papilio (*Pathysa*) nomius, Esper.

Exceedingly common in the forests of the Dun from March to May. Recorded from "Chukrata" by Oberthür, but probably in error, as it does not extend into the hills, Chakrata being a military cantonment about twenty-five miles north of Mussoorie in the hills.

265. Papilio (*Dalchina*) sarpedon, Linnæus. Plate W, Figs. 26*a*, 26*b*, *pupa*.

Very common at Mussoorie in the spring, summer, and beginning of the rainy season, and in the Dun in March and August. The larva in Mussoorie feeds on the leaves of *Machilus odoratissima*, Nees, Natural Order *Laurineæ*. The larva pupates in June, and the imago emerges the following spring.

266. Papilio (*Dalchina*) cloanthus, Westwood. Plate W, Figs. 27*a*, 27*b*, *larva*; 27*c*, 27*d*, *pupa*.

Common in the spring and summer months in Mussoorie. The larva feeds on the leaves of *Machilus odoratissima*, Nees, Natural Order *Laurineæ*; is bright green with a yellow collar on the fifth segment. The pupa is bright green, with the angles yellow. The larva pupates in June, and the butterfly emerges in the following April. Mrs. Robson has described the transformations of this species in the Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 497 (1895).

267. Parnassius hardwickii, Gray.

Very common in April, and from July to September in the interior to the north of Mussoorie from 10,000 to 12,000 feet elevation; especially so in the valleys near the Nilung and Nila Passes. Recorded from "Masuri" (but in error) by Felder.

268. PARNASSIUS JACQUEMONTII, Boisduval.

Not so common as *P. hardwickii*, Gray, and occurs at higher elevations nearer the snows further in the interior. We have specimens taken in the Nila Valley and Nila Pass, and from the Nilung Pass in July and August, at elevations from 12,000 to 15,000 feet. We have followed M. Charles Oberthür in "Etudes d'Entomologie," vol. xiv, p. 9 (1891), in identifying our specimens, our males agreeing with the figure of the typical specimen of *P. jacquemontii* in M. Oberthür's collection as given by the latter on plate ii, fig. 11, of the above-cited work. Our females have the pouch keeled as described by Boisduval.

269. PARNASSIUS CHARLTONIUS, Gray.

Rare, flies in July and August at great elevations, above 14,000 feet, on the inner ranges of the hills north of Mussoorie just below the snows.

Family HESPERIIDÆ.

270. ACHALARUS CASYAPA, Moore.

Common in Mussoorie, from whence it was originally described, from April to September. Messrs. Elwes and Edwards in their recent monograph * of the Oriental *Hesperiidæ* place (p. 109) *A. casyapa* as a synonym of *A. liliana*, Atkinson, but the Western Himalayan species can at once be distinguished from the Assamese species by its paler coloration.

271. CELÆNORRHINUS DHANADA, Moore.

Rare in Mussoorie from April to June, and in August and September.

272. CELÆNORRHINUS LEUCOCERA, Kollar.

Very common in Mussoorie from April to September. The larva feeds on *Strobilanthes angustifrons*, Clarke, Natural Order *Acanthaceæ*. The "*Plesioneura*" *sumitra*, Moore, is probably a synonym of this species, but is kept distinct by Watson. Colonel Lang's specimens of this species are so named.

273. CELÆNORRHINUS MUNDA, Moore.

Flies in Mussoorie from April to September. Capt. E. Y. Watson in Proc. Zool. Soc. Lond., 1893, p. 49, places this species as a synonym of *C. leucocera*, Kollar, but it is really quite distinct, the prominent white-checkered cilia of the hindwing and the shaft of the

* Trans. Zool. Soc. Lond., vol. xiv, p. 101 (1897).

antenna of the male above being black instead of white, will distinguish between the two species at a glance. Capt. Watson informs me that the positions of *C. putra*, Moore, and *C. munda*, Moore, should be reversed in his first hesperid paper cited above ; the latter being a good species, the former a synonym of *C. leucocera*, Kollar. Messrs. Elwes and Edwards give *C. munda* as a synonym of *C. leucocera* (p. 116).

274. Celænorrhinus pulomaya, Moore.

Common in August in the Upper Ganges Valley at about 8,000 feet elevation.

275. Celænorrhinus pero, de Nicéville.

C. pero, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. iv, p. 183, n. 20, pl. B, fig. 1, *male* (1889).

Not rare, but seldom seen, as it flies at Mussoorie in August only, very early in the morning and late in the afternoon and evening (up to 8 P.M.). It especially frequents the flowers of the wild balsams. The male has the apex of the forewing whitish on the upperside, in the female it is concolorous with the rest of the wing.

276. Sarangesa purendra, Moore.

Found in Dehra Dun only, commonly from March to June and again in December.

277. Sarangesa dasahara, Moore.

Rare in Mussoorie in August and September, and in the Dun in June and September.

278. Coladenia fatih, Kollar.

Common in Mussoorie from April to September, and in the Dun in August and September. The larva in Mussoorie feeds on the leaves of *Achyranthes aspera*, Willd., Natural Order *Amarantaceæ*, and is pale smoky-white in colour with a black head. Messrs. Elwes and Edwards place this species as a synonym of *C. dan*, Fabricius (p. 127).

279. Coladenia indrani, Moore.

Flies in Mussoorie in April, June, August and September, and in the Dun in June and August.

280. Satarupa dohertyi, Watson.

Rather common at Mussoorie at 5,000 feet elevation in May and June.

281. Darpa hanria, Moore.

Two specimens only obtained at Mussoorie at about 5,000 feet elevation in May.

282. Tagiades atticus, Fabricius.

Very common in Mussoorie from April to August, the larva feeding on the leaves of a wild species of yam (*Dioscorea* sp., Natural Order *Dioscoreaceæ*). Found in the Dun in September. Messrs. Elwes and Edwards give (p. 142) *T. menaka*, Moore, from the Western Himalaya, and say that it may be known from *T. atticus* by the presence of a dark spot near the apical third of the submedian interspace of the hindwing. This spot is sometimes so minute as to be only traceable with a magnifying glass; it is often large and often absent altogether. By its presence or absence the two species cannot be differentiated, so it is by the clasping organs of the male alone that they can be distinguished.

283. Odontoptilum angulata, Felder.

Common in Mussoorie in April, and from July to September, and in the Dun in July and August.

284. Caprona syrichthus, Felder.

One specimen obtained in August in the Aglar Valley below Mussoorie, and one in July in Dehra Dun.

285. Caprona ransonnetii, Felder.

A single specimen obtained in the Dun in June.

286. Caprona taylorii, de Nicéville.

Rare in the Aglar Valley near Mussoorie in August, and in the Dun in March. This species is not improbably a dimorphic or seasonal form of *C. ransonnetii*, Felder.

287. Hesperia galba, Fabricius.

Rather rare in Mussoorie and on Nag Tiba from May to August, occurs in the Giri Valley in November, and in the Dun commonly from March to May, and again in October and November.

288. Suastus gremius, Fabricius.

Common in the Dun from June to October.

289. Suastus robsonii, de Nicéville.

S. robsonii, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 372, n. 38, pl. Q, fig. 50, *male* (1895).

One specimen from Mussoorie in July, one from the Dun in June.

299. Taractrocera mævius, Fabricius.

Found in the Aglar Valley and on Nag Tiba, both near Mussoorie, in May and June; also in Dehra Dun.

291. AEROMACHUS STIGMATA, Moore.

Very common in Mussoorie, from whence it was originally described, in May, June and August.

292. PEDESTES MASURIENSIS, Moore.

Not common in Mussoorie in June and July, from whence it was originally described as its name shows.

293. HYAROTIS ADRASTUS, Cramer.

Rare in the Eastern Dun in April and June.

294. MATAPA ARIA, Moore.

A single specimen taken in the Dun in May.

295. ERIONOTA THRAX, Linnæus.

Very common in the Dun. There are two broods—one in April, the other in August and September. The larva feeds on cultivated plantains, *Musa sapientum*, L., Natural Order *Musaceæ*, and a single larva will devour all the leaf on one side up to the mid-rib, the leaf being seven or eight feet long, and the portion eaten half a foot wide, which seems out of all proportion to its size. The head of the larva is much smaller than the body, and is black ; the body is covered with a white powdery wavy substance, as also is the pupa, which is placed in a portion of a rolled-up leaf.

296. NOTOCRYPTA FEISTHAMELII, Boisduval. Plate W, Fig. 28, *larva*.

Common in Mussoorie from April to September. The larva feeds on a species of wild ginger, *Hedychium spicatum*, Ham., Natural Order *Scitamineæ*.

297. NOTOCRYPTA RESTRICTA, Moore.

Found commonly in the Aglar Valley below Mussoorie in May. Given by Messrs. Elwes and Edwards as a synonym of the last species.

298. UDASPES FOLUS, Cramer.

Common in Mussoorie from May to September, occurs in the Dun in March and April. The female has been observed ovipositing on a broad-leaf species of grass, Natural Order *Gramineæ*.

299. ACTINOR RADIANS, Moore.

Four specimens in all taken in the Dun in April in 1895 and 1897, two on each occasion.

300. AUGIADES BRAHMA, Moore.

Originally described from "Masuri," 7,000 feet, where it is common in the ravines in May and June.

301. Telicota bambusæ, Moore.

Rather rare in Mussoorie in April and May, and in the Dun in April, September and October.

302. Telicota (*Padraona*) dara, Kollar.

Rare in Mussoorie from May to July, and in the Dun in April and September.

303. Telicota (*Padraona*) mæsoides, Butler.

There appears to be a second species of this genus found in the Aglar Valley below Mussoorie in May, August and September, and in the Dun in August and September, which we doubtfully identify under this name, although Messrs. Elwes and Edwards (p. 254) consider it to be a synonym of the last species.

304. Halpe gupta, de Nicéville.

A few male specimens brought in by the collectors in May from North-East Tehri Garhwal.

305. Halpe aina, de Nicéville.

Common in North-East Tehri Garhwal in May and June.

306. Halpe moorei, Watson.

Not common in the Dun in May.

307. Baoris (*Parnara*) plebeia, de Nicéville.

A single female obtained in the Dun in April.

308. Baoris (*Parnara*) conjuncta, Herrich-Schäffer.

One male taken in the Dun in April.

309. Baoris (*Parnara*) assamensis, Wood-Mason and de Nicéville.

Rather rare in Mussoorie in May, June, August, and September; very common in the Giri Valley in November, and in the Dun.

310. Baoris (*Parnara*) eltola, Hewitson.

Not rare in Mussoorie from April to June, and in August and September, and in the Dun in September. The larva, which is pale green in colour, feeds in Mussoorie on the leaves of the hill bamboo, *Arundinaria falcata*, Nees, Natural Order *Gramineæ*.

311. Baoris (*Parnara*) bevani, Moore.

Common both in Mussoorie and the Dun from May to September.

312. Baoris (*Parnara*) guttatus, Bremer and Grey.

Very common in Mussoorie from July to September, and in the Dun in September.

313. Baoris (*Chapra*) sinensis, Mabille.

Two specimens obtained in the Aglar Valley below Mussoorie at about 3,000 feet elevation in August and September. Mr. Moore described it from the Tonse Valley, 6,000 feet, Garhwal, as *Chapra prominens*.

314. Baoris (*Chapra*) mathias, Fabricius.

Very common in Mussoorie in the summer, rains, and autumn, and in the Dun from March to November.

315. Gegenes karsana, Moore.

A single specimen obtained in Mussoorie in September, and another in the Dun in August. Messrs. Elwes and Edwards place this species (p. 286) as a synonym of *G. nostrodamus*, Fabricius.

316. Erynnis dimila, Moore.

E. dimila, de Nicéville, Journ. A. S. B., vol. lxiii, pt. 2, p. 52, n. 43, pl. i, fig. 7-*male* (1894).

Somewhat rare in the Upper Ganges Valley near the Nilung Pass at 16,000 feet elevation in July and August. M. Charles Oberthür places this species as a synonym of "*Hesperia*" *comma*, Linnæus, in "Etudes d'Entomologie," vol. xx, p. 39 (1896), a common European butterfly. Messrs. Elwes and Edwards give it (p. 287) as a "var." of *E. comma*, under a separate heading.

317. Ismene ataphus, Watson. Plate W, Figs. 29*a*, 29*b*, *larva*; 29*c*, *front view of face of larva*; 29*d*, 29*e*, *pupa*; 29*f*, *front view of head of pupa*.

Occurs in February, August and October commonly in the Dun. The larva feeds on *Hiptage madablota*, Gærtn., Natural Order *Malpighiaceæ*, and is about 1·2 inches long. Head-case black, the sides dull vermilion-red, the red colour produced into three rounded spots on each side joined to the red edging towards the middle of the face; the body with a broad dorsal black stripe, which is divided equally into three portions by two very fine pale blue lines; each segment bears laterally a large oval black spot, and posterior to this are two fine narrow black lines; these three black markings are crowned with rich chrome-yellow; the second, third and fourth segments each bears just above the legs an additional small rounded black spot; the underside of the larva is pale greenish-white; the anal segment above bears two dull vermilion-red spots. Pupa reddish-brown spotted with black, covered with a white powder, which powder in figures 29*d* and 29*f* has

been rubbed off; there is a small rounded projecting knob in the middle line of the face.

318. Ismene jaina, Moore.

Occurs rarely from February to August in the low valleys about Mussoorie and in the Dun.

319. Ismene anadi, de Nicéville.

A single specimen only obtained in Mussoorie, at 7,000 feet elevation, on 27th May, 1868, by Colonel A. M. Lang, R.E.

320. Ismene (*Parata*) chromus, Cramer.

A single male taken in the Dun in August.

321. Bibasis sena, Moore.

Common in Mussoorie and the neighbouring valleys in April, May, August and September, and in the Dun in February, May and October.

322. Badamia exclamationis, Fabricius.

Occurs sparingly in Mussoorie, but is common in the Dun in August and September.

323. Rhopalocampta benjaminii, Guérin. Plate W, Figs. 30*a*, 30*b*, *larva*; 30*c*, *pupa*.

Common at Mussoorie and in the Dun from March to September. In Mussoorie the larva feeds on *Meliosma pungens*, Wall., and *Sabia campanulata*, Wall., both Natural Order *Sabiaceæ*. Two types of larva have been bred and are here figured. Further observations are necessary to determine conclusively whether these very differently-marked (the colours in both are the same) larvæ really produce the same species of butterfly, and if they do, if the coloration is sexual.

NAMES OF PLANTS MENTIONED IN MACKINNON AND DE NICEVILLE'S LIST OF THE BUTTERFLIES OF MUSSOORIE AND NEIGHBOURING REGIONS.

BUTTERFLY.	NAME OF PLANT.	NATURAL ORDER.
D. limniace.	Marsdenia tenacissima, Wight and Arn.	Asclepiadeæ.
„ *septentrionis.*	Vallaris dichotoma, Wall.	„
„ *chrysippus.*		„
„ *plexippus.*	Cynanchum Dalhousiæ, Wight.	„
„ *sita.*	Marsdenia Roylei, Wight.	„
E. core.	Ficus glomerata, Roxb.	Urticaceæ.

L. isana.	ARUNDINARIA FALCATA, Nees.	GRAMINEÆ.
„ *vaivarta.*	„ „ „	„
P. yama.	„ „ „	„
A. swaha.		„
C. nirmala.		„
P. vesta.	DEBREGEASIA BICOLOR, Wedd.	URTICACEÆ.
E. merione.	RICINUS COMMUNIS, L.	EUPHORBIACEÆ.
S. dichroa.	QUERCUS INCANA, Roxb.	CUPULIFERÆ.
A. ambica.	ULMUS WALLICHIANA, Planch.	URTICACEÆ.
H. persimilis.	CELTIS AUSTRALIS, L.	„
N. yerburii.	„ „	„
P. wedah.	DEBREGEASIA BICOLOR, Wedd.	„
A. opalina.	BERBERIS NEPALENSIS, Spreng.	BERBERIDEÆ.
„ „	„ ARISTATA, DC.	„
„ „	„ LYCIUM, Royle.	„
E. patala.	QUERCUS INCANA, Roxb.	CUPULIFERÆ.
P. cardui.	DEBREGEASIA BICOLOR, Wedd.	URTICACEÆ.
„ *indica.*		„
V. caschmirensis.		„
„ *xanthomelas.*	CELTIS AUSTRALIS, L.	„
S. hippoclus.	DEBREGEASIA BICOLOR, Wedd.	„
C. thyodamas.	FICUS NEMORALIS, Wall.	„
„ „	„ GLOMERATA, Roxb.	„
„ *athamas.*	ALBIZZIA JULIBRISSIN, Durazz.	LEGUMINOSÆ.
„ „	ACACIA CATECHU, Willd.	„
I. lepita.	CELTIS AUSTRALIS, L.	URTICACEÆ.
D. ouida.		GRAMINEÆ.
„ *eugenes.*		„
C. cœlestina.	PRINSEPIA UTILIS, Royle.	ROSACEÆ.
I. timoleon.	PUNICA GRANATUM, L.	LYTHRACEÆ.
S. querectorum.	ACACIA sp.	LEGUMINOSÆ.
A. rama.	QUERCUS INCANA, Roxb.	CUPULIFERÆ.
„ *dodonæa.*	„ „ „	„
„ *ganesa.*	„ „ „	„
Z. birupa.	RHODODENDRON ARBOREUM, Sm.	ERICACEÆ.
C. odata.	JUGLANS REGIA, L.	JUGLANDEÆ.
„ *phlœas.*	RUMEX NEPALENSIS, Spreng.	POLYGONACEÆ.
I. sena.	„ HASTATUS, Don.	„
O. deva.	LORANTHUS LONGIFLORUS, Desr.	LORANTHACEÆ.
T. diœus.	„ BICOLOR, L.	„
C. kina.	RHYNCHOSTYLIS RETUSA, Blume.	ORCHIDEÆ.
H. onyx.	CORIARIA NEPALENSIS, Wall.	CORIARIEÆ.
„ *viola.*	„ „ „	„
D. epijarbas.	ÆSCULUS INDICA, Colebr.	SAPINDACEÆ.
„ „	PUNICA GRANATUM, L.	LYTHRACEÆ.
H. selira.	INDIGOFERA ATROPURPUREA, Hamilt.	LEGUMINOSÆ.

R. schistacea.	SPIRÆA SORBIFOLIA, L.	ROSACEÆ.
„ *nissa.*	ASTILBE RIVULARIS, Ham.	SAXIFRAGACEÆ.
V. isocrates.	PUNICA GRANATUM, L.	LYTHRACEÆ.
„ *perse.*	RANDIA DUMETORUM, Lamk.	RUBIACEÆ.
D. belladonna.	LORANTHUS VESTITUS, Wall.	LORANTHACEÆ.
„ „	„ LONGIFLORUS, Desr.	„
C. pyranthe.	CASSIA TORA, L.	LEGUMINOSÆ.
„ *fieldii.*	INDIGOFERA DOSUA, Ham., var. HETHERANTHA, Wall.	„
G. rhamni.	RHAMNUS DAHURICUS, Pall.	RHAMNEÆ.
A. soracta.	BERBERIS LYCIUM, Royle.	BERBERIDEÆ.
„ *caphusa.*	„ NEPALENSIS, Spreng.	„
P. brassicæ.	BRASSICA CAMPESTRIS, L. var.	CRUCIFERÆ.
„ *machaon.*	HERACLEUM sp.	UMBELLIFERÆ.
„ *protenor.*	ZANTHOXYLUM ALATUM, Roxb.	RUTACEÆ.
„ *polytes.*	MURRAYA KŒNIGII, Spreng.	„
„ *govindra.*	MACHILUS ODORATISSIMA, Nees.	LAURINEÆ.
„ *clytia.*	LITSÆA SEBIFERA, Perf.	„
„ *polyctor.*	ZANTHOXYLUM ALATUM, Roxb.	RUTACEÆ.
„ *glycerion.*	MACHILUS ODORATISSIMA, Nees.	LAURINEÆ.
„ *sarpedon.*	„ „ „	„
„ *cloanthus.*	„ „ „	„
C. leucocera.	STROBILANTHES ANGUSTIFRONS, Clarke.	ACANTHACEÆ.
„ *fatih.*	ACHYRANTHES ASPERA, Willd.	AMARANTACEÆ.
T. atticus.	DIOSCOREA sp.	DIOSCOREACEÆ.
E. thrax.	MUSA SAPIENTUM, L.	MUSACEÆ.
N. feisthamelii.	HEDYCHIUM SPICATUM, Ham.	SCITAMINEÆ.
U. folus.		GRAMINEÆ.
B. eltola.	ARUNDINARIA FALCATA, Nees.	„
I. ataphus.	HIPTAGE MADABLOTA, Gærtn.	MALPIGHIACEÆ.
R. benjaminii.	MELIOSMA PUNGENS, Wall.	SABIACEÆ.
„ „	SABIA CAMPANULATA, Wall.	„

EXPLANATION OF THE PLATES.

PLATE U.

Figs. 1*a*, 1*b*, *larva* ; 1*c*, 1*d*, *pupa*, *Danais* (*Caduga*) *sita*, Kollar, p. 213.

„ 2*a*, *larva* ; 2*b*, 2*c*, *pupa*, *Lethe isana*, Kollar, p. 215.

„ 3*a*, 3*b*, *larva* ; 3*c*, *front view of head of larva* ; 3*d*, 3*e*, *pupa*, *Lethe* (*Sinchula*) *vaivarta*, Doherty, p. 215.

„ 4*a*, *larva* ; 4*b*, *pupa*, *Patala yama*, Moore, p. 216.

„ 5*a*, 5*b*, *larva* ; 5*c*, *front view of head of larva* ; 5*d*, 5*e*, *pupa*, *Callerebia nirmala*, Moore, p. 220.

Figs. 6, *pupa*, *Sephisa dichroa*, Kollar, p. 369.
„ 7*a*, 7*b*, *larva* ; 7*c*, *front view of head of larva*, *Apatura ambica*, Kollar, p. 369.
„ 8*a*, 8*b*, *pupa*, *Hestina* (*Parhestina*) *persimilis*, Westwood, p. 369.
„ 9*a*, *larva* ; 9*b*, *front view of head of larva* ; 9*c*, 9*d*, 9*e*, 9*f*, *pupa*, *Pseudergolis wedah*, Kollar, p. 371.
„ 10, *pupa*, *Euthalia* (*Dophla*) *patala*, Kollar, p. 374.
„ 11*a*, 11*b*, *larva* ; 11*c*, 11*d*, *pupa*, *Cyrestis thyodamas*, Boisduval, p. 376.

Plate V.

Figs. 12*a*, 12*b*, *larva* ; 12*c*, 12*d*, *pupa*, *Dodona eugenes*, Bates, p. 378.
„ 13*a*, 13*b*, *larva* ; 13*c*, 13*d*, *pupa*, *Cyaniris cœlestina*, Kollar, p. 379.
„ 14*a*, 14*b*, *larva* ; 14*c*, 14*d*, *pupa*, *Arrhopala rama*, Kollar, p. 382.
„ 15*a*, 15*b*, *larva* ; 15*c*, *pupa*, *Zephyrus birupa*, Moore, p. 384.
„ 16*a*, 16*b*, *larva* ; 16*c*, 16*d*, *pupa*, *Camena deva*, Moore, p. 385.
„ 17*a*, 17*b*, *pupa*, *Chliaria kina*, Hewitson, p. 387.
„ 18*a*, 18*b*, *larva*, *Horaga onyx*, Moore, p. 387.
„ 19, *pupa*, *Delias belladonna*, Fabricius, p. 585.
„ 20*a*, 20*b*, *larva* ; 20*c*, *pupa*, *Aporia caphusa*, Moore, p. 589.
„ 21, *pupa*, *Pieris canidia*, Sparrman, p. 590.
„ 22*a*, 22*b*, *larva* ; 22*c*, 22*d*, *pupa*, *Papilio* (*Cadugoides*) *agestor govindra*, Moore, p. 594.

Plate W.

Figs. 23, *larva*, *Papilio* (*Sainia*) *protenor*, Cramer, p. 592.
„ 24*a*, 24*b*, *larva* ; 24*c*, 24*d*, 24*e*, *pupa*, *Papilio* (*Sarbaria*) *polyctor*, Boisduval, p. 594.
„ 25*a*, *larva* ; 25*b*, 25*c*, *pupa*, *Papilio* (*Pazala*) *glycerion caschmirensis*, Rothschild, p. 595.
„ 26*a*, 26*b*, *pupa*, *Papilio* (*Dalchina*) *sarpedon*, Linnæus, p. 595.
„ 27*a*, 27*b*, *larva* ; 27*c*, 27*d*, *pupa*, *Papilio* (*Dalchina*) *cloanthus*, Westwood, p. 595.
„ 28, *larva*, *Notocrypta feisthamelii*, Boisduval, p. 599.
„ 29*a*, 29*b*, *larva* ; 29*c*, *front view of face of larva* ; 29*d*, 29*e*, *pupa* ; 29*f*, *front view of head of pupa*, *Ismene ataphus*, Watson, p. 601.
„ 30*a*, 30*b*, *larva* ; 30*c*, *pupa*, *Rhopalocampta benjaminii*, Guérin, p. 602.

THE POISONOUS PLANTS OF BOMBAY.

By Surgeon-Lieut.-Colonel K. R. Kirtikar, I.M.S., F.L.S.
On special duty (Plague), Bombay Municipality.

Part XVIII.

(*With Plate T.*)

(*Continued from page* 261 *of this Vol.*)

CALOTROPIS GIGANTEA (*Br.*).

Natural Order—Asclepiadeæ.

MARATHI—रुई. (*Ruí*).

A shrubby plant common in dry waste places, loose rocky soil, sandy ground, and old walls and hedges, throughout the Bombay Presidency. It avoids heavy clayey soil where its roots cannot easily penetrate. Milky throughout; glaucous or ash-coloured.

ROOT.—This is the most important part of the plant medicinally; often dividing and subdividing as far forward as its branches can penetrate; twisting slightly on itself before branching. The root-bark is pale or buff-coloured when fresh, $\frac{1}{8}$ to $\frac{1}{4}$ inch thick. Root-substance corky, soft, longitudinally wrinkled; taste bitter; milky juice acrid.

STEM.—Generally stout; when erect, 5-6 feet high, and 12-18 inches in girth; sometimes slightly reflexed; full of pith.

Branches.—Often starting from the very base of the stem; thick, herbaceous all through; woolly, and covered over with a white mealy powder. This is well seen when the branches are young and fresh; it disappears as the plant grows old, or if it is roughly handled. As the branches grow old, the pith disappears. The branches are then hollow.

Bark.—The *Cortex* or *outer bark* is tomentose; light or pale buff-coloured; slightly corky and wrinkled longitudinally. The *Liber* or *inner bark* is green, and is mainly made up of strong, long, pale, silky, fine fibres of much commercial value. The Wood is soft, porous, light, cream-coloured or yellowish. Milky juice abundant.

LEAVES.—Exstipulate; opposite, rigid, often decussate; tomentose above, cottony beneath; the tomentum on the upper surface disappears on rough handling and from dried specimens. Hence it is that Hooker

R. J. Budhavarkar del. Mintern Bros Chromo lith. London.

THE POISONOUS PLANTS OF BOMBAY.

Calotropis gigantea. Br. Nat. Ord. Asclepiadeæ.

½ Nat. Size.

says the leaves are smooth above. Hooker also says the leaves are sessile, but the general character is best described by calling it subsessile, though at times the petiole is absent. Margin of the leaf quite entire. Generally 4″ to 8″ long, 1″ to even 6″ broad; cuneate, obovate. Base retuse, sub-cordate or even cordate; at times assuming what Prof. Bentley calls *panduriform* or fiddle-shape as in Fiddle-dock (*Rumex pulcher*).

Axils.—Bearded. This is corroborated by Wight in other words when he says: that "The leaves are often furnished at their insertion with glands or hairs in lieu of stipules."

Petiole.—Often very short, rigid, channelled on the ventral aspect, and bearing a beard of numerous, short, stiff-pointed brownish hairs where it merges into the midrib. Veins white and prominent on the dorsal aspect; alternate; sometimes in pairs, reflex at the margin. Venules transverse, thin. The midrib becomes gradually thinner and thinner on the under-surface, ultimately not more than a line thick as it reaches the apex, though at the petiole it may be as thick as a goose-quill.

Internodes.—Wide, often 3-4 inches long, and at times even longer where the stem grows quickly in suitable soil.

INFLORESCENCE.—Extra-axillary in subumbelliform or subracemose cymes. The umbels are cottony, says Hooker.

Peduncle.—Alternate with the succeeding peduncle; rigid, solitary, many-flowered; with a white tomentum.

Pedicels.—Subumbellate, longer than the flowers; pink, round.

Bracts.—Oblong (Hooker). Hamilton says there are scarcely any.

FLOWERS.—Regular, pentamerous, hermaphrodite; tomentose; sometimes pure white, sometimes pinkish-purplish, the colour deepening as the flower matures, and even for some time after the flower has fully opened.

Disc.—Absent.

CALYX.—Very small, inferior, persistent; sepals five, hardly more than two lines in length, and one line in breadth, glandular at base ventrally; ovate, concave, acute; adhering to the base of the corolla.

Æstivation of the calyx quincuncial; that of the corolla valvate.

COROLLA.—Monopetalous, broadly campanulate. Petals 5, broad, smooth, spreading; ½-2 inches in diameter, ovate-lanceolate, acute, revolute and twisted in age.

ANDRŒCIUM :—

STAMENS.—Five ; adherent to the base of the corolla ; alternate with the petals ; with interposed linear glands, which when mature have brown stiff points.

FILAMENTS.—Connate, forming a very short fleshy tube or column round the Gynœcium. This structure is called the *Stylostegium* or *Gynostegium*. This column bears on its dorsal aspect a series of five processes corresponding to the five filaments which is known as the *Staminal Corona*. This "Corona" is adnate to the anthers. Dr. Francis Hamilton thus describes this complex and quaint-looking structure, in his Commentary on Rheede's "Hortus Malabaricus" (Part II, page 246, Transactions Linn. Soc., Vol. 14, 1825):—"Regular ; formed of five compressed '*corpuseles*' which are attached longitudinally to the furrow on the dorsum of each of the filaments ; which lie upon the anthers with an incurved tridentate apex ; and which encircle the reproductive organs with an obtuse, spirally revolute base." I may repeat here Hooker's observations that "The coronal processes of the stamens radiate from the staminal column," and that "The coronal scales are truncate and hairy."

ANTHERS.—Bilocular, erect, introrse ; crowning the staminal column ; connate ; adnate by the connective to the sides of the stigma ; tip often produced into an inflexed membrane (Hooker).

POLLEN.—Instead of being powdery is formed into ten *pollen-masses* technically called *Pollinia*. These ten *pollen-masses* consist of hundreds of pollen-cells (Kerner Von Marilaun). These pollen-masses are pendulous, lying in pairs outside the stigma in the form of yellow, flat, transparent, leaf-like bodies. Some describe them as pear-shaped ; others as spatulate ; DeCandolle says they are of the shape of a plough-share. These differences in description are due to the structural developments of the pollen-masses, as examined by the respective observers. The figure in my plate of an enlarged pollen-mass, as seen under the microscope, and marked No. 3, is not materially different from the description of any of the observers. Some more observations will be made further on, on this very interesting structure, known as the pollen-masses, in my general remarks. Kerner Von Marilaun says the *pollinia* are in the form of shining, horny leaflets, and that they are attached to a clip-like body by ligulate strands.

GYNŒCIUM :—

Ovary.—Of two distinct carpels, superior, and enclosed within the "Staminal column."

Ovules.—Numerous, anatropous, pendulous, multiseriate. Placentas on ventral suture; nerviform (Decaisne and Lemaout). Micropyle apical.

Styles.—Two, short; subulate (*i. e.*, shaped like a cobbler's awl); closely adherent to each other in the stigma, but quite free below.

Stigma.—Common to both the styles; dilated; depressed (Hooker); sulcated down the middle (Wight); five-lobed, forming an acute-angled pentagon; *the bases of the angles alternate with the anthers*; the angle itself each bearing a gland-like corpusele terminating below in two processes which, about the time of the expansion of the flower, become firmly attached to the apices of the corresponding pollen-masses (Wight). Thus "Included between the anthers," as Hooker graphically describes, the stigma is short, broad, truncate, fleshy, almost cartilaginous; beautifully purple, and dark brown at the angles. The bases of the pentagon are fringed with a thin, whitish, transparent fold of delicate structure.

FRUIT.—Consists of two distinct follicles, pointing opposite ways. Often one is abortive. The follicles are short, thick (Hooker); semi-ovate, says Brandis. "Ovoid, ventricose, green, herbaceous" (Dalz. and Gib.); glabrous, rugose, inflated. Between the outer and inner coats of the follicle there are several large fibrillar spaces.

Seeds.—Quarter inch long, broadly ovate (Hooker); numerous, compressed, close-packed in a scaly manner, overlapping one another; hence termed by Wight "imbricate." This is well illustrated in the open follicle (Fig. 5) in the accompanying plate. Some Botanists describe the seed as marginate. Others say that the entire margin is slightly winged, and ovoid in form. The special feature of the seed is the comose tuft at its apex. When seeds lie close packed within the follicle, the comose tuft is placed away from the base of the follicle, so that as soon as the follicle bursts, the tuft expands and forces the seed out of the follicle. The comæ at times are very dense, silvery white and shining in the fresh condition, turning brownish on exposure, or by age. When the seeds ripen, the placenta shrivels. Thus detached, they lie ready to disperse. As soon as the follicle bursts at its ventral

suture, the seeds fly about in the air, in profusion. It is quite a sight to see these scattered seeds in mid-air, the expanded comæ serving the purpose of a parachute. Dr. MacDonald happily terms them "seed-wanderers," in search of a new home. It is thus that they are seen invading loose soil, dilapidated buildings, and waste places, planting themselves in distant places, and propagating their species at times enormously. Thus it is that this plant does not require any human agency to propagate its species. I do not know of a single instance where this plant has had to be raised by sowing its seed.

ALBUMEN.—Thin, says Wight; so says also Gregg ("Text Book of Indian Botany," 1883).

EMBRYO.—Large; straight (Wight).

COTYLEDONS.—Flat (Hooker); foliaceous (Wight and DeCandolle).

RADICLE.—Short, inferior, says Hooker; superior, says Wight. I have had no time or opportunities to verify this. I leave this point to be settled by Morphologists (K. R. K.).

PLUMULE.—Inconspicuous (Wight and DeCandolle).

GENERAL REMARKS.

SYNONYMS :—

Asclepias gigantea.—Hort. Beng. 20; Willd.; Roxb. Flora Indica, II, 30.

Asclepias gigantea.—β. Lamarck, Encyclop. Méth., I, 280.

As regards bracts, Hamilton says "There are scarcely any." This is not accurate. They are deciduous, and have possibly escaped his attention. They are seen on almost every flower and flower-stalk in the fresh state. Perhaps it would be proper to say that every flower, almost without exception, has its own bracteole (K.R.K.). Some Botanists call it an "*involucre*," but it is not that structure as we understand it in botanical parlance. There are various opinions expressed by able Botanists regarding the æstivation of this plant. There is no doubt about the quincuncial æstivation of the calyx. But although I have described the æstivation of the corolla as valvate, I feel bound to state that Wight describes it as *sub-valvate*, meaning "The very edges overlapping and therefore *imbricate*." (See Wight's Illustrations of Botany, vol. II, pp. 164-169). This observation of Wight's I feel fully bound to note as inaccurate, for "*imbricate*" means that one petal overlaps the adjacent one. This is not the case in this instance. The

free ends of the petals fully fit into each other in a valvate manner. So, at the utmost, the æstivation could be termed *sub-valvate*, meaning that the petals are fitting closely to each other only at their margins; but, it must be understood that the petals are not on that account to be considered as "imbricate." With regard to the nature of the "staminal corona" and the pollen-masses, Professor Kerner Von Marilaun has made very important remarks in his "Natural History of Plants" (translated into English by Professor F. W. Oliver, Vol. II, p. 258-259, 1895). They are well worth quoting here on account of the accurate description they contain, and are as follows:—"Adnate to each of the five sides of the staminal column is a tumid bilocular anther with membranous wings running down its lateral margins. The wings are not appressed to the column, but are reflexed and stand out in pairs with the free margins of the two wings in each pair converging towards one another. This produces the same effect as if the anthers coating the central column were slit through longitudinally in front of every corner of the pentagon. Owing to the fact that the swollen part of each anther bears a curious excavated structure, it comes about that the pollen-producing portions of the anthers are nowhere visible externally save the membranous wings, or the five apparent slits." * * * "The hollow staminal appendages are full of honey, and each is embellished by a central process, shaped like a horn." I may add that the horn resembles the incurved horn of the Highland ram (K.R.K.). To continue the quotation, "At the back of every one of the five slits is a little clip-like organ from which proceed ligulate strands connecting it with the pollinia in the adjacent loculi of two different anthers, the pollen-mass in the left loculus of the anther to the right of the slit being thus associated with the pollen-mass in the right loculus of the anther to the left of the slit. The abundant honey in the staminal appendages emits a scent perceptible from afar, and attracts numberless insects to the flowers. The honey, being stored in a very superficial position, is accessible to insects with short probosces," such as bees, wasps, and sand wasps. Ants are also among the commonest visitors to this plant in quest of honey. "During the time when the honey is most abundant, the flowers are either nodding or pendent, and they offer no convenient place for the insects to alight

upon, or from which they can comfortably suck the honey. All parts of the flower are smooth and slippery, and the only way in which an insect can support its weight is by inserting its claws in the slits between the anthers. In endeavouring to take firm hold, the insect draws its claw from one end of the slit to the other, and so becomes attached to the clip-like organ at the back. When the insect's foot is withdrawn, the two pollinia adherent to the clip are dragged out of their niches. One of the claws on that foot is then seen to be wedged between the arms of the clip, whilst the two pollinia are suspended from it." The clip-like organs will be readily distinguished in Fig. 3 of the accompanying plate. It is coloured brown and is Y-shaped in the illustration. It would be interesting to follow still further the remarks of Professor Kerner Von Marilaun and trace the destination of the pollen-masses so torn away from their seat and to see how they are conveyed to the stigmas of other flowers. For, without doing so, this description of the pollen-masses must necessarily remain incomplete. "The question is," says the learned Professor, "where are these stigmas to be found? The pentagonal central column, surrounded by the five anthers, contains the ovary in its interior. The approaches to this organ lie through the so-called stigmatic chambers which are situated close beneath the truncate end of the column, and open outwards. The chambers are concealed in the slits, just as were the clip-like organs, and insects occasionally come across them as they move their claws about in the recesses. If the foot inserted by an insect has pollinia already attached to it, they are thus introduced into the slit in a new flower, and as the insect feels about for firm support, it thrusts the pollinia into the stigmatic chamber. When the foot is subsequently withdrawn, the ligatures attaching the pollinia to the clip are broken, and the pollinia are left in the chamber, whilst the actual clip maintains its grip of the claw." It may be stated here that the above quotation refers to the flowers of *Asclepias cornuti*, but the learned Professor remarks that other members of the *Asclepiadeæ* have essentially the same mechanism, though differences in detail of course occur. I am persuaded to believe that the process of fertilization in the plant I am describing is not materially different from that depicted above in connection with *Asclepias cornuti*.

With regard to the substance which binds the clip-like organ to the stigma, it may be observed that Professor Kerner Von Marilaun terms it *Viscin*. It is a transparent structureless and colourless substance ; it "Does not form droplets with water, nor does it dissolve in alcohol or olive-oil. It may be termed *Viscin*, from the similarity which it presents to the bird-lime obtained from the berries of the Mistletoe. (*Viscum*)." "It is very sticky, and on the slightest touch can be drawn out into delicate threads." "The sticky substance is probably a mucilage formed from the outer wall of the pollen-tetrad, or from the broken-down walls of the mother-cells." (Pp. 101-102, op. cit.)

Professor Asa Gray very rightly remarks that the flowers of the entire order *Asclepiadeæ* are rather too difficult for the beginner to understand. I would add that to the Amateur Botanist it is almost repulsive, if not a veritable *Pons asinorum*. Nevertheless to the truly faithful and earnest student of Vegetable Morphology, the complex structure of the reproductive organs of the *Asclepiadeæ* is of immense, almost undying interest in common with that of similar organs among the *Orchideæ*, *Aristolochiæ*, and *Nepenthes* or Pitcher-plants. I may usefully add a passing remark here of Professor Kerner Von Marilaun's, which is one of very great importance in understanding the structural difference between the pollinia of the *Orchideæ* and those of the *Asclepiadeæ*. In the former, the pollinia are connected by a little knob called the *Corpusculum* "Which is soft and viscid ; whereas in the latter there is a *clip* which is a hard dry implement with two arms capable of holding any small delicate object by gripping it. Secondly, the pollinia in the Orchids are clavate or of pasty consistency ; in the Asclepiads, as already described, they are in the form of shining, horny leaflets" (Kerner Von Marilaun, p. 257, *op. cit.*).

There is a difference of opinion among Botanists with regard to the flowering time of *Calotropis gigantea*. Rheede says it flowers thrice a year. But I have the high authority of Brandis and Gregg, and of Sanskrit writers such as Madan Pâl (see Nighant, p. 31, Calcutta, 1886), coupled with my own experience, to be able to say that the plant flowers throughout the year, in suitable soil, wherever the roots of the plant can extend far and wide and derive ample nourishment of the requisite kind. There are differences of opinion again as regards the odour of the flowers of this plant. The correct description of the odour, however,

is to be found in Rheede's "Hortus Malabaricus" (Vol. II, p. 53), where he says that the odour of the flowers is by no means unpleasant; it is similar to that of lilies. I fully endorse this view, with this remark, that you have to smell the flowers just as they open, for the odour is evanescent. If that is not done, you will have to say with Brandis, that the flowers are *inodorous*. Brandis is one of our most accurate observers in botanical phenomena, and I have always held him in very high esteem. If, therefore, in agreeing with Rheede I contradict Brandis, it must be considered entirely due to my personal appreciation of the delicate odour of a fresh-blown flower. Moreover, I find that a Sanskrit writer, Bhâv Misr, distinctly describes it as sweet-scented (Sanskrit, *Madhura*). [See Bhâv Prakash, p. 101, Bombay ed., 1890.]

I am limited as to space, or else I would enter on the description of the Folklore of this plant, as prevalent in India among the Hindus. I would merely rest content with briefly saying that it is used on the third day of the bright fortnight of Bhâdrapad—(Shukla-paksha, when the moon is waxing) during the worship of Sakhi and of Pârvati, the wife of Shiva. This day is a general fast-day for all Hindu females. The most rigid observers of this fast live on nothing but the leaf of *Calotropis gigantea* and a little sugarcane. The others abstain from their usual daily food and eat nothing but plantains, and *Chibûd* (*Cucumis Melo*, Linn.); and drink no water save what is contained in immature coconuts, and popularly, but mistakenly, called "Coconut Milk." The real coconut milk is the rich thick milk-like juice obtained from the matured "Kernel" or fresh "Kopra" of the coconut. The leaf of this plant is besides used by Hindu ladies on the 5th day after accouchement in the worship of *Sati* and *Jiwati*. Surgeon-General Balfour of Madras, in his "Cyclopœdia of India" (Vol. I, p. 553), says that this plant is by the Hindus held sacred to Shiva. "Its buds," says he, "also form one of the five flowers on the darts with which Kâma, the Indian God of Love, is supposed to pierce the hearts of mortals." In Bombay the Hindus offer the flowers to Hanumân, the Monkey-god.

The economic uses of the plant are varied. The root, says Col. Drury, is used in the manufacture of gunpowder charcoal. Brandis says that in Kattywar and in the Dekkan young branches are used for that

purpose. Charcoal for gunpowder is made in Kattywar says Captain Jacob (see Graham's Catalogue of the Bombay Plants, p. 121, 1839). Captain Twemlow mentions that the hill people about Mahableshwar obtain an intoxicating liquor called "Bar" from the plant (Graham, *op. cit*). The wood is also similarly used says Surgeon-General Balfour. The silky down which caps the seeds is used by the natives on the Madras side in making a soft cotton-like thread. "It is susceptible of being spun into the finest yarn for cambric, and has been used for the manufacture of a light substitute for flannel, by Messrs. Thresher and Glennie of London. It is also being tried by Messrs. Cowan & Co. of Edinburgh, as a material for paper" (1885). I quite agree, however, with Mr. A. Smith, when he says that the silky hairs capping the seeds are too short to be used for any elaborate spinning purposes. The inner bark produces a strong, long, silky, tenacious fibre which is not affected by water. Its breaking weight is the greatest of all known vegetable fibres. A three-strand $\frac{3}{8}$-inch rope can sustain 552 lbs. as against 407 lbs. of *Crotolaria juncea* (Sunn), and 224 lbs. of coconut coir. This valuable fibre, as obtained from the inner bark, especially of the young branches, be it noted, is spoken of by Mr. A. Smith, as being capable of bearing a greater strain than Russian hemp. (See Lindley and Moore's "Treasury of Botany," p. 202, Part I, 1870.) The fibre is employed for fishing lines, nets, gins, bowstrings, and even tiger-traps, in places where the plant grows abundantly and almost wildly. No wonder that the specific name of the plant is *gigantea*, when its fibre can be used successfully to entrap a tiger—one of the strongest and fiercest denizens of the Indian forests, and one whose existence is a terror to the surrounding population, the more especially when he is a "Man-eater!" To me, therefore, the specific name of "*gigantea*" appears to have been aptly chosen. I am not aware who the originator of the specific name is. I wish some better-informed student of Botany would help me and my readers to find this out.*

* Since writing the above, I find that Mr. F. Gleadow, who is well known to the readers of this Journal, has published the following remarks in the *Indian Forester* for November 1897:—"As to quality, it is stated that the fibres of both species," (viz:—*Calotropis gigantea* and *C. procera*), "are equally good. That is a statement that I have hitherto taken for truth, and have now to suffer certain qualms of conscience because I know the fibre of *C. gigantea* to be neglected in the Deccan, where it is common, and never suspected the possible reason, viz., its uselessness. However that may be, I found the fibre of *C. gigantea* quite useless in

Firminger says that this plant is unquestionably a "Handsome flowering shrub," along with its congener *C. Hamiltonii* (which, by the way, is no other than *C. procera*), and "nothing but their extreme commonness in the jungle and by the way-side excludes them from admission into the garden. ("Manual of Gardening," p. 532, H. St. John Jackson's Edition, Calcutta, 1890).

Surgeon-General Balfour of Madras speaks of a *Manna* produced from this plant (*op. cit.*), under the name of *Madâr-kâ-Shakar*. Dr. Dymock has the following remark to make *a propos* of this sugary exudation, in the Pharmacographia Indica (Vol. II, p. 430) :—"According to Burhan, '*Ushr*' is a Persian name for all plants having a milky juice, and especially for the plant known in Hindustan as *Ak*. It would therefore seem that *Ushar* is not an Arabic word, as generally stated in the dictionaries, but of Arian (*Aryan*? *K.R.K.*) origin, and perhaps connected with the Sanskrit '*Ush*' to burn." * * * "The author of the Minhâj describes *Sakar-el-Ushar* as a gum which exudes from the inflorescence of the plant and gradually hardens. He remarks that people say that it is a dew which falls upon the plant and concretes like manna." I have examined hundreds of plants of Mudâr—(*Calotropis gigantea*), but I have failed to find the manna on any part thereof. When quoting the popular belief about the exuded

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the Saharanpur District in the month of February." This is reproduced from the *Tropical Agriculturist*, Colombo, page 478, January, 1898. Contrast with this the following from the pen of M. Cathiravalo in the same Journal at page 472. This writer after trying the experiment of growing the plant on "Temple Bar," Sir Græme Elphinstone's Estate on Pallai, sent to England some cotton produced on the estate. Of course by cotton is meant the silky comose tuft on the top of the seeds. Mr. Cathiravalo says it was pronounced excellent. He adds:—"I have seen fishermen getting the fibre and making ropes out of it for their nets." At page 473 of the same Journal another writer signing himself B, writes thus about the fibre of *Calotropis gigantea* :—I sent home a sample of this fibre some ten years ago unnamed. It was prepared by hand, regardless of cost, and the brokers classed it as the finest Rhea, value I think £ 36 or £ 38 per ton. I do not remember the percentage of fibre from the weight of stems cut, but it was rather higher than that from Rhea stems obtained at the same time: the latter were grown though under shade. The *Calotropis would doubtless be improved by cultivation.* (The Italics are mine.—K. R. K.). Read in this connection the concluding portion of Mr. Gleadow's remarks—"As to cultivation I considered the matter twenty years ago, and came to the conclusion that it could not pay, and think so still, principally on the ground that the plant is of a straggling light-demanding habit, and could probably not be grown dense enough to give any considerable yield, *but I made no experiments on the point, and that is the only reliable source of information.*" (The Italics are mine.—K. R. K.).

gum "Which is said to fall upon the plant and concrete like manna," Dr. Dymock and his collaborateurs make no further remark than the following :—"The best authorities describe its properties as similar to those of the plant, it would therefore seem to be nothing more than an exudation of the juices of the plant which naturally contain some sugar." Might I ask if *Calotropis gigantea*—the plant I am now describing, has any exudations, save the rich, milky juice when the plant is wounded, and the honey that pervades the staminal corona ?

Surgeon-General Balfour and several other Botanists say that the milky juice has been prepared like *caoutchouc* and *gutta-percha*, and yields 50 per cent. I can claim no personal knowledge in this direction.

The plant is known in Southern India as *Yercum*, and in Northern India as *Ak* or *Mudâr*. Note that *Ak* is a corruption of the Sanskrit *Ark*, meaning the Sun, and that *Mudâr* is a corruption of the Sanskrit *Mandâr*. In Bombay, the plant I am describing is invariably known among the Marathi-speaking classes as *Ruí*. The Gujratis call it *Akado*. In the Sanskrit works I have consulted, I find that Bhâv-Prâkash (*op. cit.*) recognizes two varieties of the plant, namely, (1) the white, and (2) the red-flowered ; so do Dhanvantariya Nighant, and Raj-Nighant (pp. 136-137, Anandâshram Series, Poona, 1896.)* Madan Pâl in his Nighant (page 31, Calcutta, 1886) simply mentions two varieties of Mandâr, but he does not specify the colours of the flowers of the two varieties. Mr Woodrow describes two flowering varieties of *Calotropis gigantea*—purple and white. "The white variety," says this veteran and consummate practical Botanist, "is well worthy of a place in gardens, because some of the white flowers have as pure a colour as it is possible to find among flowers. White-flowered plants are met with rarely over the great range of the common sort" ("Gardening in India," p. 384, Bombay, 1889). I remember having seen a similarly pure white-flowered plant in Mr. L. B. Joglekar's garden in Thana, two years ago, in a bush of pinkish-purple flowered Mudârs, self-grown from the seed of a purple-flowered plant. To me this is an illustration of *lusus naturæ* among plants. Rheede has not failed to recognize the white and purple-flowered species. †

* As also Raghunath S. Lale, in his Guna Dosh Prakash, p. 143, Poona, 1892.

† It also prevails in the Sattara District among the purple-flowered plants.

I have already said that Graham, on the authority of Captain Twemlow, says, that "The hill people about Mahableshwar obtain an intoxicating liquor called *Bar* from the plant" (Catalogue of Bombay Plants, p. 121, 1839). I may add here that Sir George Birdwood repeats this observation. (*Vide* his Vegetable Products of Bombay, p. 222, 2nd. Ed., 1865). Balfour observes that in Arabic authors on "Materia Medica," Mudâr is said to have been known even to the Greeks.

POISONOUS PROPERTIES.

In a previous communication to this Journal, describing the poisonous properties of *Gloriosa superba* (see Vol. VII, p. 492), I have already said that the leading Sanskrit writers recognize *Calotropis gigantea* among the nine secondary poisons (Upvisha) along with *Gloriosa superba* and seven others. (See also Nighanta Ratnâkar, p. 255, Bombay, 1867). The leading Sanskrit writers are agreed that this plant is "heating," or "burning," in other words "acrid" and drastic. Among the modern native writers of authority Rao Bahadur Kanny Lal Dey makes the following remarks about this plant :— "The powdered *Root-bark* and inspissated juice are used extensively for their diaphoretic, emetic, alterative and purgative properties which have been known to the Indian practitioners for many centuries and regarded in some parts as *vegetable mercury*." Thirty to sixty grains of the powder are used for an emetic. "The author has lately found that a fluid extract of the *leaves* given in doses of one to five drops in intermittent fever, during intermission, generally cuts off the paroxysm more effectually than quinine. Poisonous in large doses" (Indigenous Drugs of India, p. 57, 2nd. Ed., Calcutta, 1896). Dr. Sakharam Arjun says "That the milky juice is a mild rubefacient, and is believed to produce abortion" ("Bombay Drugs," p. 85, 1879). The learned Doctor does not however specifically mention as to whether abortion is caused by the internal administration of the juice or by its topical application to the *os uteri*. Jaikisan Indraji says "That the milky juice is believed to procure abortion. It is a caustic, also an emetic and purgative." This writer also does not mention whether the abortive properties are displayed in internal administration of the juice or in topical application to the *os uteri*. More direct evidence is wanted on this score, as both Dr. Sakharam and

Mr. Jaikisan simply say *it is believed* to possess abortive properties. Personally, I have no knowledge of such use ; I am therefore unable to express any opinion one way or the other. To come to the European and Anglo-Indian Pharmacologists who have studied this plant, O'Shaughnessy says that the powdered bark of the root, in doses of from half to one dram, "Proves emetic after an interval of from 20 minutes to an hour, generally causing much nausea, and in about one case in every three inducing a cathartic operation. In doses of from 2 to 5 grains, taken every half hour, it proves nauseant, powerfully diaphoretic, and after several doses gently cathartic." An alcoholic extract of the milky juice, says O'Shaughnessy, "In doses of 10 grains acts as a powerful, but uncertain, cathartic and frequently causes violent vomiting." The dried bark of the root, says O'Shaughnessy, "Is of greyish-yellow colour ; heavy and very peculiar smell, acrid, nauseous. It yields to water at 70°, 15 per 100 of gummy saccharine matter, and a peculiar extractive principle which has the singular property of gelatinizing as it is heated, then liquefying again and, as the solution cools, gelatinizing as before. This principle is termed *Mudárine* by its discoverer, Dr. Duncan, at whose chemical and clinical experiments thereon, the Editor was present"—meaning O'Shaughnessy himself (Bengal Dispensatory, p. 453, Calcutta, 1841).

In passing, I may add that O'Shaughnessy feels satisfied that the powdered root is efficacious in incipient leprosy, for he says that the clinical experiments of Drs. Playfair Duncan and Royle leave no doubt of the bark of the root being "*really efficacious in incipient leprosy and in numerous diseases of the skin.*"* To enter into a critical examination of this very broad statement of three able exponents of the pharmacology of Indian plants, viewed in the light of recent clinical experience, would be beyond the scope of this paper. Dr. Duncan's discovery of the active principle of the root of *Asclepias gigantea*, Linn., as *Calotropis gigantea*, Br., was named in Dr. Duncan's days, marks an important epoch in the pharmacological and clinical history of the plant I am describing. It is described by Dr. A. Duncan as an "*Extractive matter*," in Phil. Mag., X, 465 (see Watt's "Dictionary of Chemistry," Vol. III, 1868). Dr. Duncan calls it *Mudárine*. A recent writer on the Active Principles of Plants, namely, Charles E. Sohn, drops the *e*, and calls the

* *N.B.*—The italics are mine.—(K. R. K.)

extractive *Mudarin*. In doing so, he says, he is acting in conformity with the system adopted by the Chemical Society of London, in their journal of spelling all *alkaloids* with the termination *ine*; and all *glucosides* and *amaroids* (*i.e.*, Bitter Principles) with the termination *in*, without the final *e*. Starting with this clear understanding in the introductory and explanatory pages of his "Dictionary of the Active Principles of Plants," Mr. Sohn refers to Mudarin in his work at page 24 (ed. 1894, London) in the following terms:—*Mudarin* is a bitter principle, *i.e.*, an *amaroid*. It is amorphous, yellow, soluble in alcohol and cold water, gelatinizing on warming. Insoluble in ether and turpentine. Professer Dragendorff of Russia (University of Dorpat) classes *Mudarin* among the bitter principles which have not as yet been shown to be glucosides, but which are sparingly soluble in ether; more freely in alcohol. (See Plant Analysis of Prof. Dragendorff, translated into English by H. G. Greenish, F.C.S., pages 175-171, 1884). Note also in connection with the remark which Prof. Dragendorff makes with regard to the sparingly soluble nature of *Mudarin* in ether as contrasted with Sohn's statement that *Mudarin* is insoluble in ether. I am not a practical chemist of any pretensions whatsoever, I am therefore not in a position to state which of the two eminent writers is accurate in his respective statement. I feel bound, however, to place before my readers the two statements, for the guidance of such of the practical chemists as are interested in the search of true chemical tests for *Mudarin*. The subject of practical organic chemistry is altogether beyond the scope of this paper, or, for the matter of that, beyond the scope of my present scientific studies.

But to return to the description of the poisonous properties of *Calotropis gigantea*, still further, from well-known authorities, Norman Chevers,—the pioneer of all writers on Indian Medical Jurisprudence, must first be quoted here in support of the poisonous properties of *Mudar*. At page 285 of his standard and unexcelled work on Medical Jurisprudence in India (Calcutta, 1870), Dr. Norman Chevers says thus:—"In the Chapter on Infanticide in the last edition of this work, mention was made of the practice of murdering new-born female infants by forcing the milky juice of the *Mudar* down their throats." In the "Indian Medical Gazette" of April and June, 1867, pp. 106 and 148, Mr. McReddie, Medical Officer of Hurdui, again drew attention to this mode

of infanticide, and suggested that an investigation should be made with a view to the detection of this poison by chemical analysis. He, at the same time, gave the results of some experiments on puppies. Mr. McReddie infers from them that Mudar juice is acrid, but that it is not, as it is supposed to be by the natives, a "*narcotic poison.*" Speaking for myself, I have not heard or read of the narcotic properties of any of the parts or products of *Calotropis gigantea*. It principally acts on the *primæ viæ* so far as I know, producing at times violent emesis and drastic purgation, often far beyond calculation, and much to the detriment and even danger to life of the person in whom the powder of the root-bark is used as a cure for dysentery, and a vaunted *safe* substitute for the root of Ipecacuanha. I would rather use Ipecacuanha, now that we can have it in our dispensaries *sine emetine*, than expose a dysenteric patient to the risk of treatment of his complaint with such an uncertain substitute as the powdered root of *Calotropis gigantea*. I say this from experience, for eight years ago as Civil Surgeon of Thana, in medical charge of a large Depôt Jail and of the Civil Police and Military Hospitals there, I obtained a large consignment of the powdered bark of *Mudar* and tried it at the earnest desire of my late lamented friend and former teacher of Materia Medica, Brigade-Surgeon Dymock, who was then our Principal Medical Storekeeper in Bombay. My experience lead to an utter discomfiture. Wherever I tried the powder of Mudar root-bark, there was either violent emesis, or violent catharsis. The following year, in my official annual indent on Dr. Dymock, I asked not "for more." I have come to the conclusion that the vaunted position of Mudar as a substitute for Ipecacuanha is untenable, at any rate according to my clinical experience. But I stand corrected. *Apropos* of Dr. Norman Chevers' remark, cited above, that the milky juice of *Calotropis gigantea* is used for the purpose of murdering new-born, female infants, I find that Surgeon-General Balfour of Madras has the following remark regarding *Calotropis procera*, a near congener of *Calotropis gigantea*:—The acrid juice of *C. procera*, says he, "is used by Rajputs to poison their infant daughters" ("Cyclopœdia of India," Vol. I, p. 553, 3rd ed., London, 1885). Brigade-Surgeon J. B. Lyon, C.I.E., who has been to me the chief inspirer of the papers on the Poisonous Plants of Bombay, which have so long occupied the pages of this journal, says thus regarding *Mudar* :—"It may be mentioned that Mudar (a name, I may

add, common to *Calotropis gigantea* and *Calotropis procera*) and tobacco are said to be used for purposes of infanticide" ("Medical Jurisprudence for India," p. 114, Calcutta, 1889). In Gribble's "Medical Jurisprudence" (Madras, 1885, p. 188) there are the following remarks regarding *Calotropis Hamiltonii*, which is no other than *Calotropis procera*, a congener of *Calotropis gigantea*, with respect to its abortifacient properties :—*Calotropis Hamiltonii* (Madras native name Atrendo) "Is used both internally and externally. The milky juice is mixed with flour and given in a pill; a rag is then dipped in the juice and folded round a stick. About four and a-half inches are introduced *per vaginam*. This plan is useful in all stages of pregnancy, and there is not much danger to the mother or to the fœtus, which latter may in fact be born alive if the step is taken at an advanced stage." I may observe that whether or not there be danger to the mother or to the fœtus ultimately, the initial use of any part or product of this plant for the purposes of abortion has *crime* at its bottom, within the meaning of the Indian Penal Code, and as such it is specially worthy of notice here.

In support of all that I have said above, I feel bound to refer to the researches of C. J. H. Warden and L. A. Waddell. (*Pharm. Journ.*, 3rd Series, XVI, 167-70.) "In India, under the name of 'Madar,' two plants belonging to the N. O. ASCLEPIADACEÆ, are known, the *Calotropis gigantea* or *Asclepias gigantea*, and the *Calotropis procera* or *C. Hamiltonii*. The former is one of the commonest weeds throughout India, and is most abundant in the Lower Provinces and Eastern India; while the *C. procera*, which most closely resembles it, is found chiefly in the drier parts of North and Central India" ("Year Book of Pharmacy," 1886, p. 153).*

I cannot conclude this paper without referring to the most modern results of the three learned writers who have contributed to bring out the most standard work of the day in Anglo-Indian Pharmacology, under the name of the "Pharmacographia Indica." (See p. 428—437, Vol. II, 1891, Bombay.) It is said, in this grandest work up to date on the Pharmacology of Indian plants, that *Calotropis* is not mentioned by Greek or Roman writers, but some Mahomedans give *Ijakiyns* as its Yunani name; this appears to be a corruption of the word ἅγιάθεος "most holy," or "under divine protection," and was probably applied to

* I have found it in the Satara District since writing this paper.—(K. R. K.)

the plant by some Syrian physicians who instructed the Arabs in Greek medicine. The modern Persians call *C. procera* Khark and Darakht-i-Zahrnak or "poison-tree." So far back as 1813, Ainslie in his "Materia Medica" of Hindustan seems to have noted the purgative properties of both *Calotropis gigantea* and *Calotropis procera.* It is stated in the *Pharmacographia Indica* (Vol. II, p. 434) that the emetic properties of *Calotropis* were brought to the notice of the medical profession by Dr. Duncan who, as I have already noted before, was the first person to isolate the bitter principle of the plant and examine clinically, in the presence of O'Shaughnessy, the pharmacological properties thereof, so far back as 1829. (See Edin. Med. and Surg. Journ., XXXII., p. 65.)

"Modern physiological research has shown that the juice applied to the skin acts as an irritant."

"In large doses *Calotropis* causes vomiting and purging, acting as an irritant emeto-cathartic." (Ph. Ind., p. 434.)

This is the best description of the poisonous properties of the plant that could be given in the existing state of our knowledge regarding *Calotropis gigantea* and *Calotropis procera* as well. With these remarks I conclude this paper.

Description of Plate T.

No. 1.—The top of a flowering branch—half natural size. The white paint at the cut end in the right lower corner of the plate shows the milky juice.

No. 2.—The staminal corona—full natural size.

No. 3.—A pollen-mass—six times magnified. Note the *brown clip* at the lowest part of the pollen-mass.

No. 4.—A mature follicle—entire ; the corresponding fellow follicle was here abortive—half natural size.

No. 5.—The same follicle in dehiscence, showing the imbricate, close-packed arrangement of the mature seeds, with the coma at the top of the follicle—half natural size.

No. 6.—A detached comose seed with the coma as pictured flying about in the air after the fruit dehisces—half natural size. The cut end of the peduncle is painted white to show the milky juice.

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F.E.S.,
With Notes by H. J. Elwes, F.Z.S., F.E.S., &c.,
and
Additions by Sir George F. Hampson, Bart., B.A., F.E.S., &c.

Part III.

(*With a Plate.*)

(*Continued from page* 419 *of this Vol.*)

Family NOTODONTIDÆ.

Genus Tarsolepis, Butl.

210. *T. sommeri*, Hübn.

Sikhim (*Hampson*). Neither Mr. Elwes nor I have obtained this species from this locality.

Genus Dudusa, Wlk.

211. *D. sphingiformis*, Moore.

Sikhim and Bhutan. I have only obtained this on two occasions. My first specimen was taken at light in June at Badamtam, 3,000 feet, my other at Pedong Turning at about 5,000 feet in the same month. It appears to be rare. Mr. Elwes has two male specimens, which he took sitting on the doorstep of the Darjeeling Club, so that its range is from 3,000 to 7,000 feet.

Genus Baradesa, Moore.

214. *B. lithosioides*, Moore.

Sikhim. I have taken this species at light only at 1,800 and 4,000 feet in the Balasun and Rungeet valleys in July.

Genus Rachia, Moore.

215. *R. plumosa*, Moore.

Sikhim. I have never taken this species. (I took this on Tongloo at 10,000 feet in July.—*H. J. E.*)

216. *R. striata*, Hmpsn.

Sikhim. The type of this from Möller's collection taken in April is apparently unique.

Genus Phalera, Hübn.

217. *P. parivala*, Moore.

Sikhim. (Although several species of this genus are common in Sikhim, I have never seen females of any except *P. torpida* there.—*H. J. E.*)

218. *P. sangana*, Moore.

Sikhim and Bhutan. This and *P. raya* appear to be the two most frequently met with in Sikhim.

219. *P. torpida*, Wlk.

Sikhim, 1,800 feet. This is a much smaller insect than the two preceding. I have only one male specimen, taken at light at the elevation above-mentioned in May.

220. *P. procera*, Feld.

Sikhim, 1,800 feet. This seems to be near the next species, but differs in having much less silvery suffusion, which is confined to the basal portion and the posterior angle of the forewing. Frons brown; vertex of the head white, as in *P. sangana*; apical patch on forewing evenly rounded on the inner edge. The segmental bands of the abdomen are much more pronounced than those of *P. raya*. The dark sub-basal patch mentioned by Hampson does not appear to me to be sufficiently conspicuous to be of much importance as a distinctive character. I have taken both sexes in May and July.

221. *P. raya*, Moore.

Sikhim and Bhutan. This is at once recognisable by the forewing being entirely suffused with silvery-grey, the vertex of the head and frons being buff, and the apical patch on the forewing having its inner edge waved. The males of this and the three preceding species have the terminal segment of the abdomen marked with a large pale quadrate patch which is lacking in the females. It occurs in June, sometimes very plentifully.

221*a*. *P. bilineata*, Hmpsn. (PLATE I, FIG. 2, ♀).

Bhutan, 2,500 feet. This belongs to a separate section of the genus in which the males have the antennæ bipectinate for two-thirds the length. The female from which the figure is taken is the only specimen I have obtained. The male was described from the Khasias.

Genus GARGETTA, Wlk.

222. *G. costigera*, Wlk.

Sikhim and Bhutan, 1,800 to 3,000 feet. I have only taken this at light. The antennæ are similar in both sexes, and the female is distinguished from the male by the absence of the tuft of long hair on the underside of the forewing below vein 1. In a pair of wings bitten off a male insect by a bat, I notice that the lobed costa of the

hindwing is folded over presumably to receive the tuft of hairs of the forewing ; in set specimens, however, this does not so appear. It occurs in May, June and November.

224. *G. curvaria*, Hmpsn.

Sikhim. I have only two specimens, one of which was taken in July. (Rare in March in Sikhim ; I have it also from the Naga Hills. —*H. J. E.*)

225. *G. ingens*, Wlk.

Sikhim. I have only seen one of this species taken by Dr. Pilcher in Darjeeling. (Occurs rarely in March and April.—*H. J. E.*)

225*b*. *G. lithosidia*, Hmpsn. (PLATE I, FIG. 5, ♂).

Sikhim. The type of this is the only specimen I have procured ; it is now in the British Museum. The corrugation of the membrane below the cell on the underside of the forewing played upon by the serrate costal edge of the hindwing is an important character not found in any other species of the genus.

226. *G. albimacula*, Hmpsn.

Sikhim. I have never received this.

226*a*. *G. viridigrisea*, n. sp. (PLATE I, FIG. 3, ♀).

♀. Grey, more or less, suffused with greenish ; collar black or grey edged with black, thorax greyish ; abdomen and hindwing fuscous-brown. Forewing with a waved black sub-basal line followed by an indistinct blackish waved band and an almost erect antemedial black line double from the median nervure to the inner margin and angled on vein 1 ; orbicular a double brown spot edged with whitish, reniform brown with its lower edge whitish, with some reddish suffusion from it towards the apex and inner margin, medial strongly waved line curved round the cell, postmedial black lunulate curved line, beyond which are some dark patches, most distinct at the inner margin, followed by an indistinct pale line ; sub-marginal and marginal series of black lunulate marks between the veins ; apex slightly suffused with fuscous, with pale specks on the costa at termination of nervules, costa of hindwing with a long fringe of hair. Antennæ minutely ciliated. Palpi with third joint porrect.

Hab. Sikhim, 1,800 feet, October (*Dudgeon*). *Exp.* 55-56 millim. Types in coll. Dudgeon and B. M.

Genus NORRACA, Moore.

228. *N. longipennis*, Moore.

Bhutan, 2,500 feet. I have only one specimen which I took in July. This corresponds with Hampson's figure and description except that vein 6 of the forewing is from the areole just after the angle of the cell, and the inner margin of the same wing is quite straight from the lobe to the outer angle. *Exp.* 54 millim.

Genus NIGANDA, Moore.

229. *N. strigifascia*, Moore.

Sikhim and Bhutan. I have one specimen taken in Bhutan in May.

Genus EUTORNOPERA, Hmpsn.

229*a*. *E. argentifascia*, Hmpsn.

Bhutan, 6,400 feet. The type was taken by me at light at Rissoom. I have never seen another specimen.

Genus STENODONTA, Hmpsn.

229*b*. *S. cyttarrosticta*, Hmpsn.

Bhutan, 2,500 feet. Occurs from June to September. I took six males and three females at Fagoo, one pair of which are in the British Museum. The type male alone has the white streak in continuation of the black one in the cell of the forewing, my specimens having only a bluish-silvery speck on vein 5 instead.

Genus PYDNA, Wlk.

230. *P. testacea*, Wlk.

Sikhim. I have two females, taken in June, identically marked, but the areole on the forewing of one is triangular and that of the other narrowly oblong. (I have some difficulty in accepting Sir George Hampson's identification of *P. testacea* with *P. kamadena*, Moore, but the types of *Pydna* are in several cases impossible to identify, and the species seem in some cases very variable. I have taken what I believe to be *P. kamadena* at 10,000 feet in July.—*H. J. E.*)

230*a*. *P. tenebralis*, Hmpsn. (PLATE I, FIG. 4, ♂).

Sikhim, 1,800 feet. The type specimen, which is in the British Museum, was taken at Punkabaree at light.

232. *P. longivitta*, Wlk.

Sikhim and Bhutan, 5,000 feet. My only specimen was taken in September; the species, however, is not a rare one. Mr. Elwes

remarks that he has taken both sexes at from 7,000 to 10,000 feet in July and August.

234. *P. pallida*, Butl.

Sikhim. I have not seen this species. (Sir George Hampson identifies this with the Japanese insect described by Butler. What I have so named by him seems to be different, but it is not in good enough condition to describe.—*H. J. E.*)

235. *P. ochracea*, Moore.

Sikhim. I have not seen this.

236. *P. galbana*, Swinh.

Sikhim. Only females of this and the preceding species were apparently available for description. I do not know it.

238. *P. eupatagia*, Hmpsn.

Sikhim. The type of this is in Mr. Knyvett's collection.

239. *P. aurata*, Moore.

Sikhim. I have not received this.

241. *P. sikhima*, Moore.

Sikhim. Mr. Elwes says that this is common at light, at Darjeeling, in July.

242. *P. nigropuncta*, Hmpsn.

Sikhim and Bhutan. I have four males taken at 12,000 feet in Bhutan in July. The antennæ of the male are worthy of remark ; the fascicles of long cilia are given off from each side of the antennæ in pairs, and the basal portion of each tuft is agglutinated, so that the cilia appear to rise from short stems. In *Antheua servula*, Drury, *Spatalia argentifera*, Wlk., *Fentonia apicalis*, Moore, and a few others of the family, this agglutination is extended to two-thirds or more of the whole branch, giving the appearance of pectinations with tufts at their extremities.

243. *P. nigrofasciata*, Hmpsn.

Sikhim. I have only seen one specimen of this species which was taken in Darjeeling by Dr. Pilcher. Mr. Elwes says that the type is the only specimen he has seen, and was taken in July.

244. *P. basistriga*, Moore.

Sikhim. (The type of this being in Dr. Staudinger's collection has not been certainly identified by Sir George Hampson, and may be a variety of *P. nigrofasciata*.—*H. J. E.*)

245. *P. ferrifera*, Wlk.

Sikhim and Bhutan. My only specimen was taken in the latter locality in June. Mr. Elwes remarks that the male is not uncommon at Darjeeling, but that he has never seen a female.

249. *P. albistriga*, Moore. (PLATE I, FIG. 1, ♂).

Sikhim and Bhutan. I obtained one specimen in Bhutan which is now in the British Museum. This species was originally included as a *Ramesa*, but Sir George Hampson now makes it the type of the third section of *Pydna*.

Genus RAMESA, Wlk.

246. *R. tosta*, Wlk.

Bhutan, 3,000 feet. I took a specimen of this at light in September at Fagoo.

247*a*. *R. docilis*, Wlk. (PLATE I, FIG. 18, ♀).

Sikhim, 1,800 feet. The only specimen I have seen was taken at light at Punkabaree in May.

248. *R. divisa*, Moore.

Sikhim. I have never seen a specimen.

Genus ANTHEUA, Wlk.

252. *A. servula*, Drury.

Sikhim, 1,800 feet. I have two males of this species taken in July and August at Punkabaree at light. The hindwings of both are pale. Hampson's figure of the neuration inadvertently omits vein 10 of the forewing, which should be shown meeting the costa between veins 9 and 11.

Genus FENTONIA, Butl.

254. *F. argentifera*, Moore.

Sikhim, 7,000 to 10,000 feet. Dr. Pilcher obtained this on Tongloo in August. Mr. Elwes remarks that it is common on Tongloo and at Darjeeling in July and August.

255. *F. brunnea*, Moore.

Sikhim, 7,000 feet. Common at light in Darjeeling station in July and August.

256. *F. obliquiplaga*, Moore.

Sikhim. I have never seen this species. (This is another species which has never been satisfactorily indentified since its description.—*H. J. E.*)

257. *F. apicalis*, Moore.

Sikhim, 9,000 feet. This is placed in the 1st sub-section of the 1st section of the genus by Hampson, but my only specimen appears, from the form of the antennæ, to belong to a new sub-section. It occurs in July.

258. *F. ocypete*, Bremer.

Sikhim, 5,500 feet. Only one taken in March, 1889, on the Tukvar spur. It must be very rare.

300. *F. variegata*, Moore.

Sikhim. This was orginally placed in *Hypercæschra*. I have not seen it.

258*a*. *F. viridinota*, Hmpsn. (PLATE I, FIG. 11, ♂).

Bhutan, 2,500 feet. I took five males in August and September at Fagoo at light. It belongs to the same section of the genus as *F. tenebrosa*, Wlk. The neuration of the forewings of this and the next species are similar to the others of the genus. Sir George Hampson numbers this species 258*a*, implying that it should follow *F. ocypete*, but it should follow *F. tenebrosa*, Wlk. The specimens in my collection show variation in the extent of the white on the green costal patch on the forewing.

259. *F. tenebrosa*, Wlk.

Sikhim and Bhutan, 1,800 to 2,500 feet. This is far the commonest species of the genus at low elevations. I took three males at Fagoo in July at 2,500 feet, and eleven males and one female at Punkabaree in May, June, July, August, and September. The female differs from the male in being slightly larger, in having the branches of the antennæ shorter, and the underside of the hindwing powdered with white scales, leaving dark distinct medial and postmedial bands. *Exp.*—♂ 26—28 ; ♀ 31 millimetres.

As all the species of *Fentonia*, with the exception of a new species, *F. canifusa*, Hampson, from the Khasias, which I have not seen, have been found within the limits of Sikhim and Bhutan, and the disposi-

tion of the same in their sections according to Hampson requires some alteration, I now give a key to the genus.

Section I.—Hindwing with the stalk of veins 6 and 7 short.

(*a*) *Antennæ of male bipectinate, with branches moderately long and reaching the tip.*

F. argentifera, Moore.

(*b*) *Antennæ of male with the terminal one-third serrate; the branches shorter.*

F. ocypete, Brem.

F. variegata, Moore. (*Fide* Hampson).

(*c*) *Antennæ of male with small fascicles of cilia.*

F. brunnea, Moore.

F. obliquiplaga, Moore. (*Fide* Hampson).

(*d*) *Antennæ of male with short stiff branches with fascicles of cilia at their extremities.*

F. apicalis, Moore.

Section II.—Hindwing with the stalk of veins 6 and 7 very long; antennæ of male with branches long.

F. tenebrosa, Wlk.

F. viridinota, Hmpsn.

Genus STAUROPUS, Germar.

260. *S. maculatus*, Moore.

Sikhim. I do not know this. (Taken at Darjeeling at light in July.—*H. J. E.*)

261. *S. alternus*, Wlk.

Sikhim. One specimen reared from a larva taken at 900 feet elevation in the bed of the Balasun river in October. The larva differs from Hampson's description only in the presence of paired conical dorsal prominences on the fourth and fifth somites, and the flattened portion of the tenth somite being produced laterally into a hooked spine; the processes from the extremity of the anal segment are long and clubbed. Pupa formed in a yellow silk cocoon. Food plant a thorny tree locally called *Kayer*. Emerged in November.

262. *S. sikhimensis*, Moore.

Sikhim. I have only obtained it in July at 5,000 feet. Mr. Elwes says it is common at light in Darjeeling in July and August.

264. *S. apicalis*, Moore.

Sikhim, 1,800 feet. I took this at light at Punkabaree in May. (Seems a very rare species in Sikhim ; I have only one specimen from Möller's collection —*H. J. E.*)

265. *S. viridescens*, Wlk.

Sikhim and Bhutan, 2,500 feet. I have only seen females, two of which I took in April and August at light. (Occurs rarely in March and June. There is a great difference in size between the sexes.—*H. J. E.*)

266. *S. pallidifascia*, Hmpsn.

Sikhim and Bhutan, 1,800 to 2,500 feet. I took a male of this species at Fagoo and a female at Punkabaree in September and November respectively, both at light.

The female differs from the male in the postmedial double line on the forewing being farther from the base, the area beyond it paler, and the hindwing suffused with brown. Both sexes have a large black quadrate patch below the origin of vein 2 of the forewing, and the antennæ similarly bipectinate.

268. *S. perdix*, Moore.

Sikhim, 5,000 feet. I have a single specimen taken in October, 1888. (This rare species has been recently taken in Sikhim by Mr. Knyvett.—*H. J. E.*)

270. *S. orbifer*, Hmpsn.

Sikhim. I have not seen a specimen. (This has been taken, as far as I know, only by Mr. Knyvett in May.—*H. J. E.*)

273. *S. plagiviridis*, Moore.

Sikhim and Bhutan, 6,400 feet. I took a male on Rissoom in September, which is the only specimen I have seen. Mr. Elwes remarks that the male is not uncommon, but that he has not seen a female.

Genus Somera, Wlk.

274. *S. viridifusca*, Wlk.

Sikhim and Bhutan, 3,000 to 7,000 feet. My specimens were taken in May, July and August. It is not uncommon.

Genus Cerura, Schrank.

276. *C. liturata*, Wlk.

Sikhim and Bhutan, 1,000 to 3,000 feet. This is a very common species, and occurs in May, July and August. The larva up to the

penultimate moult is purplish-brown, marked with greenish-yellow laterally, and there are two blunt spiny processes behind the head ; these are lost in the last moult, when the upper part of the first somite becomes scutellate, and a lateral white ocellus appears on the eighth somite. Before pupating the bright green colour, which the larva has adopted, becomes suffused with crimson from the legs gradually upwards. The cocoon is formed of comminuted fragments of bark cemented together, forming a hard shell.

Genus DAMATA, Wlk.

278. *D. longipennis*, Wlk.

Sikhim, 7,000 to 9,000 feet. This is apparently a common species at light in Darjeeling in July. I have it only from 9,000 feet.

Genus METASCHALIS, Hmpsn.

281. *M. disrupta*, Moore.

Sikhim. I have not seen this species. (I have only one specimen from Sikhim where it is rare.—*H. J. E.*)

Genus PHEOSIA, Hübn.

283. *P. fasciata*, Moore.

Sikhim. I have never seen a specimen. (Bred from pupæ found under cakes of mud at a low elevation by Knyvett.—*H. J. E.*)

284. *P. pulcherrima*, Moore.

Sikhim, 7,000 feet. The only specimen I have seen was taken by Dr. Pilcher at light in Darjeeling. (I took a female of this at Darjeeling at light in July.—*H. J. E.*)

285. *P. excurvata*, Hmpsn.

Sikhim. I do not know this species, the type of which is in Mr. Knyvett's collection.

287. *P. strigata*, Moore.

Sikhim, 3,000 feet. My only specimen was bred from a larva found at Badamtam. The larva was green with the anterior somites slightly marked with purplish dorsally, the three terminal somites broad, flattened and oval, having the appearance of a leaf when seen from behind, terminating in two short points. Last pair of prolegs wanting. The pupa is formed in a cocoon similar to that of *C. liturata*, Wlk., and is dull blackish with a sharp process on the front of the head. My specimen is in the British Museum.

287*a*. *P. centristicta*, Hampson, Jour. Bo. N. H. Soc., vol. XI, No. 2, p. 282. (PLATE I, FIG. 15, ♂).

Sikhim, 1,800 feet. The type of this was taken by me at light in May at Punkabaree ; I obtained another in July ; these are the only specimens I have seen. The type is in the British Museum.

288. *P. sikkima*, Moore.

Sikhim. I have not seen this species ; it differs from all others of the genus in the antennæ being ciliated in the male.

Pheosia is separated from *Fentonia* by Hampson, chiefly apparently on the position of vein 7 of the forewing ; *Pheosia* having 7 given off further from the apex than 10, and *Fentonia* having the same vein arising nearer to the apex than 10. I have only two species of this genus in my collection, namely, *P. centristicta*, Hampson, and *P. strigata*, Moore (the latter from Kanara). Both these have vein 7 as in *Fentonia*. *Pheosia* then, as it at present stands, is only separable from *Fentonia* by the forewing being narrower and with the outer margin crenulate instead of broad and evenly-curved, and by the palpi being porrect instead of upturned. The palpi are so small in both genera that this latter feature is difficult to recognise.

ADDENDUM TO GENUS FENTONIA, page 631.

259*a*. *F. ferrifusa*, n. sp.

♂. Grey irrorated with fuscous scales ; thorax clothed with long deep brown hairs; abdomen fuscous, whitish towards the extremity. Forewing with a dark streak from the base meeting a broad fuscous patch below the median nervure at $\frac{1}{4}$th from the base ; an ante-medial indistinct reddish-brown triangular mark from the costa to the median nervure; a post-medial series of black specks on the veins, followed by a reddish-brown waved band, broad and triangular towards the costa, narrowing to the outer angle ; a submarginal row of brownish specks. Hindwing whitish, suffused with fuscous towards the apex and inner margin. Underside of forewing grey, hindwing and abdomen white.

This belongs to section II of the genus, and the antennæ and neuration of the hindwing are similar to those of *F. tenebrosa*, Wlk.

Sikhim, 1,800 feet, May (*Dudgeon*). Exp. 27 millim. Type in coll. Dudgeon.

THE FLORA OF WESTERN INDIA.

By G. Marshall Woodrow, Professor of Botany,
College of Science, Poona.

Part IV.

(*Continued from page* 430 *of this Vol.*)

LI.—Rosaceæ.

3. *Prunus.*

P. Amygdalus, *Baill.*, F.B.I.—II-313. *Badam*, the Almond. In gardens rarely.

P. persica, *B. & H.f.* F.B.I.—II-313. *Alú*, the Peach. Gardens. Panchgani.

5. *Pygeum.*

P. Gardneri, *H. f.*, F.B.I.—II-321. Mahableshwar. Nov.

P. Wightianum, *Bl.*, F.B.I.—II-319. Divimana, N. Kanara. Nov.

8. *Rubus.*

R. moluccanus, *Linn.*, F.B.I.—II-330. Western Ghats, Southwards. Oct.

R. lasiocarpus, *Smith*, F.B.I.—II-339. *Rajapuri*, Raspberry. Panchgani. May.

R. rosæfolius, *Smith*, D.C. Prod.—F. B. I.—II-341. Gardens. Aug.

10. *Fragaria.*

F. indica, *Andr.*, F.B.I.—II-343. Yellow-flowered Strawberry. Gardens, Baroda, Poona. Jan.-Mar.

F. vesca, *Linn.*, F.B.I.—II-344. Strawberry. Gardens, Mahableshwar. Jan.-Apl.

11. *Potentilla.*

P. supina, *Linn.*, F.B.I.—II-359. Karnali, Guzerat. Nov.

16. *Rosa.*

No species of this genus is indigenous, and the few widely cultivated species are doubtfully identified.

17. *Neurada.*

N. procumbens, *L.*, F.B.I.—II-368. Hills at the Hub river, Karachi. Jan.

17*a*. *Cydonia.*

C. vulgaris, *Pers.*, F.B.I.—II-369. *Bihi*, the Quince. Planted rarely. Mahableshwar.

19. *Eriobotria.*

E. japonica, *Lindl.*, F.B.I.—II-372. The Loquat. Planted, Poona.

20. *Pyrus.*

P. malus, *Linn.*, F.B.I.—II-373. The Apple. Planted, Panchgani, rarely.

P. communis, *Linn.*, F.B.I.—II-374. *Náspáti*, the Pear. Cultivated near Mahableshwar.

LII.—Saxifrageæ.

3. *Vahlia.*

V. viscosa, *Roxb.*, F.B.I.—II-399. Divale, 23 miles east of Ratnagiri. Jan.

LIII.—CRASSULACEÆ.

3. *Bryophyllum.*

B. calycinum, *Salisb.*, F.B.I.—II-413. *Pánjhád.* Wai, Satara Dist. Jan.

4. *Kalanchoe.*

K. glandulosa, *Hochst.*, F.B.I.—II-414. Shinghad. Hills near Satara. Mar.
K. spatulata, *DC.*, F.B.I.—II-414. Panchgani, Badami. Oct.-Nov.
K. floribunda, *W. & A.*, F.B.I.—II-414. Hills near Satara. Nov.
K. brasiliensis, *Camb.*, F.B.I.—II-415. Gokak, Panchgani. Oct.

LIV.—DROSERACEÆ.

1. *Drosera.*

D. Burmanni, *Vahl.*, F.B.I.—II-424. Siddapur, Yacombi, N. Kanara. Jan.-Feb.
D. indica, *Linn.*, F.B.I.—II-424. Sawantwadi, Mahableshwar, Lanauli. Nov.

LVI.—HALORAGEÆ.

4. *Myriophyllum.*

M. intermedium, *DC.*, F.B.I.—II-433. The Lake, Mahableshwar. Nov.

LVII.—RHIZOPHOREÆ.

1. *Rhizophora.*

R. mucronata, *Lam.*, F.B.I.—II-435. *Doombee.* Hareshwar. Dec.

3. *Kandelia.*

K. Rheedii, *Woa.*, F.B.I.—II-437. Kumta. Mar.

4. *Bruguiera.*

B. parviflora, *Woa.*, F.B.I.—II-438. Karwar. Dec.

5. *Carallia.*

C. integerrima, *DC.*, F.B.I.—II-439. *Panshi.* Marmagoa. Nov.

LVIII.—COMBRETACEÆ.

1. *Terminalia.*

T. Catappa, *Linn.*, F.B.I.—II-444. *Deshi badám.* Planted, Deccan, widely. Apl.
T. belerica, *Roxb.*, F.B.I.—II-445. *Behadá.* Devale, Konkan. Apl.
T. chebula, *Retz.*, F.B.I.—II-446. *Hirdá.* Mahableshwar. Apl.
T. Arjuna, *Bedd.*, F.B.I.—II-447. *Kahu, Arjun, Arjunsadada.* Apl.-May.
T. tomentosa, *Bedd.*, F.B.I.—II-447. *Ain.* Hills near Poona. July.
T. paniculata, *Roth.*, F.B.I.—II-448. *Kinjal.* Near Sirsi. Nov.-Dec.

2. *Calycopteris.*

C. floribunda, *Lamb.*, F.B.I.—II-449. *Ukshi.* Deccan Hills. Sept.-Oct.

3. *Anogeissus.*

A. latifolia, *Wall.*, F.B.I.—II-450. *Dhavda.* Deccan Hills widely. July-Nov.

4. *Lumnitzera.*

L. racemosa, *Wild.*, F.B.I.—II-452. Ratnagiri. Jan.

5. *Combretum.*

C. ovalifolium, *Roxb.*, F.B.I.—II-458. *Pilolka.* Karli, W.Ghats. Feb.
C. extensum, *Roxb.*, F.B.I.—II-458. *Piluki.* Khandalla. Jan.

6. *Quisqualis.*

Q. indica, *Linn.*, F.B.I.—II-459. *Rangoonacha vel.* Rangoon creeper. Gardens. Mar.-Aug.

LIX.—MYRTACEÆ.

4. *Psidium.*

P. Guyava, *Linn.*, F.B.I.—II-468. *Jâmb, Pairu.* The Guava. Cultivated.

Myrtus.

M. communis, *Linn.*, D.C. Prod.—III-239. *Myrtle.* The Myrtle. Planted.

8. *Eugenia.*

E. malaccensis, *Linn.*, F.B.I.—II-471. Planted. Apl.-May.

E. jambos, *Linn.*, F.B.I.—II-474. *Gulab Jamb.* Planted, widely. Feb.

E. hemispherica, *Wight*, F.B.I.—II-477. Ainshi Ghat. Mar.-Apl.

E. laeta, *Ham.*, F.B.I.—II-479. W. Ghats. Nov.

E. memecylifolia, *Talbot*, Jour. Bom. Nat. Hist. Soc.—XI-236. Kalpa. May.

E. toddalioides, *Wight*, F.B.I.—II-482. *Cêppa, Titpoli.* Castle Rock, W. Ghats. Jan.

E. Wightiana, *Wight*, F.B.I.—II-485. Konkan, N. Kanara. *Stocks, Talbot.* Feb.-Mar.

E. zeylanica, *Wight*, F.B.I.—II-485. Sawad, Kanara. Feb.

E. lissophylla, *Thwaites*, F.B.I.—II-488. Konkan. *Stocks.*

E. caryophyllæa, *Wight*, F.B.I.—II-490. Marmagoa, Mahableshwar. May.

E. rubicunda, *Wight*, F.B.I.—II-495. *Lendi Jambul.* Shinghad. Mar.-May.

E. Stocksi, *Duthie*, F.B.I.—II-498. Konkan. *Stocks.*

E. jambolana, *Lam.*, F.B.I.—II-499. *Jambul.* Waghai, Dang. Planted widely. May.

E. Heyneana, *Wall.*, F.B.I.—II-500. Mahableshwar. May.

E. macrosepala, *Duthie*, F.B.I.—II-501. Nagar, N. Kanara. Jan.-Feb.

E. bracteata, *Roxb.*, F.B.I.—II-502. N. Kanara. Poona, planted. Apl.-July.

E. mooniana, *Wight*, F.B.I.—II-505. Ainshi Ghat. *Talbot.* Nov.

E. uniflora, *Linn.*, F.B.I.—II-505. (American.) Gardens. Aug.-Sept.

9. *Barringtonia.*

B. acutangula, *Gaertn.*, F.B.I.—II-508. *Nevar.* Shrivardhan. Oct.

10. *Careya.*

C. arborea, *Roxb.*, F.B.I.—II-511. *Kumbha.* W. Ghats widely. Apl.

LX.—MELASTOMACEÆ.

1. *Osbeckia.*

O. truncata, *Don.*, F.B.I.—II-514. Londa, Collem. Oct.

3. *Melastoma.*

M. malabathricum, *Linn.*, F.B.I.—II-523. *Paloré.* Kumta, Siddapur. Oct.-Mar.

10. *Sonerila.*

S. scapigera, *Dalz.*, F.B.I.—II-538. Khandalla. July-Aug.

S. Wallichii, *Benn.*, F.B.I.—II-538. Karwar. Aug.

21. *Memecylon.*

M. Wightii, *Thwaites*, F.B.I.—II-554. Karwar.
M. terminale, *Dalz.*, F.B.I.—II-558. W. Ghats southwards.
M. edule, *Roxb.*, F.B.I.—II-563. *Anjan.* Lanauli, W. Ghats, widely. Jan.-Mar.

LXI.—LYTHRARICÆ.

1. *Ammannia.*

A. peploides, *Spreng.*, F.B.I.—II-566. Rice fields, Malwan. Nov.
A. Ritchiei, *C.B. Clarke.*, F.B.I.—II-566. Belgaum. *Ritchie.*
A. rotundifolia, *Ham.*, F.B.I.—II-566. Savantvadi, Malwan. Nov.
A. tenuis, *C. B. Clarke*, F.B.I.—II-567. Konkan. Oct.
A. floribunda, *C. B. Clarke*, F.B.I.—II-567. Mahableshwar. Dec.-Jan.
A. rotala, *F. Muell.*, F.B.I.—II-567. Hullihul. *Talbot.* Dec.
A. pentandra, *Roxb.*, F.B.I.—II-568. Kudra, Londa, Malwan. Aug.
A. baccifera, *Linn.*, F.B.I.—II-569. *Bhar-jambul.* Mulier, Sind, Guzerat. Nov.
A. salicifolia, *Monti.*, F.B.I.—II-569. Hullihul, N. Kanara, Kelgaon, Poona. Nov.
A. multiflora, *Roxb.*, F.B.I.—II-570. Kelgaon, near Poona. Nov.

3. *Woodfordia.*

W. floribunda, *Salisb.*, F.B.I.—II-572. *Dhâyti.* Poona, Deccan Hills, widely. Jan.-May.

5. *Lawsonia.*

L. alba, *Lamb.*, F.B.I.—II-573. *Mendi*, Henna. Planted Guzerat and Deccan. Sandy, salt land near Bombay; seedlings abundant. Apl.-July.

7. *Lagerstrœmia.*

L. indica, *Linn.*, F.B.I.—II-575. *Chini Mindi.* Cult. in gardens. May-Aug.
L. parviflora, *Roxb.*, F.B.I.—II-575. *Bondarah.* Hills near Poona. June.
L. lanceolata, *Wall.*, F.B.I.—II-576. *Nana.* Kumta, Sirsi Road. Apl.-May.
L. flos-reginæ, *Retz*, F.B.I.—II-577. *Taman, Mothàbondàrà.* S. Konkan, Goa. May-July.

9. *Sonneratia.*

S. apetala, *Ham.*, F.B.I.—II-579. Dharamter, Mumbra, Thana. Feb.
S. acida, *Linn.*, F.B.I.—II-579. Hareshwar, Konkan. Feb.

10. *Punica.*

P. granatum, *Linn.*, F.B.I.—II-581. *Dàlimb.* The Pomegranate. Cult. widely.

LXII.—ONAGRACEÆ.

2. *Jussiœa.*

J. repens, *Linn.*, F.B.I.—II-587. Guzerat. Nov.
J. suffruticosa, *Linn.*, F.B.I.—II-587. *Pánlavang.* Tulsi Tank, near Poona. Aug.-Oct.

3. *Ludwigia.*

L. parviflora, *Roxb.*, F.B.I.—II-588 Narel. May-Nov.

Œnothera (*American*).

Œ. rosea, *Ait., DC.*, Prod.—III-51. Escaped from gardens, Poona, Mahableshwar. Nov.-Jan.

5. *Trapa.*

T. bispinosa, *Roxb.*, F.B.I.—II-590. *Shingari, Shingádá.* The Water Chestnut. Cult. in tanks widely.

LXIII.—SAMYDACEÆ.

1. *Casearia.*

C. graveolens, *Dalz.*, F.B.I.—II-592. *Bokhádá.* Hatland, Peint. Aulus Mawal. Waghai, Dang. Jan.-May.

C. esculenta, *Roxb.*, F.B.I.—II-592. *Mori.* Karwar, Yellapur. May.

C. rubescens, *Dalz.*, F.B.I.—II-593. W. Ghats, Konkan.

C. tomentosa, *Roxb.*, F.B.I.—II-593. *Chillara.* W. Ghats, Poona. Mar.

3. *Homalium.*

H. zeylonicum, *Benth.* F. B. I.—II-596. Diggi, N. Kanara. *Talbot.* May.

TURNERACEÆ (*Trop. America and Africa*).

Turnera.

T. ulmifolia, *Don., DC.* Prod—II-346. *Pewli Ghanari.* In gardens. Oct.-Feb.

LXIV.—PASSIFLORÆ.

1. *Passiflora.*

P. fœtida, *Cav., DC.*,Prod.—III-331. *Veli Ghani.* As a garden escape frequent.

3. *Modecca.*

M. palmata, *Lam.*, F.B.I.—II-603. *Tyer balli.* Divimana, Sumpkund, N. Kanara. May.

Carica.

C. papaya, *Linn., DC.,Prod.*—XV. S.I., I-414. *Papaya.* The Papay. Cult. widely.

LXV.—CUCURBITACEÆ.

2. *Trichosanthes.*

T. palmata, *Roxb.*, F.B.I.—II-606. *Koundal.* Lanauli, Mahableshwar. May-July.

T. cucumerina, *Linn.*, F.B.I.—II-609. *Kadu-padval.* Poona, Karwar. July-Aug.

T. anguina, *Linn.*, F.B.I.—II-610. *Padwal.* The Snake Gourd. Cult.

3. *Trichosanthes.*

T. palmata, *Roxb.*, F.B.I.—II-606. *Koundal.* W. Ghats, widely. May-July.

T. cucumerina, *Linn.*, F.B.I.—II-609. *Jungli Padole.* Karwar, N. Kanara, Poona. July-Aug.

T. anguina, *Linn.*, F.B.I.—II-610. *Padol, Chiconda, Chachinda.* Cult.

6. *Lagenaria.*

L. vulgaris, *Seringe*, F.B.I.—II-613. *Dudhya.* Cult.

7. *Luffa.*

L. ægyptiaca, *Mill*, F.B.I.—II-614. *Ghosali, Ghiya Turoi.* Cult.

L. acutangula, *Roxb.*, F.B.I.—II-615. *Shirolà, Dodká Turoi.* Cult.

L. amara, *Roxb.*, F.B.I.—II-615. *Kadu-shirola, Kadudodká Ran Turoi.* W. Ghats. Sept.

L. echinata, *Roxb.*, F.B.I.—II-615. *Kukarvel Deodángri.* Godra, Bombay. Sept.

8. *Benincasa.*

B. cerifera, *Savi.*, F.B.I.—II-616. *Kohala.* Cult.

9. *Momordica.*

M. charantia, *Linn.*, F.B.I.—II-616. *Karli.* Cult. widely. May-Aug.

M. balsamina, *Linn.*, F.B.I.—II-617. *Kurelo-jangro.* Sind, Pahlanpur. Nov.

M. dioica, *Roxb.*, F.B.I.—II-617. *Kartoli.* Deccan. Cult. widely. June-Aug.

M. cochinchinensis, *Spr.*, F.B.I.—II-618. N. Kanara. June-July.

M. cymbalaria, *Fenzb.*, F.B.I.—II-618. *Kadwanchi.* Benicopa, Dharwar. Nov.

10. *Cucumis.*

C. trigonus, *Roxb.*, F.B.I.—II-619. *Karit.* Poona. June.

C. prophetarum, *Linn.*, F.B.I.—II-619. Mulier, Sind.

C. melo, *Linn.*, F.B.I.—II-620. *Kharbuza.* Cult.

C. melo, var. utilitissimus. *Tur Kakri.* Cult.

C. melo, var. momordica. *Shendada.* Cult. and wild on hills near Poona.

C. sativus, *Linn.*, F.B.I.—II-620. *Kakri.* Cult. Oct.-Dec.

11. *Citrullus.*

C. colocynthis, *Schrad.*, F.B.I.—II-620. *Kadu vrindavan.* Deccan, Guzerat. Nov.—Jan.

C. vulgaris, *Schrad.*, F.B.I.—II-621. *Tarbuj, Kalingad.* Cult.

C. vulgaris, var. fistulosus. Cult.

12. *Cephalandra.*

C. indica, *Naud.*, F.B.I.—II-621. *Tondli.* Sind, Rajkot, Deccan. Aug.-Sept.

13. *Cucurbita.*

C. moschata, *Duchesne* (Duthie's "Field and Garden Crops"). *Bhopla.* Cult.

C. pepo, *DC.*, F.B.I.—II-622. *Vegetable marrow.* Cult.

14. *Bryonia.*

B. laciniosa, *Linn.*, F.B.I.—II-622. *Pindail* or *Pindwail, Shivlingi.* Poona. Aug. Sept.

15. *Mukia.*

M. scabrella, *Arn.*, F.B.I.—II-623. *Hanali, Chirati.* Hills near Poona, Dakor, Guzerat. July.

16. *Zehneria.*

Z. Baueriana, *Erdl.*, F.B.I.—II-624. Mahableshwar, Ambe Ghat. Aug.-Oct.

Z. umbellata, *Thw.*, F.B.I.—II-625. *Gomethi, Gogari.* W. Ghats. Sept.-Oct.

18. *Rhynchocarpa.*

R. fœtida, *Schrad.*, F.B.I.—II-627. *Nurakwel.* Castle Rock, Mira Dongar, Penn. Oct.-Nov.

19. *Corallocarpus.*

C. epigæa, *H. f.*, F.B.I.—II-627. *Karwina.* Poona, Badami. June-Aug.
C. conocarpa, *H. f.*, F.B.I.—II-628. *Nurki.* Malpor, Gunder Guzerat. *Dalz.*
C. velutina, *H. f.*, F.B.I.—II-628. Sind. *Dalzell.*

21. *Ctenolepis.*

C. Garcini, *Naud.*, F.B.I.—II-629. Surat. Oct.
C. cerasiformis, *Naud.*, F.B.I.—II-630. Verawel.

22. *Dicœlospermum.*

D. Ritchiei, *C.B. Clarke*, F.B.I.—II-630. *Gogara.* W. Ghats, near Matheran. July-Oct.

28. *Zanonia.*

Z. indica, *Linn.*, F.B.I.—II-633. *Chirpoti.* Vingorla. *Dalzell.* Fruit ripe. May.

LXVI.—Begoniaceæ.

1. *Begonia.*

B. integrifolia, *Dalz.*, F.B.I.—II-648. W. Ghats. *Dalzell.*
B. crenata, *Dryand*, F.B.I.—II-651. Mahableshwar, Deccan Hills. Sept.
B. concanensis, *A.D.C.*, F.B.I.—II-653. Lanauli. Aug.
B. trichocarpa, *Dalz.*, F.B.I.—II-653. W. Ghats. *Dalzell.*

LXVII.—Datiscaceæ.

2. *Tetrameles.*

T. nudiflora, *R. Br.*, F.B.I.—II-657. *Ugado.* W. Ghats, N. Kanara. Feb.-Mar.

LXVIII.—Cactaceæ.

Cereus.

C. multiangularis, *Haw.*, *DC.*, Prod.—III-463. *Bhowdari Nigadung.* Gardens, Poona.
C. peruvianus, *Tabern.*, *DC.*, Prod.—III-464. *Sadari Nigadung.* Planted as a fence. Kumta. June, July.
C. quadrangularis, *Haw.*, *DC.*, Prod.—III-468. *Choudari Nigadung.* Planted, Poona. June-July.
C. triangularis, *Haw.*, *DC.*, Prod.—III-468. *Tindari Nigadung.* Planted, Poona. July.

Opuntia.

O. Dillenii, *Haw.*, *DC.*, Prod.—III-472. *Pila Nigadung.* Poona, rare. June, July.
O. nigricans, *Haw.*, *DC.*, Prod.—III-473. *Nigadung.* Deccan, very abundant.
O. cochinillifera, *Haw.*, *DC.*, Prod.—III-473. *Binkanta Nigadung.* Planted, Bombay.
O. Ficus-indica, *Haw. DC.*, Prod.—III-473. *Mota Binkanta Nigadung.* Poona. Feb.-Mar.

Pereskia.

P. aculeata, *Mill.*, *DC.*, Prod.—III-474. Gardens.
P. grandiflora, *Haw.*, *DC.*, Prod.—III-475. Planted, Poona. July.

Phyllocactus.

P. Hookeri, Nicholson's " Dict. Gard." Gardens. June.

LXIX.—FICOIDEÆ.

1. *Aizoon.*

A. canariensis, *Linn.*, F.B.I.—II-659. Hub river, near Karachi. Dec.

2. *Sesuvium.*

S. portulacastrum, *Linn.*, F.B.I.—II-659. Revadanda. Dec.

3. *Trianthema.*

T. monogyna, *Linn.*, F.B.I.—II-660. *Visha Kapra.* Karachi, Poona. June, Feb.

T. crystallina, *Vahl.*, F.B.I.—II-660. *Bhis Kapra.* Bijapur, Badami. Oct.

T. pentandra, *Linn.*, F.B.I.—II-660. *Bhis Kapra.* Poona, Badami, Karachi, Oct.-Nov.

T. decandra, *Linn.*, F.B.I.—II-661. *Bhis Kapra.* Adur, 10 miles W. of Haveri, Dharwar Coll. Dec.

T. hydaspica, *Edgw.*, F.B.I.—II-661. Karachi. Dec.

4. *Orygia.*

O. decumbens, *Forsk.*, F.B.I.—II-661. Karachi. Jan.

5. *Mollugo.*

M. hirta, *Thunb.*, F.B.I.—II-662. *Dusera Sag, Kottruck.* Khandala. Feb.-Apl.

M. spergula, *Linn.*, F.B.I.—II-662. *Jharshi.* Badami, Belgaum. Oct.

M. stricta, *Linn.*, F.B.I.—II-663. *Jharshi.* Poona, Panchgani, Belgaum. Sept.-Nov.

M. cerviana, *Seringe*, var. rupestris, F.B.I.—II-663. *Pada.* Guzerat, Badami. Oct.-Nov.

6. *Gisekia.*

G. pharnaceoides, *Linn.*, F.B.I.—II-664. *Waluche Baji.* Badami. Aug.-Sept.

7. *Limeum.*

L. indicum, *Stocks*, F.B.I.—II-664. Sind.

LXX.—UMBELLIFERÆ.

1. *Hydrocotyle.*

H. javanica, *Thunb.*, F.B.I.—II-667. Hoolicul, Kanara. Feb.

H. burmanica, *Kurz*, F.B.I.—II-668. Bombay. Oct.

H. asiatica, *Linn.*, F.B.I.—II-669. *Brahmi.* Deccan, S. M. Country, W. Ghats. June-Dec.

H. nitidula, *Rich*, D.C., Prod.—IV-66. Gardens widely. Sep.-Mar.

7. *Bupleurum.*

B. mucronatum, *W. & A.*, F.B.I.—II-676. Santaveri. Dec.

11. *Carum.*

C. stictocarpum, *C. B. Clarke*, F.B.I.—II-680. *Ran Owa.* Deccan Hills, widely cult. Sept.

C. Roxburghianum, *Benth.*, F.B.I.—II-682. Deccan Hills, widely. Nov.-Dec.

C. copticum, *Benth.*, F.B.I.—II-682. *Owa.* Cult. Salt Swamp, Bombay. Apl.

13. *Pimpinella.*

P. Heyneana, *Wall.*, F.B.I.—II-684. Wadi, near Mawar, Dharwar. Oct.
P. Candolleana, *W. & A.*, F.B.I.—II-687. Panchgani. Oct.
P. monoica, *Dalz.*, F.B.I.—II-687. Mahableshwar. Nov.
P. tomentosa, *Dalz.*, F.B.I.—II-689. Sinhagad. Nov.
P. adscendens, *Dalz.*, F.B.I.—II-689. Poona, Sinhagad. Feb.
P. lateriflora, *Dalz.*, F.B.I.—II-689. Deccan ravines, Dalz.

20. *Fœniculum.*

F. vulgare, *Gaertn.*, F.B.I.—II-695. *Bari Shopha.* Cult. Bombay. Dec

32. *Peucedanum.*

P. graveolens, *Benth.*, F.B.I.—II-709. *Bâlant Shop.* The Dill Seed.
Shepu, the young herb. Cult.
P. Dhana, *Ham.*, F.B.I.—II-709. *Koland.* Pen, Konkan. Aug.
P. grande, *C. B. Clarke*, F.B.I.—II-710. *Bâfali.* Mawal Taluka. July.

33. *Heracleum.*

H. aquilegifolium, *C. B. Clarke*, F.B.I.—II-715. Konkan. *Stocks.*
H. sprengelianum, *W. & A.*, F.B.I.—II-716. Khandala, W. Ghats. Aug.
H. concanense, *Dalz.*, F.B.I.—II-716. Panchgani, Khandala. Aug.
H. Pinda, *Dalz. & Gibs.*, F.B.I.—II-717. *Pinda.* Hari Chandragarh. Aug.

34*. *Coriandrum.*

C. sativum, *Linn.*, F.B.I.—II-717. *Dhana*, (grain) Coriander, *Kotimbir*, (herb) Cult.

34**. *Cuminum.*

C. cyminum, *Linn.*, F.B.I.—II-718. *Jira.* Cult.

35. *Daucus.*

D. carota, *Linn.*, F.B.I.—II-718. *Gajir.* The Carrot. Cult.

LXXI.—ARALIACEÆ.

3*. *Panaœ.*

P. fruticosum, *Linn.*, *DC.*, Prod.—IV-254. Gardens.
P. cochleatum, *DC.*, Prod.—IV-253. Gardens.
P. nitidum, *Hort.* Gardens.
P. Victoriæ, *Gard. Chron.*—XIX-405. Gardens.

Fatsia.

F. papyrifera. "D. et Pl. Rev. Hort., 1854"—105. The Rice Paper Plant. (Syn. *Aralia papyrifera*, *Bot. Mag.*, *t.* 4897.) Gardens. Dec.

7. *Heptapleurum.*

H. venulosum, *Seem.*, F.B.I.—II-729. Gardens, Bombay, Poona.

8. *Trevesia.*

T. palmata, *Vis.* F.B.I.—II-732. Gardens, Poona. Apl.

15. *Hedera.*

H. Helix, *Linn.*, F.B.I.—II-739. *Ivy.* Gardens, Poona.

LXXII.—CORNACEÆ.

1. *Alangium.*

A. Lamarckii, *Thw.*, F.B.I.—II-741. *Ankol.* Bodeli, Guzerat Gadhul, N. Kanara. Jan.

4. *Mastixia.*

M. pentandra, *Bl.*, F.B.I.—II-745. Dharwar, Kanara, Konkan. *Stocks.*

LXXIV.—CAPRIFOLIACEÆ.

6. *Lonicera.*

L. Leschenaultii, *Wall.*, F.B.I.—III-10. *Honeysuckle.* Planted.

LXXV.—RUBIACEÆ.

2. *Anthocephalus.*

A. cadamba, *Mig.*, F.B.I.—III-23. *Nhew, Niv.* Dasgaon, Ratnagiri Dist. Oct.

4. *Adina.*

A. cordifolia, *H. f.*, F.B.I.—III-24. *Hedu, Hed.* Nasik, Wassind. Aug.-Feb.

5. *Stephegyne.*

S. parvifolia, *Korth.*, F.B.I.—III-25. *Kudamb, Kalamb.* Dabhoi. Nov.

6. *Nauclea.*

N. purpurea, *Roxb.*, F.B.I.—III-26. *Devphanas.* S. Kanara. Feb.

N. elliptica, *Datz.*, F.B.I.—III-27. *Phuga.* Tiniaghat. Feb.

N. missionis, *Wall.*, F.B.I.—III-27. *Phuga.* Karwar, Sirsi. Apl.

10. *Hymenodiction.*

H. excelsum, *Wall.*, F.B.I.—III-35. *Kalâkadu.* Katriz Ghât. Aug.

H. obovatum, *Wall.*, F.B.I.—III-36. *Kadwah Sirid.* Matheran.

12. *Wendlandia.*

W. exserta, *DC.*, F.B.I.—III-37. Decid. forest, N. Deccan. *Talbot.*

W. Notoniana, *Wall.*, F.B.I.—III-40. Castle Rock, Thalghat. Feb.

14. *Deviella.*

D. repens, *Forst.*, F.B.I.—III-42. Badami, Poona, Dharampter. Apl.-Nov.

20. *Hedyotis.*

H. vestita, *Br.*, F.B.I.—III-58. Sawantwadi, Kumta. Oct.-Nov.

H. nitida, *W. & A.*—III-61. Londa. Nov.

21. *Oldenlandia.*

O. corymbosa, *Linn.*, F.B.I.—III-64. *Khet papada, Pit Papada.* Poona, Godra. Kalyan. Sept.-Nov.

O. diffusa, *Roxb.*, F.B.I.—III-65. Sirsi. *Talbot.* April.

O. Heynii, *Br.*, F.B.I.—III-65. *Paripath.* Malwan, Belgaum. Nov.

O. umbellata, *Linn.*, F.B.I.—III-66. *Chirval.* Wadi, near Raichor. Sept.-Jan.

O. dichotoma, *Boen.*, F.B.I.—III-66. *Kajhuri.* Poona District.

O. aspera, *DC.*, F.B.I.—III-68. Poona, Badami. Feb.-Aug.

O. senegalensis, *Hier.*, F.B.I.—III-68. Kirkee. Sept.

O. retrorsa, *Boiss.*, F.B.I.—III-68. Banks of Mulier, Karachi. Nov.

22. *Anotis.*

A. lancifolia, *Dalz.*, F.B.I.—III-73. Mahableshwar, Purandhar. Sept.
A. Rheedii, *W. & A.*, F.B.I.—III-73. Near Matheran, Goa Ghats. Aug.-Oct.
A. Montholoni, *H.f.*, F.B.I.—III-73. *Fuli.* Poona. Aug.
A. fœtida, *Dalz.*, F.B.I.—III-74. Kanara, Khandalla, Londa. Aug.

25. *Ophiorhiza.*

O. Harrisiana, *Heyne*, F.B.I.—III-78. Ambe Ghat, Divimana. Aug.

29. *Mussænda.*

M. frondosa, *Linn.*, F.B.I.—III-89. *Shivardoli.* Koina Valley, N. Kanara, widely. July-Nov.

Hamelia (*American*).

H. patens, *Jacy.*, *D.C.*, Prod.—IV-441. Planted.

2. *Webera.*

W. corymbosa, *Willd.*, F.B.I.—III-102. W. India. *E. de Cresp̃igny.*

46. *Randia.*

R. uliginosa, *DC.*, F.B.I.—III-110. *Pendar.* *Pandri* near Pen. Porebunder. June.
R. dumetorum, *Lamk.*, F.B.I.—III-110. *Gela.* Matheran, Mahableshwar. Sumpkund. Mar.-July.
R. rugulosa, *Thw.*, F.B.I.—III-113. Devimana, N. Kanara. Matheran, Feb.-Mar.

74. *Gardenia.*

G. lucida, *Roxb.*, F.B.I.—III-115. *Dikémali.* N. Kanara. June.
G. gummifera, *Linn.f.*, F.B.I.—III-116. *Dikémali.* N. Kanara. Feb.-June.
G. turgida, *Roxb.*, var. montana, F.B.I.—III-118. Poona District. June,
G. florida, *L. Roxb.*, Fl. Ind.—I-703. Cult., Gardens.

61. *Knoxia.*

K. corymbosa, *Willd.*, F.B.I.—III-128. Londa, Gamji, S. M. Railway.

63. *Canthium.*

C. umbellatum, *Wight*, F.B.I.—III-132. Khandalla, Mahableshwar. Nov.
C. Rheedii, *DC.*, F.B.I.—III-134. Yacombi, N. Kanara. Feb.-May.
C. angustifolium, *Roxb.*, F.B.I.—III-135. *Chapyel.* Castle Rock, Kadgal, N. Kanara. Nov.
C. parviflorum, *Roxb.*, F.B.I.—III-135. *Kirni.* Poona, Mungode, N. Kanara. Apl.-May.

64. *Vangueria.*

V. spinosa, *Roxb.*, F.B.I.—III-136. *Alu.* Lanauli, Peint Taluka.

66. *Ixora.*

I. lanceolaria, *Colebr.*, F.B.I.—III-138. Godhuli, Karwar. July.
I. Notoniana, *Wall.*, F.B.I.—III-138. Santaveri. Dec.
I. polyantha, *Wight.*, F.B.I.—III-140. Nilkund, N. Kanara. Mar.
I. elongata, *Heyne*, F.B.I.—III-141. Parwar Ghat, Bheemashankar. Feb.
I. parviflora, *Vahl.*, F.B.I.—III-142. *Raikuda, Lokhandi.* Pal jungles. Matheran. Feb.

I. coccinea, *Linn.*, F.B.I.—III-145. *Ok-bok.* Thana, Sion, Ratnagiri. Dec.
I. nigricans, *Br.*, F.B.I.—III-148. *Ambavne.* Kumta, Mahableshwar. May-Nov.

67. *Pavetta.*

P. indica, *Linn.*, F.B.I.—III-150. Matheran. Mar.-Apl.
P. hispidula, *W. & A.*, var. siphonantha, F.B.I.—III-151. Matheran, Bheemashankar. May-June.
P. brunonis, *Wall.*, F.B.I.—III-152. Yacombi, N. Kanara. May.

68. *Coffea.*

C. arabica, *Linn.*, *CD.*, Prod.—IV-499. *Boond.* Coffee. Planted, Jan.-Apl.

69. *Morinda.*

M. citrifolia, *Linn.*, F.B.I.—III-155. *A'l, Bartondi.* Poona. May.
M. citrifolia, *Linn.*, var. bracteata. Marmagoa, near Sea. Nov.
M. tinctoria, *Roxb.*, F.B.I.—III-156.

75. *Psychotria.*

P. Thwaitesii, *H. f.*, F.B.I.—III-162. Nilkund Ghat, N. Kanara. Mar.
P. truncata, *Wall.*, F.B.I.—III-163. Mahableshwar, Diggi, N. Kanara. May.
P. Dalzellii, *H. f.*, F.B.I.—III-163. Banda, Yellapur, N. Kanara.
P. sarmentosa, *Bl.*, F.B.I.—III-165. Yacombi, N. Kanara. Jan.-Feb.

76. *Chasalia.*

C. curviflora, *Thw.*, F.B.I.—III-176. Karwar, Siddapur, Divimana, N. Kanara. Apl.-May.

79. *Lasianthus.*

L. venulosus, *Wight*, F.B.I.—III-190. W. Ghats, *E. de Crespigny.*

80. *Saprosma.*

S. indicum, *Dalz.*, F.B.I.—III-192. Ghats, Western Peninsula.

84. *Hamiltonia.*

H. suaveolens, *Roxb.*, F.B.I.—III-197. *Gidas, Gidasawa. Ghanera.* Sinhagad, Mahableshwar, Katriz. Feb.

Serissa (*Eastern Asia*).

S. fœtida, *Comm.*, *DC.*, Prod.—IV-575. Gardens. May.

86. *Hydrophyllax.*

H. maritima, *Linn.*, F.B.I.—III-199. Porebunder, Katiawad Coast. Dec.

87. *Spermacoce.*

S. stricta, *Linn. f.*, F.B.I.—III-200. Poona, Badami. Oct.-Nov.
S. hispida, *Linn.*, F.B.I.—III-200. *Madanghanti.* Nadiad, Poona. Sept.-Oct.

88. *Gaillonia.*

G. hymnostephana, *Jaub. & Spach.*, F.B.I.—III-202. Bullo Khan, Sind. Aug.

89. *Rubia.*

R. cordifolia, *Linn.*, F.B.I.—III-202. *Manjishtha, Vitali.* Mahableshwar. Sept.-Jan.

LXXVIII.—Compositæ.

2. *Centratherum.*

C. molle, *Benth.*, F.B.I.—III-227. Tugglepet, N. Kanara. Nov.
C. Ritchiei, *H. f.*, F.B.I.—III-228. Goa. Nov.
C. phyllolænum, *Benth.*, F.B.I.—III-228. Marmagoa. Oct.
C. tenue, *Clarke*, F.B.I.—III-228. Mahableshwar. Oct.
C. Hookeri, *Clarke*, F.B.I.—III-228. Khandalla. Nov.

3. *Lamprachœnum.*

L. microcephalum, *Benth.*, F.B.I.—III-229. *Ajadandi, Brahmadandi.* Mahableshwar. Oct.

4. *Adenoon.*

A. indicum, *Dalz.*, F.B.I.—III-229. *Koosumb, Mota Sonki.* Mahableshwar, Tinai, N. Kanara. Sept.

5. *Vernonia.*

V. cinerea, *Less*, F.B.I.—III-233. *Sahadevi.* Matheran, Tata, Sind. Feb.
V. divergens, *Benth.*, F.B.I.—III-234. *Kandesur.* Sirsi, N. Kanara, Khandalla. Dec.
V. anthelmintica, *Willd.*, F.B.I.—III-236. *Kadukarala.* Poona.
V. cinerascens, *Schultz Bip.*, F.B.I.—II-237. Ruk, Karachi, Sind. Oct.-Dec.
V. indica, *Clarke*, F.B.I.—III-238. Panchgani, Mawar. Oct.

6. *Elephantopus.*

E. scaber, *Linn.*, F.B.I.—III-242. *Baltan, Hastipata.* Bulsad, Guzerat, Konkan, widely. Sept.-Nov.

7. *Adenostemma.*

A. viscosum, *Forst.*, F.B.I.—III-242. Mahableshwar. Sept.-Feb.

8. *Ageratum.*

A. conyzoides, *Linn.*, F.B.I.—III-243. *Oshadi, Sadadevi.* Poona, widely spread. Nov.-Mar.

12. *Dichrocephala.*

D. latifolia, *DC.*, F.B.I.—III-245. Mawar, Panchgani. Aug.-Sept.

13. *Cyathocline.*

C. lyrata, *Cass.*, F.B.I.—III-246. *Avkir.* Kirkee, Mawal taluka. Nov.-Feb.
C. lutea, *Law*, F.B.I.—III-246. Karlee, Mawal. Feb.

14. *Grangea.*

G. madraspatana, *Poir.*, F.B.I.—III-247. *Mustaru, Dovana.* Dharwar, Panwel, Sukkur, Sind. Dec.-May.

20. *Aster.*

A. amellus, *Linn.*, *DC.*, Prod.—V-231. Michelmas Daisy. Cult. Poona.

22. *Erigeron.*

E. asteroides, *Roxb.*, F.B.I.—III-254. *Sonasali, Maredi.* Ahmednagar, Poona. Oct.-Nov.

Vittadinia (*Australasia*).

V. australis, *A. Rich.*, *DC.*, Prod.—V.-280. Australian Daisy. Cult. gardens.

24. *Conyza.*

C. stricta, *Willd.*, F.B.I.—III-258. Panchgani, Wada, near Mahableshwar. Oct.

26. *Blumea.*

The species of this genus generally are named *Burambi* or *Mharbir.*

B. amplectans, *DC.*, F.B.I.—III-260. Bombay, Vankanea, Kattiawad. Dec.
B. Wightiana, *DC.*, F.B.I.—III-261. Matheran, Poona. Dec.-Jan.
B. glomerata, *DC.*, F.B.I.—III-262. Konkan, Dalz.
B. lacera, *DC.*, F.B.I.—III-263. *Burando.* N. Kanara, Dang. Feb.-Apl.
B. virens, *DC.*, F.B.I.—III-264. Konkan.
B. membranacea, F.B.I.—III-265. *Mharbir.* Poona, Alur, Dharwar. May.
B. oxydonta, *DC.*, F.B.I.—III-266. Lanauli. Jan.-Mar.
B. eriantha, *DC.*, F.B.I.—III-266. *Nimurdi.* Panwel. Feb.
B. Malcolmii, *H. f.* F.B.I.—III-266. Mahableshwar.
B. malabarica, *H. f.* F.B.I.—III-267. Sirsi, N. Kanara. Feb.
B. myriocephala, *DC.*, F.B.I.—III-269. Divimana, N. Kanara. Feb.

28. *Pluchea.*

P. Wallichii, *DC.*, F.B.I.—III-272. Waghai, Dangs. Feb.
P. tomentosa, *DC.*, F.B.I.—III-272. Bijapur, Deccan. Feb.
P. arguta, *Bois*, F.B.I.—III-273. Mulier District, Sind. Jan.

29. *Nanothamnus.*

N. sericeus, *Thoms.*, F.B.I.—III-273. Boshi, Lanauli. Apl.

30. *Epaltes.*

E. divaricata, *Cass.*, F.B.I.—III-274. Malwan, Sangameswar, Konkan. Nov.-Dec.

31. *Sphaeranthus.*

S. africanus, *Linn.*, F.B.I.—III-275. *Mundi, Gorakhamundi.* Vingorla. Oct.

33. *Blepharispermum.*

B. subsessile, *DC.*, F.B.I.—III-276. Dharwar, Katriz, near Poona. Sept.

39. *Anaphalis.*

A. cutchica, *Clarke*, F.B.I.—III-284. Barda, Katiawad.

40. *Lasiopogon.*

L. lanatum, *Cass.*, F.B.I.—III-287. Khirthar Mts., Sind. Mar.

42. *Gnaphalium.*

G. alboluteum, *Linn.*, F.B.I.—III-288. Matheran. Dehu, Poona Dist. Mar.
G. indicum, *Linn.*, F.B.I.—III-289. Pen, Konkan. Feb.
G. pulvinatum, *Del.*, F.B.I.—III-289. Shinghad, Mawal Taluk. Feb.

44. *Caesulia.*

C. axillaris, *Roxb.*, F.B.I.—III-291. *Mâkâ.* Deccan, widely. Dec.-Feb.

45. *Inula.*

I. grantioides, *Boiss.*, F.B.I.—III-296. Hyderabad (Sind). Dec.

46. *Vicoa.*

V. auriculata, *Cass.*, F.B.I.—III-297. *Sonkadi.* Deccan. Nov.-Feb.
V. cernua, *Dalz.*, F.B.I.—III-297. Mahableshwar. Nov.-Feb.

47. *Pulicaria.*

P. foliolosa, *DC.*, F.B.I.—III-298. *Kakro.* Hyderabad (Sind). Poona. Nov.
P. Wightiana, *Clarke*, F.B.I.—III-298. Deccan, widely. Sept.
P. angustifolia, *DC.*, F.B.I.—III-299. Porebandar. Dec.
P. glaucescens, *Jaub. & Spach.*, F.B.I.—III-300. Sind.
P. Boissieri, *H. f.*, F.B.I.—III-300. Sind.
P. Stocksii, *H.f.*, F.B.I.—III-300. Laki, Sind. Oct.

48* *Lagascea.* (*Mexico and Cent. America.*)

L. mollis, *Pers.*, F.B.I.—III-302. *Jharwad.* Deccan, nearly all the year.

48** *Melampodium.* (*Trop. America.*)

M. divaricatum, *DC.*, Prod.—V-520. Poona, weed in gardens. Sept.

51. *Xanthium.*

X. strumarium, *Linn.*, F.B.I.—III-303. *Sankeswar.* Poona, Deccan, widely. Jan.-Feb.

Zinnia. (*Mexico.*)

Z. elegans, *Jacq.*, *DC.*, Prod.—V-536. *Jinia.* Garden escape. Sept.

52. *Siegesbeckia.*

S. orientalis, *Linn.*, F.B.I.—III-304. *Katampam, Katampu.* Panchgani, Poona. Dec.

54. *Eclipta.*

E. alba, *Hassk.*, F.B.I.—III-304. *Mâka Bungaroo.* Karachi (Sind), Poona, Kalyan. Oct.-Dec.

55. *Sclerocarpus.*

S. africanus, *Jacq.*, F.B.I.—III-305. Nasik, Poona. Aug.

56. *Blainvillea.*

B. latifolia, *DC.*, F.B.I.—III-305. Poona. Sept.

57. *Wedelia.*

W. urticæfolia, *DC.*, F.B.I.—III-306. Poona, Kanara. Aug.
W. biflora, *DC.*, F.B.I.—III-306. *Sonki.* Marmagoa. Dec.

Helianthus.

(*North America, Peru, and Chili.*)

H. tuberosus, *Linn.*, *DC.*, Prod.—V-590. *Artichoke.* Jerusalem Artichoke. Cult.
H. annuus, *Linn.*, *DC.*, Prod.—V-585. *Suryaful.* Sunflower. Cult.
H. argyrophyllus, *Hort.* *Kasi Suryaful.* Silvery-leaved Sunflower. Cult.
H. rigidus (*Nicolson's Dict. Gard., II.*, 127). Small Sunflower. Cult.

58. *Spilanthes.*

S. Acmella, *Linn.*, F.B.I.—III-307. *Akkalkara.* Nov.

58. *Guizotia.*

G. abyssinica, *Cass.*, F.B.I.—III-307. *Karala, Kalatil.* Cultivated.

59. *Glossocardia.*

G. linearifolia, *Cass.*, F.B.I.—III-308. *Pitpapda, Phattarsuva, Gooi.* Deccan. Aug.

Cosmos. (*Trop. America.*)

C. bipinnatus, *Cav., DC.*, Prod.—V-606. Gardens.

60. *Bidens.*

B. pilosa, *Linn.*, F.B.I.—III-309. Aug.

61. *Glossogyne.*

G. pinnatifida, *DC.*, F.B.I.—III-310. Sonoree Ghat, Poona. Oct.

62.°° *Tridax.*

T. procumbens, *Linn.*, F.B.I.—III-311. Deccan, widely. Common weed.

63. *Achillea.*

A. millefolium, *Linn.*, F.B.I.—III-312. Milfoil. Gardens.

Flaveria (*Tropical America.*)

F. contrayerba, *Pers., DC.*,—V-635. Poona, Bijapur, superabundant all the year.

71. *Tanacetum.*

T. vulgare, *Linn., DC.*, Prod.—VI-128. *Tansy.* Gardens, Poona.

72. *Artemisia.*

A. parviflora, *Roxb.*, F.B.I.—III-322. *Tail Downa.* Mahableshwar. Oct.

A. scoparia, *Waldst. & Kit.*, F.B.I.—III-323. *Gájára.* Mulier, Sind. Mar.

A. vulgaris, *Linn.*, F.B.I.—III-325. *Surband, Dhor Downa.* Panchgani. Oct.

A. pallens, *Wall.*, F.B.I.—III-329. *Davna.* Cult. at Alandi, Jejuri, for use at the *Ram Nawami* festival.

76. *Gynura.*

G. nitida, *DC.*, F.B.I.—III-333. Lanauli, Purandhur, Singhur. Sept.

77. *Emilia.*

E. sonchifolia, *DC.*, F.B.I.—III-336. *Sadamandi.* Poona. Sept.

78. *Notonia.*

N. grandiflora, *DC.*, F.B.I.—III-337. *Vandar-roti.* Mulhargad Poona. Sept.

N. balsamica, *Dalz. & Gibs.*, F.B.I.—III-337. Hills near Satara. Sept.

79. *Senecio.*

(*The name Sonki is loosely applied in this genus.*)

S. tenuifolius, *Burm.*, F.B.I.—III-345. Badami. Oct.

S. Hewrensis, *H.f.*, F.B.I.—III-346. Jooneer. Sept.

S. Edgeworthii, *H.f.*, F.B.I.—III-346. Katraz, Mahableshwar, Dongargan. Aug.-Nov.

S. Dalzellii, *Clarke*, F.B.I.—III-346. Pand, Matheran. Dec.

S. Grahamii, *H.f.*, F.B.I.—III-346. *Sonki.* Khandalla. Sept.

S. Gibsoni, *H.f.*, F.B.I.—III-347. Konkan and Kanara. *Law—Dalz.*

S. belgaumensis, *Clarke*, F.B.I.—III-348. Ainshi, N. Kanara, Mahableshwar. Oct.-Jan.

80. *Othonnopsis.*

O. intermedia, *Boiss.*, F.B.I.—III-356. Top of Kojak Pass. *H. E. M. James.* Spring.

82. *Calendula.*

C. officinalis, *Linn.*, F.B.I.—III-357. Marygold. Cult. widely.

83. *Echinops.*

E. echinatus, *DC.*, F.B.I.—III-358. *Utkatar.* Poona. Nov.

90. *Goniocaulon.*

G. glabrum, *Cass.*, F.B.I.—III-377. *Kadkusumba.* Uruli, Poona. Jan.

93. *Tricholepis.*

T. radicans, *DC.*, F.B.I.—III-381. *Dahan.* Poona. Sept.

T. amplexicaulis, *Clarke*, F.B.I.—III-381. *Dahan.* Khandalla. Dec.

T. glaberrima, *DC.*, F.B.I.—III-381. *Dahan.* Panchgani. Dec.

94. *Volutarella.*

V. divaricata, *Benth.*, F.B.I.—III-383. *Lih Katmanda.* Broach, Mulir, Sind. Nov.

96. *Carthamus.*

C. tinctorius, *Linn.*, F.B.I.—III-386. *Kusumba. Kardi.* Cult. Jan.-Feb.

98. *Dicoma.*

D. tomentosa, *Cass.*, F.B.I.—III-387. *Navanangi.* Tata, Sind. Jeur. Jan.

98.* *Hochstetteria.*

H. Schimperi, *DC.*, F.B.I.—III-388. Sind. Jan.

114. *Lactuca.*

L. Heyneana, *DC.*, F.B.I.—III-403. *Patri.* Deccan, widely. Dec.

L. remotiflora, *DC.*, F.B.I.—III-403. *Patri.* Poona, Badami. Sept.

L. Scariola, *Linn.*, var. sativa. *Salad.* The Lettuce. Cult. widely.

116. *Picridium.*

P. tingitanum, *Desf.*, F.B.I.—III-413. Sind.

117. *Sonchus.*

S. asper, *Vill.*, F.B.I.—III-414. *Mhatara.* Poona. Jan.-Mar.

S. oleraceus, *Linn.*, F.B.I.—III-414. *Mhatara.* Deccan, widely. Sept.-Mar.

S. arvensis, *Linn.*, F.B.I.—III-414. *Mhatara.* Bijapur. Dec.

118. *Launea.*

L. pinnatifida, *Cass.*, F.B.I.—III-416. *Pathari.* Rewadanda, Verawal. Dec.

L. sp. inc. Khirthar Mts., Sind. Mar.

THE BIRDS OF NORTH KANARA.

By J. Davidson, I.C.S.

(*Read before the Bombay Natural History Society on Feb. 28th*, 1898.)

I was first appointed to Kanara in December, 1888, and I remained there till May, 1890. During that time I had charge of the Southern portion of the district, and except during the five months of the rains which I spent at the Head-Quarters, Karwar, I was during this period touring about in the four Southern talukas.

I again returned to Kanara in January, 1893, and remained there till the conclusion of my Indian service on March 31st, 1896. During this later period I travelled pretty well everywhere throughout the district, and devoted almost all my spare time to studying its birds and insects. I have therefore seen a good deal of the feathered denizens of the most beautiful part of the Bombay Presidency, and now that I have left Kanara probably for ever, I gladly take advantage of Mr. Phipson's kind offer to put on record my notes on its birds. They are of course incomplete, as in these dense forests passing strangers must constantly occur and are very likely to be overlooked, and my duties being almost entirely inland, I never had an opportunity of properly studying the sea-birds on the coast. With regard to these latter, the information I have obtained is very meagre.

Kanara, the most Southern district of the Bombay Presidency, is situated on the coast, immediately south of the Portuguese territory of Goa, and extends to the South along the coast till it reaches the Madras Presidency at Kundapur, a distance of about eighty miles. In the extreme South it is a narrow strip of some fifteen miles, but in the centre and North, say from Kumta to the east of Sirsi, or from Karwar to Mundgode, it is about sixty to seventy miles broad.

It is naturally divided by the line of Ghats into the coast and above-Ghat talukas. The coast portion consists of five divisions, Karwar, Ankola, Kumta, Honawar, and Bhutkul. This contains valleys along the four main rivers occupied by rice fields and cocoa-nut gardens. These also form a belt along the coast extending in Bhutkul nearly to the hills, but elsewhere comprising a good deal of broken hilly ground, largely clothed with evergreens and containing small patches of rice and spice gardens; the evergreen forests in Karwar come down to the

shore. The Ghats, which are from two to three thousand feet high, are almost entirely clothed with forest mainly evergreen, and do not show the precipitous cliffs seen in the neighbourhood of Bombay.

The above-Ghat portion consists of the divisions of Supa, Yellapur, Sirsi, and Siddapur in the centre, with the divisions of Halyal and Mundgode in the extreme North-east adjoining Dharwar. The forest in this is mainly deciduous, but especially in the South contains large patches of evergreens called by the inhabitants "kans."

In the East portion of Sirsi and Siddapur, and generally in Halyal and Mundgode, there is much cultivation, mainly rice, but an occasional field of gram or millet is grown. In the West of Sirsi and Siddapur and throughout Yellapur there are large and valuable spice gardens with their auxiliary "betta" lands covered with pollarded trees for supplying leaf manure. There are also numerous scattered rice fields, mostly however waste, as the climate is so bad that the cultivators find it impossible to get labour to cultivate them, though many retain the fields in hopes of better days, and unwilling to have Government land in the midst of their properties, paying the rents of the rice fields from the profits of their gardens.

The West of Halyal and the East of Supa consists of magnificent teak jungle intermixed as are most of the other forests with bamboo, while the rest of Supa is mainly covered with almost worthless scrub, and the Mahrattee cultivators who inhabit it live a hard life working at small patches of rice, and eking out the proceeds by such labour as is available.

The rainfall of course varies much ; on the Coast it is generally from a hundred to two hundred inches ; the southern portion having the heaviest fall. Along the ridge of the Ghats, judging from the rain-gauge returns at Castle Rock where the Southern Mahratta Railway pierces the Ghats, it is probably seldom much under three hundred inches.

A hundred inches is about the average at Sirsi and Siddapur, while in the East at Halyal and Mundgode, it diminishes to some forty inches.

Such a varied country naturally produces much variety in its avifauna, and several birds found there commonly appear elsewhere in the Presidency only as stragglers.

Heavy forests are however bad ground for finding nests, and even for collecting the birds themselves, and no doubt there are a good

many fairly common visitors I did not succeed in coming across, as till the very end of my time in Kanara I was occasionally making additions to my list.

I append a list of all birds noticed by me together with any notes I think of sufficient interest to justify publishing, and follow Oates and Blanford's "Fauna of British India" as the most recent work on the subject in classification and nomenclature, the numbers used being from that work as far as it is as yet published.

4. Corvus macrorhynchus, Wag.

Common all over the district at all seasons. It breeds both above and below the Ghats in March and April.

7. Corvus splendens, Vieill.

This crow is local in Kanara, avoiding all the dense forest country. It is common everywhere along the coast, and is fairly abundant in the extreme North-east of the district on the Dharwar border, and I have seen a straggler at Siddapur. Below the Ghats along the coast it breeds in October and November, and not in the beginning of the rains, as in other parts of the country.

16. Dendrocitta rufa, Scop.

This magpie is abundant everywhere in the district both in the forests, and in the scrub around the villages. Its nests are built in March, and eggs are found all through the end of that month and April.

17. Dendrocitta leucogastra, Gould.

This magpie is very local, and even in the places it is found it is rare. The place I have seen it oftenest is at Nilkund on the crest of the Ghats between Siddapur and Kumta. I have also seen it at Devimane on the crest of the Ghats between Sirsi and Kumta, and in the broken country west of Siddapur. Mr. Bell tells me he saw a pair near the Bara Ghat further North, also on the ridge of the Ghat. It keeps as a rule among the more open forest, in the immediate neighbourhood however of evergreen jungle.

I have only once found its nest, and that was at Devimane, and in the beginning of April it contained young. The nest was a small one, placed in a tree about ten feet from the ground. On the 27th March, 1893, I shot a female containing a fully formed but unshelled egg.

31. PARUS ATRICEPS, Horsf.

All tits are rare in Kanara, and I have never seen this species either in the coast or in the thick forest. The few I have seen have been confined to the very North-east of the district on the borders of Dharwar. It is there no doubt a permanent resident.

43. MACHLOLOPHUS HAPLONOTUS, Blyth.

This tit is more common than the last, but is still a rare bird. I have occasionally noticed it in all the forest parts above the Ghats, where no doubt it is a permanent resident. I have never seen it on the coast, or even in the forests below the crest of the Ghats.

75. GARULAX DELESSERTI, Jerd.

A rare bird in Kanara. I have only found it in the extreme North-west portion of the district along the Goa frontier, from Castle Rock to Anshi, where it goes about in large flocks. While beating for a tiger at Anshi, I obtained a nest in the latter portion of May. It was in a low bush in thick jungle, and was an ordinary small babbler's nest, composed of rough creepers and roots, with a couple of skeleton leaves in the foundation. It contained a single partially incubated egg; this was pure white and glossy, and a very broad oval.

105. ARGYA CAUDATA, Dumeril.

A very rare bird in Kanara. I obtained a single pair at Murdeshwar in the extreme South portion of the coast in January, 1890. I never came across the bird again in the district.

108. ARGYA SUBRUFA, Jerd.

Fairly distributed both above and below the Ghats in all the forests except the extreme east of the district. They go about in small flocks, and their shrill cry is quite different from any of the other babblers. I have obtained their nests in April or May and also during the rains. They are very deep cups, formed of rough grass and roots and are generally placed near the tops of saplings some eight or nine feet from the ground. The eggs are large for the size of the bird, being hardly less than those of *C. canorus*.

110. CRATEROPUS CANORUS, Linn.

This babbler is common among the forests above Ghats, and is found probably also below the ridge, but all the specimens of babblers I have from below the Ghats belong to the next two species, so I cannot be sure. It breeds abundantly in March, April and May.

111. Crateropus griseus, Gm.

This babbler is common both on the coast and in the east of the district. It is scarce along the line of Ghats, nor does it inhabit the thick forest ; but keeps to the more open forests in the neighbourhood of villages, being very partial to the wildernesses of "lankana" which have grown up in some places. It breeds in the ordinary way in March and April.

113. Crateropus somervillei, Sykes.

Found along the coast from the northern boundary of the district as far south as the southern part of the Kumta Taluka, and also through the Supa petta. It breeds like the last in April and May.

120. Pomatorhinus horsfieldii, Sykes.

This bird is common all over the district from the east to the coast. I have obtained fully incubated eggs in October at Castle Rock, but the other nests I have found with eggs have always been in January and February.

136. Dumetia albigularis, Blyth.

A scarce bird in Kanara, but I have noticed it at Palla in the north-east of the district, also at several places along the coast, and once at Nilkund on the crest of the Ghats. I took eggs in September at Karwar.

139. Pyctoris sinensis, Gm.

Noticed occasionally at Halyal, and along the extreme east portion of the district. I also saw a pair at Bhutkul in the extreme south.

144. Pellorneum ruficeps, Swains.

This bird is very common everywhere in Kanara in the forests both above and below the Ghats. I have taken numbers of their nests in May, mainly in the Supa petta, and also in June in Karwar. The nests are largish structures, with the entrance on one side; made of dead leaves, and placed on the ground or banks generally without any cover.

164. Alcippe phaeocephala, Jerd.

A very common bird in the evergreen forests all over the Districts. I have always found its neat cup-shaped nests on bushes in the "kans" in January, February and March. The nests were generally about three feet from the ground and in very thick cover.

166. Rhopocichla atriceps, Jerd.

One of the commonest birds in Kanara everywhere except in the extreme east of the district. It breeds at all seasons, laying two, or

very rarely three, long-shaped eggs, white, boldly mottled with pink. It seems to spend most of its time building unnecessary nests, as one finds eggs or young in only one out of about a dozen nests. They are thick untidy masses of bamboo leaves with an entrance on one side, and are placed at all heights from two feet to about ten or twelve. The bird is very partial to bamboo jungle, and most of the nests found were in bamboos.

189. Myiophoneus horsfieldi, Vig.

Fairly distributed throughout the district except in the eastern portion. It breeds in the rains generally about July. A pair have for many years built their nest under the eaves of the Godhulli Bungalow near Karwar.

191. Larvivora brunnea, Hodgs.

A rare straggler in winter to the line of the Ghats. I have obtained specimens in March at Ulvi and Anshi, both in the Supa petta, and at Nilkund in Siddapur in January.

226. Zosterops palpebrosa, Temm.

Uncommon, but no doubt a permanent resident above Ghats, where alone I have found it. I have taken its nests once or twice at Sirsi.

243. Ægithina tiphia, Linn.

A common permanent resident everywhere in Kanara. It breeds in March and April above Ghats, in the central portion of the district, and about Karwar in October. In May it seemed preparing to breed about Halyal.

248. Chloropsis malabarica, Gm.

This bird is much rarer than the next species which it much resembles; when close to one, however, the males may be easily distinguished by the absence of any yellow surrounding the black on the breast, and by the bright golden yellow of the forehead. The female has a black throat and cheek stripe, while *C. jerdoni* has a greenish-blue one, so when you see a pair of these bulbuls each with a black throat, you may be pretty sure they are *C. malabarica*. I have only once taken the nest of this bird: it was at Sumpkund in the Sirsi taluka, and was placed some twenty feet from the ground in a sapling. The nest, which was a hanging one, was made of very pale material, and contained two young just hatched; it was found in February.

252. Chloropsis jerdoni, Blyth.

A common bird everywhere in Kanara. I have taken nests in July, August, September and October about Karwar, and above Ghats in February, March and April. I think that below Ghats it also breeds in the spring, as in May I have seen young at Karwar just able to fly.

254. Irene puella, Lath.

A common and noisy bird in Kanara, seen wherever there is thick forest, especially evergreen, except in the extreme north-east of the district about Halyal. It is rather a shy bird, and also much resembles a *Merula* while dodging among the trees, and is constantly overlooked by any one not knowing its notes; so much is this the case that a good ornithologist who had been over a year in Kanara told me he had only noticed it once or twice, and I think had not procured a specimen. Except about Karwar in the rains, when it goes about in flocks and is seen only in particular places, it is very generally distributed, and travelling about on tour, I hardly passed a day without noticing it. I have taken many nests; they are as a rule some fifteen or twenty feet from the ground in the centre of a pollarded tree, often quite invisible from below and only to be discovered when on knocking the trunk with a stick the hen flies off. I once however took a nest at Yellapur on a leafless tree some twelve feet up. The nests are large loose structures, composed of coarse twigs with an inner layer of green moss and lined with fine sticks. The number of eggs or young has been invariably two, and I have taken the nests from the end of February to the middle of April.

271. Hypsipetes ganeesa, Sykes.

Widely distributed and locally common in a few places, mostly on the ridge of the Ghats. It is rather a shy bird and difficult to see in the thick forests it inhabits. I have only taken two nests; one at Siddapur on the 15th March was about fifteen feet up a tree in a mass of creepers, and was a regular bulbul's nest lined with hair, and the other was composed mainly of green moss lined with hair, and was near the top of a sapling in the edge of evergreen forest. This was at Nilkund, where the bird is very common.

278. Molpastes hæmorrhous, Gm.

This is of course very common in Kanara as elsewhere and is found all over the district. Above Ghats it breeds in February,

March and April, and about Karwar in August, September and October.

289. Otocampsa fuscicaudata, Gould.

This is the commonest bulbul—indeed the commonest bird in Kanara—and breeds from February to May, and again in Karwar in the rains.

295. Iole icterica, Strickl.

This bulbul is found all over the district with the exception of the extreme north-eastern portion. It is locally common, but keeps generally in the vicinity of evergreen jungle. I have taken very many of its nests, generally suspended between two twigs on a small tree from eight to twenty feet from the ground, but occasionally in the branches of a large tree. The eggs are generally two, very rarely three, and vary from pinkish-white unmarked to fairly marked eggs; they are long-shaped.

303. Pycnonotus gularis, Gould.

I have not noticed this bird in the north-eastern portion of the district. It is common in Siddapur and in the wooded part of Honawar and Kumta, and occasionally through the dense forests of Karwar, Ankola, and Yellapur. It is rather a shy bird, and may occasionally be mistaken for the last-named. I have taken five or six of its nests. They are small cups, outwardly composed of a mass of large red dead leaves slightly bound with one or two roots and spider's web, and lined inside with a few roots and grass-stems of a coarse description. The first nest I found was on a sapling some ten feet from the ground. It was a solitary tree about twenty yards from a thick piece of evergreen jungle. I saw a bird fly from the tree, but from below all that appeared was apparently some dead leaves, and it was a mere chance I sent a boy up to look. Another nest taken a few day's later was similar, but in a small bush, in very thin forest, and only a foot and a half from the ground. A third was about five feet from the ground in evergreen forest; others were in similar situations, and were all similar. The solid mass of dead leaves forming the foundation being unlike anything I have seen in other nests. The eggs are two in number, and very small for the size of the bird; they are quite devoid of gloss, and of a pink colour, mottled thickly all over with the smallest possible dark reddish-brown and purple spots, these spots being hardly larger than pin points.

305. Pycnonotus luteolus, Less.

A very local bird in Kanara shunning the heavy forest. It is found occasionally along the coast from Karwar as far as Kumta, and is also found in the neighbourhood of Sirsi. It is extremely common among the "lankana" or wild heliotrope surrounding the old fort at Halyal. I have taken numbers of its nests there, generally suspended from the "lankana" about one-and-a-half or two feet from the ground. The eggs, which are two in number, vary much; they much resemble those of *M. hæmorrhous*, but while some are larger than any I have seen of that species and very boldly marked, others are small and with very few markings.

313. Micropus phæocephalus, Jerd.

A rare and very local bird in Kanara. There used to be one pair in the neighbourhood of Karwar at a particular spot on the road to Seizwa, and I noticed them in the same place in three successive years.

The birds were fairly common in the central part of Kumta about Burgee and Kutgul, and also in the south-west of Sirsi and the west of Siddapur, especially about Harsikatta. I only once have found a nest, though I have no doubt a clutch brought to me belonged to this bird, but as unauthenticated they are of no value. The only nest I found was on the 16th March at Siddapur. I was assisting a boy to climb up to a nest of *Eulabes* in a woodpecker's hole in a silk-cotton tree, when I noticed a small bird fly out of a small bamboo bush behind me, and on looking at the spot I saw a neat bulbul's nest; it was however empty, and I determined to visit it on the evening of my last day at Siddapur. This happened to be on the 21st, but official duties kept me busy till almost sunset, and as I did not know what the bird was and it might have been merely a rubbishy *Otocampsa*, I very nearly gave it up, and actually tossed up a coin to see whether I would take the trouble to go the half mile walk from my camp to visit it. The result was that I did go, and on reaching the nest found it contained one egg which a glance showed me was of a species whose egg was new to me. I sat down at once to wait for the bird, and in five minutes a small bird lit on a branch near, then flew to the bamboo and seated herself on the nest. It saw me however in a moment, and flew over my head alighting in a thick evergreen exactly between me and the pink of the vanished sun. With my gun to my shoulder I

followed the movements among the leaves, and getting a glimpse of the bird, fired. I could not see the result, but a search on the ground below in the dark disclosed a specimen of this bird. The nest was a neat cup outwardly composed of bark, bamboo and other leaves, and lined inside with moderately fine roots. It is a solid and shallow nest. It was in the fork of two or three branches in a low bamboo about a foot from the ground and surrounded by evergreen forest. The egg was long-shaped, of a pinkish-brown colour with a distinct cap of a darker hue, and has faded a good deal since I secured it.

325. Sitta frontalis, Horsf.

I cannot find any record of having seen this bird below the Ghats, though I think I must have seen it. It is generally distributed in all the forests above Ghats, but seems to avoid evergreens. A nest I took at Manchikeri in the south of the Yellapur taluka on the 23rd March, 1894, consisted of a little green moss and one green parrot's feather. It was in a natural hole in a small tree some twenty feet from the ground, the entrance being a large triangular crack. It contained three fresh eggs, pinkish-white boldly marked with red.

327. Dicrurus ater, Herm.

This bird is not a common one in Kanara, except in the extreme north-east corner of the district about Halyal. It is seen occasionally along the coast from Karwar to Bhutkul, but is absent from the greater portion of the district. I have seen nests with young at Karwar in June, and with eggs at Halyal in the beginning of May and the end of April.

328. Dicrurus longicaudatus, A. Hay.

This bird is very common all over the district from the end of October to the end of April. I have never seen any signs of its breeding, and do not think it does so. Mr. Aitken however informs me that he took a nest near Castle Rock on the 15th April, 1892, placed in a small tree six feet from the ground. He showed me the eggs which I should certainly have put down to those of *Chaptia aënea*, and neither the situation nor the eggs in the least resemble what I have seen in the Himalayas, so I believe a mistake occurred and that this bird is merely a migrant in Kanara.

330. Dicrurus cærulescens, Linn.

This bird is generally distributed in all the forests both below and above Ghats, though in no place is it what I should call really common.

I have taken many nests, neat slight cups suspended in the forks of what at that season are usually leafless trees, and about fifteen feet from the ground. They contained three eggs of a deep pink thickly blotched with lilac, pink, and brown. The bird breeds in March and April.

334. Chaptia aenea, Horsf.

This drongo is found all over the district, but is not very common. It breeds in March, April, and the beginning of May, forming a neat solid nest at no great distance from the ground, and lays three or four eggs of two very distinct types, one is a warm reddish-brown with markings only faintly darker at the larger end, while the other is a pale whitish-pink with light yellowish-pink blotches. I have never seen this bird at Karwar in the rains, so it is perhaps migratory.

335. Chibia hottentota, Linn.

A winter migrant not very uncommon along the coast from Karwar to Bhutkul from December to February. It seems to be irresistibly attracted to the large red blossoms of the silk cotton tree, and whenever any are present in the neighbourhood can be easily found out by a visit to these in the early mornings. I have once or twice found this bird in the end of February in the east of the district, and I think it was then migrating, and that it crosses India and does not follow the coast to the North. It certainly does not breed within the limits of the district.

340. Dissemurus paradiseus, Linn.

By far the commonest drongo in the district, and found in abundance in all the forests except the extreme north-east. It breeds from March to May, placing its nest as a rule at a moderate height from the ground, but generally suspended on a thin branch, so that though nests are very easy to find owing to the pugilistic behaviour of the old ones, they are not always easy to take down without breaking the eggs.

363. Acrocephalus stentoreus, Hemp. & Ehr.

Noticed occasionally in the cold weather in the few marshes in the district. I find, however, I have not kept any specimens.

366. Acrocephalus dumetorum, Blyth.

Also noticed occasionally in the cold weather, both above and below the Ghats.

374. Orthotomus sutorius, Forst.

A fairly common bird everywhere, breeding in the rains round Karwar. The nests found there frequently contain eggs of *C. passerinus*.

381. Cisticola cursitans, Frankl.

A fairly common bird in the long grass on the sides of the tanks in the east of the district. I have also noticed it near the Gairsoppa falls, and at Bhutkul. It breeds in September and October.

382. Franklinia gracilis, Frankl.

A scarce bird, but noticed along the coast occasionally from Karwar to Bhutkul, and also about Palla in the north-east of the district. I have taken eggs in September at Karwar.

393. Arundinax ædon, Pall.

I have obtained one or two specimens of this bird in the cold weather. They were obtained both above and below the Ghats.

408. Phylloscopus indicus, Jerd.

I obtained a single specimen of this bird at Bhutkul in January 1890, but have never come across one since. It was scrambling about in thick undergrowth among rocks.

422. Acanthopneuste viridanus, Blyth.

This is the only tree warbler I have been able to identify in Kanara, and I have obtained a good many specimens in places both above and below the Ghats. I have shot warblers whenever I had the chance in hopes of coming across other species, but without success.

464. Prinia socialis, Sykes.

Occasionally seen along the coast among the sugarcane fields; also noticed at Halyal. It is a permanent resident, breeding in the middle of the rains.

466. Prinia inornata, Sykes.

A rare bird found only in the extreme east of the district, and along the coast. It breeds in September about Bunwasi.

473. Lanius vittatus, Val.

A mere straggler to the east of the district. I have only twice come across it; both times being near the Dharwar frontier.

476. Lanius erythronotus, Vig.

A permanent resident, common along the coast and in the east of the district. It breeds about Halyal in the end of April, and in May.

481. Lanius cristatus, Linn.

A not infrequent cold weather visitant both to the coast and to the eastern part of the district.

484. Hemipus picatus, Sykes.

Noticed occasionally in the forests of Kumta and Karwar in the cold and hot weather, but not noticed at Karwar in the rains. Above Ghats it is generally distributed, and is no doubt a permanent resident. I have taken its nest only three times in Kanara. In all cases it was placed on silk cotton trees at that time devoid of leaves, and was almost quite invisible, as the moss and lichens composing it exactly correspond with the colour of the bark. The nests are very minute, and shallow. I have never seen more than two eggs or young in any nest; but as I have seen flocks of five and six, I have no doubt they occasionally lay more. The eggs I have taken were in March and May, and were greenish, mottled with darker green and brown; they are broad ovals, and very shrike-like.

487. Tephrodornis sylvicola, Jerd.

A fairly common bird in all the Kanara forests, being found in the rains and cold weather in small flocks; afterwards in pairs. I have seen a good many nests, mostly however with young. They are large fairly thick structures composed of roots and bordered with bright green moss, and ornamented outside with cobwebs. They are placed at moderate heights from ten to twenty-five feet in forks of trees, or on pollarded trees in "betta" land. They are not easy to find, as though at the season they build the trees are leafless, they exactly correspond with the adjoining tree, and would frequently be overlooked if it was not for the fact that the birds like *H. picatus* and *T. pondicerianus* constantly fly to and from the nest. The number of eggs or young is, according to my experience, invariably two, and the eggs which are laid in March and April are broad ovals of a greenish-white boldly speckled at the larger end with purple and brown spots.

488. Tephrodornis pondicerianus, Gmel.

Very common everywhere in Kanara, breeding in March and April.

494. Pericrocotus flammeus, Forst.

This minivet is fairly common both above and below Ghats, except in the extreme north-east portion. During the rains in Karwar it is not uncommon, and I believe it breeds there at that season, as I have never seen the birds showing signs of breeding at any other time. In the rains, however, the forests are too thick to trace birds

to their nests, and minivets' nests are so like the branch on which they are built as to be practically undiscoverable from below.

500. Pericrocotus peregrinus, Linn.

The small minivet in Kanara is very brilliantly coloured, and is moderately common everywhere. I have taken its nest with fresh eggs about Sirsi in April, and at Karwar in the end of October.

508. Campophaga sykesi, Strick.

A very common cold weather visitant to every portion of Kanara, remaining till well on in May when it disappears. I do not think it breeds in the district, but it may do so as I saw a single female at Ankola on the 2nd June. This might however be merely a late stayer, as its breeding range is not much further north.

510. Graucalus macei, Less.

Moderately common both above and below the Ghats from November to the end of May (I find no record of having seen it in the rains). I have only taken three nests, two at Sirsi in the beginning of April, and one in the Yellapur taluka in March, and I am under the impression that few of the numbers seen in the cold weather stay to breed in Kanara. It is, however, a shy bird while nesting, and the nest so thoroughly harmonises with the bough it is placed on that it is possible I may have occasionally passed over nests.

512. Artamus fuscus, Vieill.

A permanent resident seen in every month, and found wherever there are cocoa-nut gardens. I have taken eggs in March and April from the east of Mundgode down to the coast, all were from the tops of cocoa-nut or supari palms.

514. Oriolus indicus, Jerd.

This bird is a straggler to Kanara in the cold weather. I have only come across it twice; both were in the month of February; on the first occasion there was a pair at Nilkund in the Siddapur taluka, and on the second a single cock at Kutgul, east of Kumta.

518. Oriolus kundoo, Sykes.

A cold weather visitor, being found in great numbers everywhere from November to the end of April. I have never seen it in the rains, nor do I think it breeds in the district.

521. Oriolus melanocephalus, Linn.

This is the common oriole of the district, a permanent resident, and breeding from March to May both below and above the Ghats.

523. Eulabes religiosa, Linn.

A permanent resident in all the forests in Kanara, but not very common below the Ghats. It is especially common in the north of Sirsi, and in Yellapur. It breeds generally in holes in silk cotton and "baini" palm trees at a considerable height from the ground, in March, April and May, but I have found nests in holes in comparatively small cocoa-nut trees.

528. Pastor roseus, Linn.

A cold weather visitor both above and below the Ghats, but only seen occasionally, and then in comparatively small flocks.

537. Sturnia blythii, Jerd.

In the cold weather common along the coast, and pretty well over the district. In the hot weather very common in the central and southern parts of the above-Ghat portion in deciduous forest, where it breeds in April. All the nests I have found were in the tops of pollarded trees in small ragged holes, and the three or four eggs they contained were practically indistinguishable from those of *T. pagodarum*.

544. Temenuchus pagodarum, Gm.

Common in the east of the district, and also noticed in the cold weather in the Bhutkul petta ; breeds in April.

549. Acridotheres tristis, Linn.

Common all over the district, breeding in March, April, and May.

552. Æthiopsar fuscus, Wagler.

Equally common with the last everywhere, breeding at the same season. Both are permanent residents.

561. Siphia parva, Bechst.

A rather scarce winter migrant, but noticed occasionally from November to the end of March at various places both above and below the Ghats.

573. Cyornis pallidipes, Jerd.

A resident species, but by no means common. It is however generally distributed in all the moist forests both above and below Ghats. I have never been fortunate enough to obtain authenticated eggs of this bird, though I have seen its nest building once at Nilkund. At

Supa also I once obtained a nest which I believe to have belonged to it. This was a nest brought to me on the 15th May, 1893, by a man who had seen it a day before, and who with the natural perverseness of the native of these parts said nothing about it when he was with me, but when he saw me in the morning in the neighbourhood of the rice field he was working in, instead of telling me about it and bringing me to the nest, rushed off to the nest and carried it off to me, in so doing breaking one of the three eggs it contained. As it reached me within twenty minutes of its being taken, and I started at once to the spot, I hardly doubted that I would be in time to identify the owner, but though I waited two hours not a bird came near the nest, and I then reluctantly left a man near it, and searched the whole forest round. It was singularly devoid of birds, and all I saw were a pair of *Zosterops*, another of *Kittacincla*, and a pair of this bird and a few wood-peckers. Half the hill was evergreen, the rest deciduous with the young leaves just coming out, and it was not easy to miss seeing what there was. The nest was in a hollow in the top of a dead stump about one and a half feet from the ground, and was composed of green moss lined with a white lichen, and with a few threads of fine grass and black roots. The eggs had been originally three in number, and were of a dull greenish-white with bold brownish blotches over the larger end. They were not exactly what one would have expected the eggs of this bird to be, and were considerably larger than those of *C. tickelli*. I am therefore keeping them in hopes some one will obtain authenticated eggs of this bird and let us know what they are like. They certainly are eggs not represented in my Indian collection of 850 species, and I cannot think of any other Kanara bird whose eggs they could possibly be.

576. Cyornis tickelli, Blyth.

This bird is a good deal commoner than *C. pallidipes*, and is generally distributed through all the forests, but is much more common above than below the Ghats. I have often taken nests in March and April in the Halyal, Supa and Sirsi talukas, built as a rule in banks on the sides of the roads, and containing three or four olive-brown eggs.

579. Stoparola melanops, Vig.

I have come across this bird singly or in pairs perhaps a dozen times in Kanara. These have all been between the months of November and March.

588. Alseonax latirostris, Raffl.

The commonest of all flycatchers from October to the end of March, but as a rule not one is visible after the first week in April. I however saw a pair on the 7th May, 1893, at Birchia, which were no doubt breeding, as on the 4th May, 1895, I was marching from Halyal to Birchia, and a friend walked out with me for a few miles. Just as I parted from him I saw one of these birds fly from a tree overhanging the road. I followed it into the forest to be sure it was *A. latirostris*, and had I any doubt I would have shot it ; as there was none, however, I walked back to the road and was moving off when the bird flew again over my head to the same tree, a " matti " one. I glanced back as it flew, and saw it light on a lump in the branch, and returning saw there was a nest. I sent a boy up the tree and he reported four eggs, which after some difficulty were safely got down, and I shot the bird as a proof of its breeding so far south. The nest was a large solid one composed of green moss and lichen, and lined with a few fibres and some feathers mostly oriole's. It was about fifteen feet from the ground and in the middle of a horizontal branch. It contained four extremely small olive-green eggs, a good deal smaller than others of this bird received from the neighbourhood of Mhow.

589. Alseonax ruficaudus, Swains.

I have only seen this bird three times in Kanara, once in February, 1889, at Nilkund, and in December, 1893 and 1895, at Malemane in the same place ; both Nilkund and Malemane are in Siddapur on the ridge of the Ghats.

590. Alseonax muttui, Layard.

I obtained a single specimen of this bird in the south of the Bhutkul petta on the 20th January, 1889. It was in a thick mass of screw-pine above some water in thin forest. I have never seen another specimen. It may easily be known by its almost white legs and feet.

592. Cullicicapa ceylonensis, Swains.

I saw one specimen of this bird at Supa on the 23rd February, 1896, but I failed to secure it.

598. Terpsiphone paradisi, Linn.

This bird is generally distributed in Kanara from November to the beginning of May. I have never seen it in the rains at Karwar, nor on the top of the Ghats at Anshi, and I am inclined to think it does

not breed in Kanara ; but as I have never been in the eastern portion in the rains, I cannot be certain, and I am told it breeds in the adjoining district of Dharwar.

601. HYPOTHYMIS AZUREA, Bodd.

A permanent resident both above and below the Ghats. It generally places its lovely little cup of a nest, adorned with a series of spiders' nests like little roses, in bamboo jungle, but occasionally in the supari gardens on the lime and other fruit trees always planted in their outskirts. It breeds in April and May.

604. RHIPIDURA ALBIFRONTATA, Frankl.

This bird avoids tracts with a heavy rainfall, and I have only seen it in the cold and hot weather at Halyal, Mundgode and the extreme east of the district.

607. RHIPIDURA PECTORALIS, Jerd.

This bird is not common anywhere in Kanara, but I have noticed it below the Ghats all along the coast, and also in the east and central part of the above-Ghat portion. It breeds in April and the beginning of May about Halyal.

608. PRATINCOLA CAPRATA, Linn.

This bird appears at Karwar about the first week in October, and is common along the coast till May, but I have never seen it in the rains there. Above Ghats it is common wherever there are fields and cultivation, especially in the eastern portion, where, no doubt, it is a permanent resident. It breeds both above and below the Ghats from February to May.

610. PRATINCOLA MAURA, Pall.

A scarce winter visitant to Kanara ; only noticed on seven or eight occasions. These were between November and February, and were some on the coast and some in the east of the district.

644. RUTICILLA RUFIVENTRIS, Vieill.

I saw two specimens of this bird in the extreme north-east of Kanara in February, 1896. It is a mere straggler there.

647. CYANECULA SUECICA, Linn.

A scarce winter migrant, found in reedy places among the rice fields both in the east of the district and on the coast. On one occasion I saw one near the top of the Ghats.

662. THAMNOBIA FULICATA, Linn.

A permanent resident on the coast, but by no means common. It is, however, common in the east of the district, but absent from all the central forest portion. It breeds from February to May.

663. COPSYCHUS SAULARIS, Linn.

Almost the commonest bird in Kanara, and is a permanent resident in every part from the coast to the extreme east. It breeds everywhere from February to May.

664. CITTOCINCLA MACRURA, Gmel.

The "shama" is extremely common in all the forest parts of Kanara from the east to the line of the Ghats. Below the Ghats I have only noticed it at Kudra, and it is certainly not common anywhere below Ghats. It is very partial to bamboo jungle. The males constantly sing, and sit in prominent situations, but the females are shy and retiring, and are not often noticed. It breeds in April and May in holes in trees: these are generally low down, but I have seen a nest in a broken bamboo at least twenty feet from the ground, and another, 16 feet, in a large crack in a banyan. The commonest situation, however, is in the hollow portion of a cut bamboo lying on the ground, but propped up at an angle of about twenty-five degrees. Indeed, in bamboo jungles such a situation almost always contains a nest, and I believe a person living constantly in a place where the bird was common, such as Supa, could, by placing a row of these in proper positions about three hundred yards apart in the forests, obtain almost any number of eggs. The nests vary with the situation. In a large hole they are bulky structures, but in a bamboo consist of only a few roots. The eggs are three or four in number, and closely resemble one of the commonest varieties of *C. saularis*, but are perhaps, as a rule, darker.

671. MERULA NIGRIPILEUS, Lafres.

This bird is found sparingly in the cold weather along the coast, and noticed occasionally here and there above the Ghats at that season. About Halyal and Mundgode it is fairly common in March and April. I have never seen a nest in Kanara, but I am pretty certain it must occasionally breed in its northern portion.

685. GEOCICHLA CYANONOTUS, Jard. & Selb.

This is the common thrush of Kanara and is a permanent resident, though one sees a great many more in the rains than at other seasons.

I have noticed it in all parts of the district. It breeds in great numbers about Karwar in June, July, and August.

691. Petrophila cinclornyncha, Vig.

A cold weather visitor, moderately common in all the forests from November to March.

693. Petrophila cyanus, Linn.

A scarce cold weather visitor from October to February along the rocky open portion of the coast. I once noticed one at Christmas at the Gairsoppa Falls (Kodkani). I also once saw one oddly enough at Marmagoa on the 4th May, 1893.

720. Ploceus baya, Blyth.

Common along the coast and in the extreme east of the district, breeding generally on cocoa-nut trees in June and July.

725. Munia malacca, Linn.

A few pairs of this bird are found among the rice fields on the coast from the extreme north to the south of the district ; they breed in July and August.

728. Uroloncha striata, Linn.

Very common round the villages both above and below the Ghats. It breeds at all seasons, a very favourite situation at Karwar being among the thorns tied round cocoa-nut trees in exposed places to prevent thieves climbing them.

734. Uroloncha malabarica, Linn.

I saw a small flock at Halyal on the 7th February, 1896. They are, however, merely casual stragglers.

735. Uroloncha punctulata, Linn.

A very local bird in the district. I noticed, however, flocks in several villages of the Bhutkul Petta, in Mundgode, and Kawalwad in the east of the district, and at Sirsi. They are probably residents breeding in the end of the rains.

761. Carpodacus erythrinus, Pall.

I have seen this bird in pairs or small flocks on one or two occasions both above and below the Ghats. They are, of course, only winter migrants.

775. Gymnorhis flavicollis, Frankl.

A resident species all over Kanara, but not especially common anywhere. I have obtained its eggs occasionally in March and April.

776. Passer domesticus, Linn.

The "common" sparrow is a rare bird in Kanara. I once saw three in Karwar, and I have noticed the bird twice at Kumta and once at Ankola. Above Ghats I have seen it in the towns of Halyal, Mundgode and Sirsi.

799. Emberiza melanocephala, Scop.

I saw a good many black-headed buntings at Halyal in the north-east corner of the district in February, 1896. I have not seen the bird elsewhere.

800. Emberiza luteola, Sparrm.

I saw a single specimen of this bird at Halyal in February, 1896.

804. Chelidon urbica, Linn.

I have seen large flocks of this bird at Halyal and along the Goa Railway, near Londa, in May, 1895, and I saw a single specimen twelve miles south-east of Halyal in February, 1896.

809. Cotile sinensis, J. E. Gray.

I noticed this bird near Honawar in January, 1889, and I also saw a pair in the east of Halyal in February, 1896.

810. Ptyonoprogne rupestris, Scop.

I have noticed this bird on the crest of the Ghats at Malemane in December, and at Anshi in March, and I have also seen it at the Gairsoppa Falls in December.

811. Ptyonoprogne concolor, Sykes.

This martin is not common in Kanara. I have noticed it at Castle Rock and the Gairsoppa Falls on several occasions in the hot and cold weather, and occasionally at Karwar in the rains. At this place there were never more than two or three, and they flew about Godhalli and the neighbouring peaks.

813. Hirundo rustica, Linn.

This swallow I have only noticed along the coast, where it is fairly common from October to February, and at Halyal and Siddapur each on one occasion.

818. Hirundo smithii, Leach.

This swallow leaves Karwar in the rains. It is, however, fairly common all over the district in the cold and hot weather. It habitually breeds over water, but I found a nest at Yellapur in March in a "mutt" and with no water for a considerable distance,

819. HIRUNDO FLUVICOLA, Jerd.

This is a scarce cold weather straggler to Kanara. I have seen large flocks at Bhutkul in January, 1890, and at other times I have seen an odd pair or two in the cold weather at several places along the coast.

823. HIRUNDO ERYTHROPYGIA, Sykes.

Generally distributed all over the district in the cold and hot weather. I have not, however, noticed it at Karwar in the rains. It breeds under culverts on the roads in February, March, and April.

826. MOTACILLA ALBA, Linn.

The form *dukhunensis* (Sykes) of this wagtail is generally distributed, but not common in the cold weather. I have notes of seeing it, however, in practically the whole district.

831. MOTACILLA MADERASPATENSIS, Gmel.

This wagtail is generally distributed, and is no doubt resident, at all events, above Ghats. I can, however, find no record of having seen it at Karwar in the rains. It breeds above-Ghats in March, April and May on the banks of, and in rocks in the beds of, the various rivers. At Supa I found four or five pairs breeding opposite the bungalow in the beginning of May.

832. MOTACILLA MELANOPE, Pall.

This is the commonest and most generally distributed wagtail in Kanara, a pair or a single one being found beside every pool of water in the cold weather. It leaves towards the close of April.

833. MOTACILLA BOREALIS, Sundev.

I have noticed this bird a few times both above and below Ghats in the cold weather.

836. MOTACILLA FELDEGGI, Michah.

This bird, which in winter plumage very much resembles the lark, is much more common, and is generally distributed in all marshy places in the cold weather, leaving in April.

837. MOTACILLA CITREOLA, Pall.

I saw a few specimens of this bird on the tanks in the north-east of Halyal in February, 1896.

839. LIMONIDROMUS INDICUS, Gmel.

This wagtail is found in the heavy evergreen jungle from December, and I have seen specimens as late as the 1st May. It is a very local bird, and will be found year after year in the same places.

840. Anthus trivialis, Linn.

This pipit I have noticed some dozen times above Ghats in all parts of the district, and once below Ghats in the Kumta Taluka. All these cases were in the cold weather.

846. Anthus richardi, Vieill.

I obtained two specimens of this pipit at Honawar in January, 1890. It had a claw of nearly an inch, and must have been a straggler far from its usual haunts.

847. Anthus rufulus, Vieill.

This pipit is common all over the district both above and below Ghats wherever the country is the least open. It breeds abundantly in March, April and May.

848. Anthus campestris, Linn.

I have noticed this bird in the Kumta and Honawar talukas on the bare hills close to the coast.

863. Calandrella dukhunensis, Sykes.

I have seen two or three large flocks of a short-toed lark which must be this species. These have been at Honawar and Ankola below and at Nilkund on the ridge of the Ghats.

869. Mirafra cantillans, Jerd.

This very local species is common to the east of Halyal in a few fields or portions of fields partially covered with long grass, as also on the borders of the adjoining fields. I have never seen it elsewhere. It breeds in April and May in a tuft of grass. None of the nests I have found were in the least domed.

871. Mirafra erythroptera, Jerd.

I saw a few of these birds in the north-east portion of Halyal and Mundgode in April and May. It was breeding at that time.

872. Mirafra affinis, Jerd.

The Madras bush-lark is sparingly distributed along the coast in the talukas of Honawar and Kumta. I think, but am not sure, I have also seen it in the east of Sirsi and Halyal.

876. Galerita malabarica, Scop.

This lark is common everywhere in Kanara, where there is any open ground not being a mere swamp. It breeds from February to April in all parts of the district.

879. Pyrrhulauda grisea, Scop.

This lark is scattered along the coast from Ankola to Bhutkul, and is found in the eastern part of the district. It is not common anywhere. It breeds in March and April.

886. Æthopyga vigorsi, Sykes.

This bird is very rare in Kanara. Mr. Aitken saw a pair near Gokern in April, 1889, and I saw a specimen from the train below Castle Rock in May, 1895.

894. Arachnechthra lotenia, Linn.

This forest-loving bird is fairly common about Karwar at all seasons and among the forests and groves along the coast. Above Ghats it is found all along the line of Ghats and over the west of Sirsi and Siddapur. It breeds at the close of the rains and also in February. The nest resembles that of *A. asiatica*, but is of course larger. It is placed generally at a height of about 15 feet or so, and, instead of being in an exposed place like that of *A. asiatica*, it is carefully concealed among the branches, and is very difficult to find ; the eggs are similar to those of *A. asiatica* and only slightly larger.

895. Arachnechthra asiatica, Linn.

Common all over the district above and below Ghats, except in the thick evergreen forest. It breeds in the latter part of the rains and again from February to April.

900. Arachnechthra minima, Sykes.

This lovely little bird is intensely common in all the forests below Ghats, along the Ghats, and in the central portion of the district, but absent from Halyal, Mundgode, and the extreme east. It breeds from December to April, making its nest at low elevations ; nine out of every ten I have found being within five feet of the ground. By far the largest number of nests I have seen, have been built on the tops of stems of karwe (*Strobilanthes*), placed either on the side of roads or on the edge of forest. The nests are very small and neat hanging balls of bright green moss and white lichens, and easily distinguishable from those of any other sunbird of Western India. The eggs are two ; white closely mottled with fine spots of purplish-red, and in no way resembling those of *A. asiatica* or *A. zeylonica*. I must have taken much over fifty nests, so there can be no doubt as to the coloration of the eggs at least in Kanara.

901. Arachnechthra zeylonica, Linn.

A very common bird about Karwar, and generally distributed along the coast. Above Ghats it is rare in the east of the district, and I have not found it along the ridge of the Ghats, nor, I think, in the central portion. It breeds about Karwar in the end of the rains. The nest is much like that of *A. asiatica*, but, if possible, neater, and the eggs undistinguishable from pale forms of that bird.

909. Arachnothera longirostris, Lath.

This bird is common in the plantain gardens in Sirsi, Siddapur and Yellapur, and I have seen specimens at Bhutkul. It is very shy, and though one may hear its alarm cry on entering a garden, it is difficult to get even a sight of the bird. It breeds on the underside of plantain leaves in the gardens from February to the beginning of April, making a large nest sewn under the leaf. The first nest I found had two entrances, but some twenty I have found since have had only one. The nests are composed of dead leaves and lined with fibre. The eggs are long-shaped, pale pink, covered with minute darker spots, and with a regular dark pink ring of these spots round the larger end.

916. Dicæum concolor, Jerd.

This bird is probably not uncommon above Ghats in Kanara, but on the wing can hardly be distinguished from the next. The only specimen I possess I shot from the nest. This was on the road from Sonda to Manchikeri in the Sirsi taluka. The nest and eggs were similar to those of the next species, but are a little larger.

919. Dicæum erythrorhynchus, Lath.

This bird is common all over the district, breeding from February to April.

921. Piprisoma sqalidum, Burt.

This bird is local, but I have seen specimens and taken nests through the whole of the above-Ghat parts, and I have noticed the bird in the Kumta taluka below Ghats. It lays in March and April.

933. Pitta brachyura, Linn.

A permanent resident, generally distributed along the coast and along the forests, except the extreme eastern ones. It is shy, and I have not noticed it often in the cold weather; but it becomes common about March, and continues so till the breeding season in the rains, the cocks singing in the extreme tops of the trees. It breeds abundantly

along the coast, at all events from Kumta northwards, and through the Supa petta, making its large round stick nest in some prominent position some twenty feet from the ground. It seems to have a preference for thorny trees.

948. Gecinus striolatus, Blyth.

I have never succeeded in obtaining a specimen of this bird, but I have three times come across it; once near Bhutkul in the extreme south of the district, in December, again at Palla, and at Sidligundi in the Mundgode petta in March. It is a shy bird, as on two of these occasions I tried to shoot it, but each time failed to get within shot.

952. Gecinus chlorogaster, Jerd.

Fairly common in all the Kanara forests, but I think a good deal commoner above than below the Ghats. Its note is a plaintive scream and not like the harsh cry of most of the wood-peckers. I have found the nest several times; oddly enough, all have been in dead supari palms in gardens. The number of eggs is three, and all were taken in the beginning of April.

972. Liopicus mahrattensis, Lath.

This wood-pecker is rare below the Ghats in Kanara, and I have only twice seen it—once at Agsar, ten miles east of Ankola, and once near Bhutkul. In the open forests towards the east of the district it is common, and I have on several occasions taken its eggs there in March.

976. Iyngipicus hardwickii, Jerd.

By no means common in Kanara, except in the extreme east of the district. I have, however, seen it occasionally both above and below the Ghats. I twice found its nest in the district at Mundgode and Palla in the end of February. The nests were, I think, finished; but though the birds were inside, in neither case were eggs laid.

985. Micropternus gularis, Jerd.

This is one of the commonest wood-peckers in the district, found from the extreme east to the coast. It is partial to low jungle, and, as has often been remarked before, is found occasionally feeding on the ground. I have taken many of its nests. All were in the centre of a nest of *Cremastogaster* ants (in all but one case the species which builds the smooth nests, not the fluted). The eggs may be found at any season from the beginning of February to the end of April, and the ants' nest chosen is generally about fifteen to twenty feet from the ground.

The ants certainly do not desert the nest when occupied, and I have been terribly punished when putting my hand into a nest even when it contained small young of this bird. The number of eggs found has always been either two or three ; they are large for the size of the bird and generally much discoloured.

986. Brachypternus aurantius, Linn.

This wood-pecker is common everywhere in Kanara. I was inclined to think we had two species, as while the majority of the birds are practically typical *B. aurantius*, occasionally, but rarely, one with a very black breast is obtained. I have shot a hen of this form from the nest, but failed to secure the cock, and so discover if he was also a black-breasted bird. Nests are common all over the district in March and April.

988. Tiga javanensis, Ljung.

This is not a common wood-pecker anywhere in Kanara, and I have no record of obtaining it below the Ghats, though I think I have seen it there, and it much resembles *C. gutticristatus*, and also is shy and objects to close examination, and may thus easily be passed over. I have seen it, however, occasionally from Siddapur as far north as Supa. I have twice obtained its nest. The first was some twenty-five feet from the ground in leafless jungle near Sonda in Sirsi, and contained, on the 14th April, a single newly hatched young one. The entrance hole was in a bough, and at least three feet from the nest. The other was taken on the 12th March near Kumbarwada in Supa, and was in a hole in a cocoa-nut tree close to a small village and adjoining a large "kan" or evergreen jungle. It contained three very glossy fresh eggs.

991. Chrysocolaptes festivus, Bodd.

I have only once come across this bird in Kanara, and that was at a village five miles east of Halyal. This was on the 26th April, 1893, and there were three birds together. I had no gun with me, but the yellow crest of the female and the white patch on the back of the neck were quite clear and rendered a mistake impossible.

992. Chrysocolaptes gutticristatus, Tick.

This bird is fairly common all over Kanara, though not so much so as *B. aurantius*. I have seen the birds excavating a hole at Kudra, near Karwar, in October, but have never come across a nest with either eggs or young.

995. HEMICERCUS CANENTE, Less.

This funny little bird I have noticed occasionally above and below Ghats. It is very partial to bamboo jungles, and walks all over the branches instead of, like most other wood-peckers, keeping to the trunk. I never took a nest myself, but Mr. Aitken obtained an egg taken from a hole near Castle Rock on the 10th January.

997. THRIPONAX HODGSONI, Jerd.

This noisy bird is common in the large teak forests of Yellapur and Halyal, and is seen occasionally in all the denser forests above Ghats and below. I have never taken a nest, but a shooting party in the Halyal taluka at Christmas, 1895, obtained one. They shot the hen as she was looking out of the nest, and with the same shot I am told broke both the eggs. Two eggs brought to me at Sirsi belonged, I have little doubt, to this species ; but not being able to start with the finder at once, I sent him off with orders to return them to the nest and to come back for me next morning. He never appeared again, and I could not find him to make further enquiries.

1001. PICUMNUS INNOMINATUS, Burton.

I only once came across this little bird. This was at Sumpkund, near the centre of the Sirsi taluka. There were a pair, and they were hopping about on some thin branches below some high trees, and I had no idea what the bird was, and shot one believing it to be a *Munia*.

1003. IYNX TORQUILLA, Linn.

I have only come across this bird in the cold weather, and that on very few occasions. I have seen it at Siddapur, at Karwar, and at one or two other places on the coast.

1008. THEREICERYX ZEYLONICUS, Gmel.

The large barbet is not common in Kanara, and is restricted there to a tract of country comprising Halyal, Mundgode, and the east portion of Yellapur, and Sirsi. I have only found it in deciduous forest. It breeds in March and April. Its voice, much louder than that of *viridis*, will proclaim its presence wherever found.

(*To be continued.*)

SOME CASES OF CAUDAL ABNORMALITY IN *MABUIA CARINATA* AND OTHER LIZARDS.

By H. H. Brindley, M.A., St. John's College, Lecturer on Biology at Clare College, Cambridge.

(*With a Plate.*)

(*Read before the Bombay Natural History Society on June 14th*, 1898.)

Since the publication of a description of a case of duplicity in a reproduced tail of a *Hemidactylus*,* the Honorary Secretary of the Bombay Natural History Society has kindly sent to me two further examples of abnormal tails in lizards obtained in the Bombay Presidency. The present paper describes these, together with certain other cases presenting resemblances to them.

External Appearance.—Both of Mr. Phipson's specimens belong to the common species *Mabuia carinata*, Boulenger (*Scincidæ*).† In both the bifid portion of the tail commences some distance posterior to a point where regrowth had arisen after a rupture. The abnormal region is therefore altogether a new structure, as was the case with the already described tail of *Hemidactylus*. The two specimens of *Mabuia* will, for brevity, be referred to as A and B.

In A the forking is in the horizontal plane, *i.e.*, the two branches of the bifid growth are right and left. The right branch was slightly the longer when examined by me, but the actual tip of the left branch appears to have been broken off.

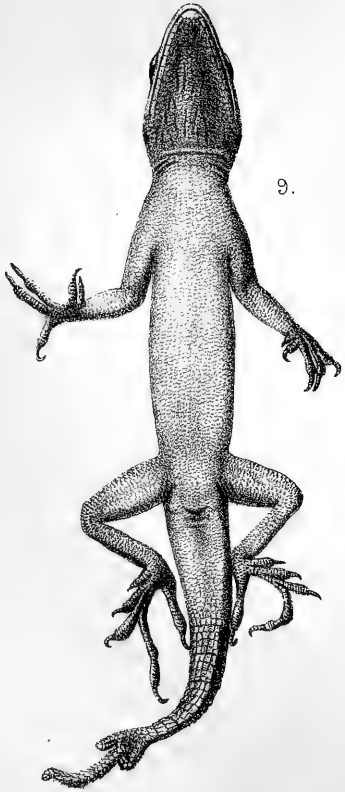
In B the forking is almost in the vertical plane, the ventral and slightly left-hand branch being about one-third longer than the dorsal and slightly right-hand branch. This specimen was only the tail, but there was sufficient of the proximal part to show the commencement of the regrowth from the normal stump.

Chief Dimensions.—These are given in centimetres :—

	A	B
Snout to cloaca	10·5	...
Cloaca to commencement of reproduced region ...	1·6	...
Break to commencement of reproduced region ...	...	2·8
Commencement of reproduced region to forking ...	3·0	1·8
Fork to tip of right branch	6·5	...
Do. left do.	6·2	...
Do. dorsal do.		4·2
Do. ventral do.		6·2

* "On a Specimen of *Hemidactylus gleadovii* with a Bifid Renewed Tail."—*Journ., Bombay Nat. Hist. Soc.*, 1894, IX (No. 1), p. 30.

† Fauna of British India (Reptilia and Batrachia)—1890, pp. 188-189.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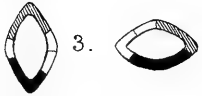
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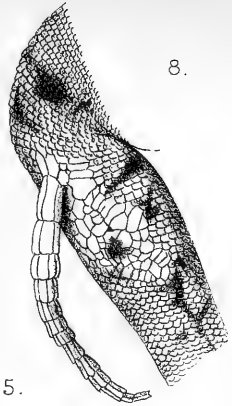
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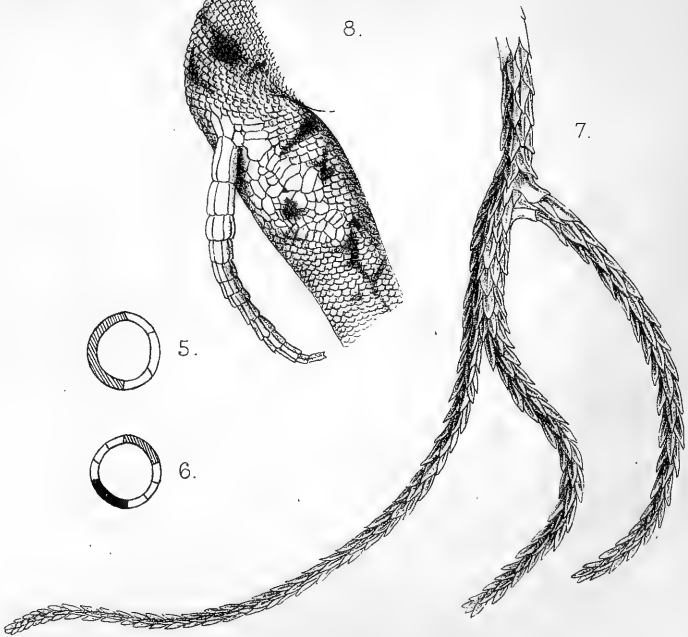

7.

In both cases the transverse section of the undivided proxima region is slightly flattened laterally, as are those of both branches of B. In A the left branch is much flattened laterally, while the right branch is flattened dorso-ventrally. The branches of both tails taper regularly to their extremities, except the ventral tail of B, which at 3·4 cm. from the forking is suddenly constricted, while the scales from this point to the tip are much smaller than those of the rest of the branch. These features suggest that injury and a second regrowth have occurred in this branch.

Scaling.—The scaling of the reproduced tail in lizards has acquired much interest from the observations by Boulenger,* that in certain genera the new scaling differs from that of the congenital stump of the tail, and at the same time resembles closely that of some other and possibly more primitive form. Reference should also be made to the work of Werner § on this subject. In many genera, on the other hand, the normal scaling is developed on the reproduced tail. *Mabuia carinata* approximates to the latter condition. The normal tail is covered on the dorsal and lateral surfaces by scales of nearly equal size, while the median ventral surface possesses a series of larger shield-like scales (fig. 1). When the tail is reproduced the scaling resembles the normal, except that there is in this case a dorsal as well as a ventral series of shield-like scales (fig. 2). I am indebted to Mr. G. A. Boulenger, F.R.S., of the British Museum, for information on this point.

In the present examples the scaling of the whole of the reproduced portions agrees with what has been described above for the reproduced tail. Moreover, compared with the normal scaling, the scales are softer, lighter in colour, and those of the dorsal and dorso-lateral surfaces exhibit only slightly or not at all the tri- or quinque-carination characteristic of the scales of the normal tail. These features, however, are such as might be expected in a new structure.

Branches of Specimen A.—The dorsal and ventral series of large scales of the undivided proximal portion appear to divide at the forking, and

* "On the Scaling of the Reproduced Tail in Lizards."—*Proc. Zool. Soc.* (1888), p. 351.
"On an Iguana with a Reproduced Tail."—*Proc. Zool. Soc.* (1891), p. 466.
Also in Mivart, "On the possible Dual Origin of Mammalia."—*Proc. Roy. Soc.* (1888), *XLIII*, p. 378.

§ "Ueber die Schuppenbe Kleidung des regenerirten Schwanzes bei Eidechsen."—Sitz, Akad. Wien., 1896, CV. p. 123.

to continue along the corresponding surfaces of the two branches ; but absolute continuity is seen only in the case of the *left* branch (fig. 3). In this laterally compressed structure the ventral series extends further up the left side than the right, so that only one series of small scales is present on this side, while two series separate the ventral and dorsal large scales on the right side. The scaling of the dorso-ventrally compressed *right* branch is very irregular at the forking, but at ·6 cm. therefrom a distinct series of broad scales commences to run along the ventral surface (fig. 4). These connect on the right side with a dorsal series of large scales, which perhaps may be regarded as a continuation of the dorsal series of the undivided proximal portion of the tail. Two series of small scales complete the scaling by covering the left dorsal surface.

Branches of Specimen B.—The dorsal series of large scales of the undivided proximal portion of the tail is continued along the dorsal side of the *dorsal* branch (fig. 5), but twists towards the left side as it proceeds. The ventral series of large scales of the undivided proximal portion is continued along the ventral side of the *ventral* branch (fig. 6), but twists towards the left side as it proceeds. The *dorsal* branch has thus a single series of large scales on its left side and from three to two series of small scales on its right side. The *ventral* branch has the left-ventral series of large scales above mentioned, while on its sides two series of small scales separate the large scales from a right-dorsal series of large scales which starts from the irregular scales at the forking. Whether this last-named series can be regarded as having anything to do with the dorsal series of the undivided portion of the tail is uncertain. The starting of a series of large scales from small irregular scales at the forking resembles the condition already described for the *right* branch of specimen A. The interest of the matter is that in both specimens both branches of the tail exhibit a tendency towards the establishment of a symmetrical scaling regardless of the plane in which the forking occurs. In other words, though the forking is horizontal in one specimen and vertical in the other, the individual branches very soon assume an arrangement attaining or approximating to dorsal and ventral single rows of large scales while the sides are covered by small scales. The twisting of the series of scales round the long axis which is seen in the present examples recalls a similar

condition in the bifid reproduced tail of a *Lygosoma* described in my previous paper.* Such twisting may perhaps be a frequent feature in connection with caudal duplicity.

Internal Structure.—The internal structure of the reproduced tail of lizards has very peculiar and constant features, which have been described by Dugès,† Fraisse§ and other writers. To render clear the statements which will be made later on, I now quote the epitome of the internal structure of the reproduced tail given in my previous paper.

(*a*) The vertebral column is not renewed as such, but from the point of fracture an unsegmented, imperforate, and usually somewhat irregular cartilaginous tube grows out in direct continuation of the neural arches. This tube tapers with the tail, and its lumen ends blindly near the tip.

(*b*) The spinal cord is not reproduced, but the lumen of the cartilage tube contains a core of connective tissue with large blood vessels, which is continuous with the spinal cord of the stump. In reality this core is a tube with thick walls, as it contains a central lumen lined by a single layer of columnar epithelial cells. This lumen is continuous with that of the central canal of the spinal cord.

(*c*) The innervation of the reproduced portion is effected by infiltration of the spinal nerve roots from above the point of fracture.

(*d*) The caudal artery and vein of the stump grow into the reproduced portion and give off branches within it.

As in the case of the *Hemidactylus*, serial sections through the tails of both specimens of *Mabuia* demonstrate the internal structure to possess essentially the above features. But in each of the present specimens a peculiarity exists in connection with the continuation of the epithelial canal of the spinal cord. In specimen A this continuation of the canal seems to be entirely absent, the connective tissue core of the cartilage tube containing only blood vessels. In specimen B one of the branches of this core contains one and the other two continuations of the central

* *Loc. Cit.*, p. 33.

† "Mèmoire sur les espèces indigenes du genre *Lacerta*." Ann. des Sciences Naturelles 1829, XVI, p. 337.

§ "Die Regeneration von Geweben und Organen beiden Wirbelthieren, besonders Amphibien and Reptilien." Cassel, 1885.

canal, thus emphasing the general branched condition of the reproduced region of the tail. I have not previously observed either of the above described peculiarities in single or bifid reproduced tails.

By way of comparison with the above instances of caudal duplicity, mention may be made of certain other cases of the condition which have been recently examined by me.

One of these is an instance of duplicity of another kind from those already described. Its occurs in a specimen of *Lacerta agilis*, Gray (*Lacertidæ*), captured in the Botanic Garden, Cambridge. The forking commences at 4·4 cm. from the cloaca and is in the vertical plane. The dorsal branch is 1·5 cm. and the ventral branch 2·1 cm. long. Both branches taper fairly regularly. The scaling throughout is that normal to the species. The scales of the dorsal branch are however smaller than those on the other portions. Serial sections show that the ventral branch is the normal tail of the animal, while the dorsal branch is an outgrowth from it, having the usual structure of a reproduced tail. At the forking the spinal cord runs dorsalwards from under the neural arches of the immediately preceding vertebra, and after giving off a branch of its central canal to the dorsal branch or supernumerary portion of the tail, turns down again to pass under the neural arches of the immediately succeeding vertebra. This condition is permitted by the two vertebræ concerned being unduly bent away from each other. In fact, the tissues generally are much disturbed in this region, and suggest that it has been the seat of an injury. The cartilage tube forming the endo-skeleton of the supernumerary tail starts directly from the neural arches of the more anterior of the above-mentioned vertebræ, is at first incomplete ventrally, and becomes closed as it runs on into the supernumerary tail.

A case in its general features apparently similar to the above is recorded by Giebel.* It occurred in the same species, but the supernumerary (? reproduced) tail was borne on the *ventral* side of the normal tail.

A greater departure from the normal is exhibited by a *Calotes cristatellus*, Fitz. (*Agamidæ*) [Indo-Malayan region] in the Cambridge University Museum. The dorsal surface of the abnormal portion of the tail is shown in fig. 7. The first forking is 18·2 cm. and the second

* Zeitshr. f. gesammt. Naturwissenschaft, 1864. XXIV, p. 48.

19·0 cm. from the cloaca. The three branches arise in the horizontal plane, and from right to left are respectively 3·0, 2·3, and 4·7 cm. in length. The soft parts form so thin a layer that the vertebral column within can be easily traced without the undesirable destruction of the specimen by section-cutting. The last vertebra present is bent outwards towards the right at an angle of 70°, so that the distal three-quarters of its length run into and form the root of the right hand branch. Beyond this point, which is ·8 cm. from the inner angle of the first forking, the right-hand branch is a reproduced structure. So also are the whole of the other two branches and the short piece from which they arise. This account is in agreement with the fact that only on the right-hand branch, and on it only as far as the end of the last vertebra, are the scales of the same size as on the normal region of the tail. Everywhere else the scales, though of the normal type, are smaller than on the region of the tail shown to be normal by the presence of the vertebral column.

The above instances seem to favour the often-expressed view that caudal duplicity is at least sometimes brought about by a supernumerary tail growing out from an injured place, and the following case described by Quelch* gives additional support thereto. A specimen of *Tupinambis nigropunctatus*, Boulenger (*Teiidæ*), was placed in a large cage in the museum of Demarara in company with alligators, snakes, and other lizards. On its introduction its tail was in a normal condition, but two years afterwards it was found to be bruised at various points. There were doubts as to whether the injuries had been inflicted by the alligators, by rats put into the cage for the snakes, or by the striking of its tail against the wire-work sides of the cage. It was however seen to fight with the rats. Soon after the bruises were noticed, three supernumerary tails were observed to be growing rapidly from three different points. At the end of another year one of these was not much shorter than the normal tail, while between the new growths three additional small stumps appeared about to grow into supplementary tails.

A somewhat similar observation among fishes has been recorded by Malm.§ In a Pipe-fish (*Syngnathus typhle*) the tail was broken

* Timehri (*Jour. Roy. Agric. and Com. Soc. of British Guiana*), 1890, IV, p. 148.

§ *Ann. des Sciences Naturelles* (1862), *Sér.* 4, *XVIII* (*Zoologie*), p. 356.

nearly across at the fiftieth vertebral articulation. On healing the seat of injury was found to bear a structure resembling the terminal segment of the normal tail, and, like it, supporting a ten-rayed fin. It is unfortunate that neither of the accounts of the last two quoted cases mention what relation, if any, the new growths had with the vertebral column. Superficially, however, the instances seem to be of the same nature as those described in *Lacerta* and *Calotes*. A tendency to hypertrophy on the part of tissues in process of healing is of wide occurrence, and it may be that in the case of certain structures which are capable of being reproduced as a whole, *e.g.*, the fin-rays in fishes and the tail in lizards, hypertrophic growth consequent on a partial injury takes a relatively and peculiarly constant form, simulating that which would have arisen in the case of injury involving actual loss of the extremities of such structures. But bearing in mind the number of different tissues which compose so complex a structure as a tail and the complicated ontogenetic development of the vertebral column, it is plain that a final explanation of such appearances as are described above cannot be offered at present. Experimental evidence on the subject is greatly needed. If eventually it be fairly established that certain kinds of injury involving the caudal vertebræ regularly result in lateral growths of the same special nature as are known to arise in the main axis after rupture of the tail, there will still remain the question as to why these special structures, axial or lateral, should occasionally exhibit duplicity on their own account.

In connection with the above described cases may be mentioned an abnormal growth of very defined form exhibited by a *Lacerta muralis*, Latr., from Naples, in the Cambridge University Museum. As shown in fig. 8, the dorsal surface of the left hind leg, immediately beyond the knee-joint, bears a small tail-like structure. This is 1·1 cm. long, and is covered by twelve or thirteen rings of scales closely resembling those of the tail. It seems very probable that this is an hypertrophy arising from the scar of an injuiry, for the dorsal surface of the leg has an oval area of quite irregular scales, which are much larger than the regular normal scales on the corresponding region of the other hind leg. The normal pigmentation is partially absent on this oval area also, and the general appearance suggests a healed wound. It is from this

area that the tail-like growth arises. The assumption of caudal scaling at a place so far removed from the tail by a growth so tail-like in form is very noteworthy. Its internal structure has not been examined, but it may perhaps resemble that of the two dwarf supernumerary tails of an *Anolis grahami*, Gray (*Iguanidæ*), from Jamaica, which are illustrated in fig. 9. From the cloaca the main tail is 2·5 cm. in length, and at 1·8 cm. from the former there is a swelling which serial sections show to be the starting point of a reproduced extremity. From this swelling two short curled branches arise laterally, each being ·3 cm. long, while the main axis of the regrowth attains a length of ·8 cm. beyond them. Internally the main axis has all the usual characters of a reproduced tail, but the two branches are merely free lateral prolongations of muscle bundles covered by skin and small scales. They do not contain any endo-skeleton, and the cartilage tube of the main axis shows no signs of sending branches into them. As the latter become free they leave the cartilage tube surrounded only by fascia, in which are scattered here and there some small muscles. Towards the extremity of the main tail these muscles gradually increase, and finally ensheath the cartilage tube in the usual manner. This case presents obvious differences of structure from those previously described.

In conclusion, the main features of the several abnormal conditions of reproduced tails described above and in my previous paper may by summarised.

(*a*) *Condition bifid.*—Main axis formed by the normal tail. A branch having the structure of a reproduced tail arises from a possibly injured place on the main axis.

(i) The forking is in the vertical plane. *Lacerta agilis.* (Probably the case in the same species quoted from Giebel should be placed here.)

(ii) The forking is (nearly) in the horizontal plane. ? *Trogonophis wiegmanni.**

(*b*) *Condition bifid.*—A structure entirely of the nature of a reproduced tail, and completely bifid *from its commencement*, arises from the extremity of a broken normal tail. The scaling indicates that one of the branches has greater claim to be

* Jour. Bombay Nat. Hist. Soc., *loc. cit.*, p. 32.

regarded as a continuation of the main axis than the other. The forking is in the horizontal plane. *Hemidactylus gleadovii.* *

(*c*) *Condition bifid.*—A structure entirely of the nature of a reproduced tail, becoming bifid *at some distance from its commencement*, arises from the extremity of a broken normal tail. There is no reliable indication that one branch should be regarded as a continuation of the main axis more than the other.

(i) The forking is in the vertical plane. *Mabuia carinata*, specimen B. *Lygosoma telfairii.*†

(ii) The forking is in the horizontal plane. *Mabuia carinata*, specimen A.

(*d*) *Condition trifid.*—A structure of the nature of a reproduced tail continues the axis of the normal tail from a point where the extremity of the latter has been broken off between two vertebræ. The last vertebra before the break is permanently bent, and from its convex side arises a structure of the nature of a reproduced tail. This structure soon becomes bifid. Both forkings are in the horizontal plane.

Calotes cristatellus.

[This case possesses features of both (*a*) and (*c*).]

(*e*) *Condition trifid.*—The main axis of a broken normal tail is continued by a structure of the nature of a reproduced tail. At its commencement this gives off two symmetrical branches which are without the typical endo-skeleton of a reproduced tail. The forkings are in the horizontal plane.

Anolis grahami.

[In the absence of information regarding the internal structure of the supernumerary tails of the *Tupinambis* described by Quelch, it is uncertain whether the case should be placed under (*a*) or (*e*).]

The above arrangement is adopted merely for the purpose of discriminating between the main characters of the cases which have been described, and it is not suggested that such extensive sub-division rests on differences between the physiological factors which brought about these abnormal appearances. Indeed, if it be true that accidental injury is a frequent or universal cause of supplementary caudal growths, it is

* † Jour. Bombay Nat. Hist. Soc., *loc. cit.*

probable that the more complex cases are the result of more frequent chance interference with the process of regrowth of the tail than obtained in those instances wherein the new structure is merely bifid. It may here be noted that none of the cases are examples of true axial duplicity, as in the bifid cases one of the branches and in the trifid cases two of the branches have the structure of a reproduced tail, and therefore contain no portion of the vertebral column. I do not know of any record of true axial duplicity involving the vertebral column in a lizard.

It seems clear that the normal tail possesses a latent tendency to develope outgrowths having the same structure as that which arises in continuation of the main axis after an accidental or reflex rupture; and moreover that these special growths, whether axial or lateral, have a latent tendency to branch. But for the present it is not possible to offer any explanation of these inherent tendencies or of the causes which from time to time call them into play.

I must express my thanks to Dr. S. F. Harmer, Superintendent of the Cambridge University Museum of Zoology, for many facilities in connection with the examination of specimens therein, and to Mr. W. Bateson, F.R.S., for information on certain points and in connection with the literature of the subject.

Explanation of the Plate.

Figs. 1 to 6. *Mabuia carinata.*—Purely diagrammatic representations of the arrangement of the scales of the tail in transverse section. The sections are represented as seen from behind, so that right and left of the plate are right and left of the sections.

Large scales of the median ventral series shown in black.
„ „ „ „ dorsal „ „ shaded.
Small „ „ lateral series shown in outline.

1. Specimens A and B. Normal region of tail.
2. „ „ „ „ Reproduced region, undivided proximal portion.
3. Specimen A. Left branch.
4. „ „ Right „
5. „ B. Dorsal „
6. „ „ Ventral „

Fig. 7. *Calotes cristatellus.* Dorsal surface of extremity of tail, natural size × about $1\frac{3}{4}$.

„ 8. *Lacerta muralis.* Dorsal surface of left hind leg with tail-like outgrowth, natural size × about 2.

„ 9. *Anolis grahami.* Ventral surface, natural size × $1\frac{1}{2}$.

SPECIES OF WESTERN PENINSULAR TREES, SHRUBS, ETC., FROM NORTH KANARA, BOMBAY.

By W. A. Talbot, F.L.S., Deputy Conservator of Forests.

(*With Plates XI to XIV.*)

(*Read before the Bombay Natural History Society on June 14th*, 1898.)

Meliageæ.

D. glandulosum, Talb., Syst. List of Trees, etc., p. 39. *Bili devdari*, *bili budlige*, K. (*Plate XI.*)

A very large tree. Leaves 12 in. ; petioles angled, 4-6 in. ; leaflets about 9, sub-opposite or alternate, ovate, elliptic-lanceolate, shortly acuminate, sometimes slightly falcate, coriaceous, puberulous when young, glabrescent in age, pale and strongly nerved beneath, lateral nerves 10-20 pairs, with hollow, ciliate glands in the axils ; blade 2-9 by 1·5-3 in.; petiolules short, ·25 in. Inflorescence in axillary, 4-8 in. puberulous panicles, often crowded near the ends of the branches, upper branches very short, lower much longer. Flowers small, ·25 in. long, white, sweetly scented, hermaphrodite, shortly pedicelled, pedicels ·10-·25 in., slender. Calyx 4-lobed nearly to the base, lobes acute or obtuse. Petals 4, broad, reflexed in flower, slightly imbricate in the 4-angled bud, ·25 in. long, pubescent on the outside. Staminal column tubular-urceolate, somewhat 4-angled, mouth crenulate ; anthers 8, included. Disk cup-shaped, equalling or ½ the ovary, crenulate and ciliate on the margin. Ovary 4-celled, white, tomentose ; style equalling the staminal column ; stigma capitate, just exserted. Fruit globose, or obovoid, 2-2·5 in. in diameter, bright yellow, tubercled, verrucose, and with the 4 sutural lines distinct ; seeds 3-4, large, angular, with a dark brown, smooth testa and green cotyledons.

North Kanara and probably the Konkan in evergreen forests from the sea-level upwards to 2,000 ft., common in many of the "kans" near Yellapore. A large or very large tree with a cylindrical stem. Trunks which yielded over 350 cubic feet of timber were not uncommon near Yellapore in North Kanara. Flowers during the latter end of January and February. Fruit ripe during May and June.

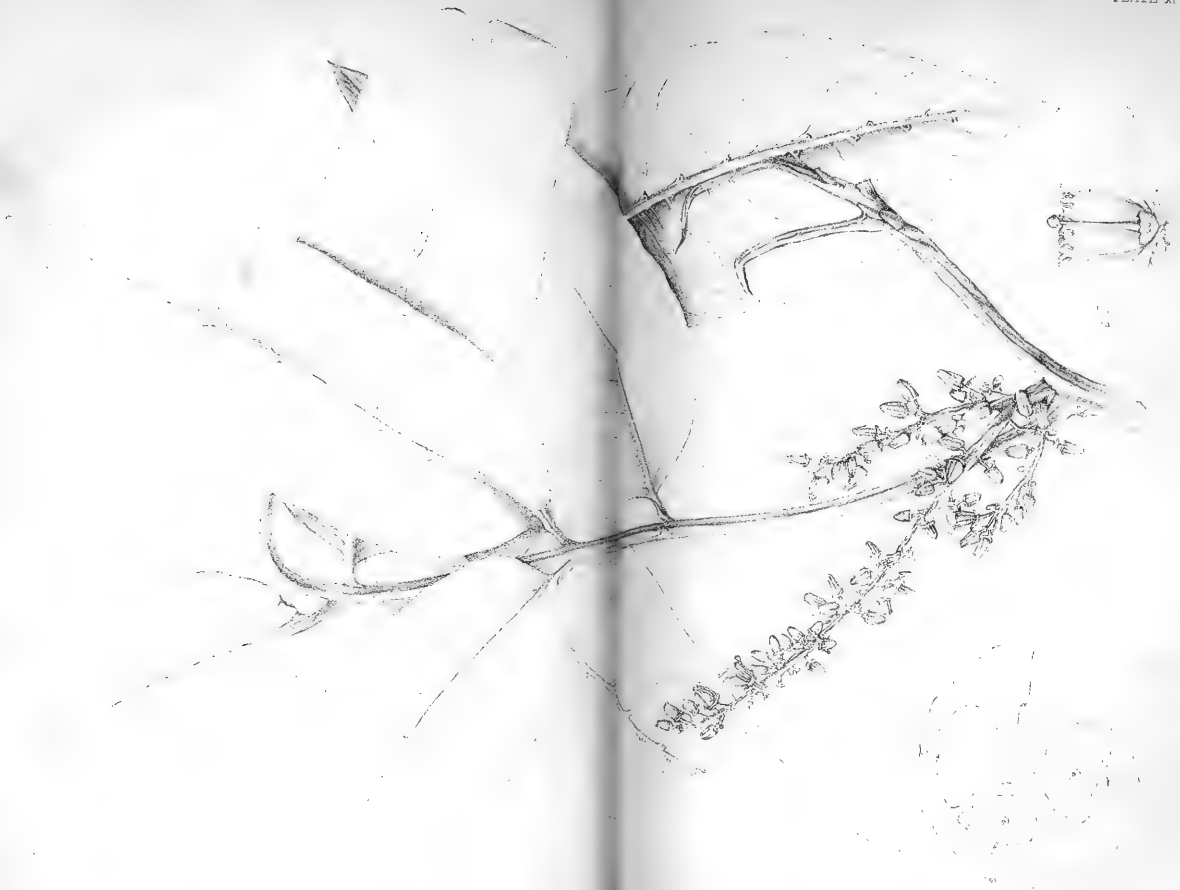
Bark light-coloured, exfoliating in large scales, mostly breaking off from below, exposing underneath a peridermic layer covered with

E. Talbot Delt.

DYSOXYLUM

Lith: by Chitra Silpi Cº.

LOSUM, Talb.



E. Talbot. Delt.

Lith: by Chitra Silpi Co.

DYSOXYLUM GLABROSUM, Talb.

E. Talbot del.

PSYCHOTRIA CANARENSIS, Talb.

New Chitra Silpi C&lith.

E. Talbot del. New Chitra Silpi C°lith.

VERNONIA ORNATA, Talb. Sp. nov.

Drawn by E. Talbot

DIOSPYROS CRUMENATA, THWAITES.

Lith: by A. C. Singha.

isolated groups of corky tissue ; inner bark of alternate layers of yellow (hard bast) and thin white (soft bast) tissue. Green and reddish parenchyma are present in old trees. Wood moderately hard, yellowish. Med. rays fine, numerous. Pores medium and small, equally distributed. Annual rings distinct. Wood possesses a strong cedar-like smell when freshly cut, and polishes with a fine satin lustre. Weight 40lbs to the cub. ft. Logs decay rather slowly on exposure. Wood used for building purposes in North Kanara but is not in great demand ; would do for cigar boxes, tea cases, etc., but the supply is limited.

RUBIACEÆ.

P. CANARENSIS, Talb., Syst. List Bomb. Trees, etc., p. 113. (*Plate XII.*)

A small erect shrub with smooth branches. Leaves ovate, obovate, or lanceolate, acute, attenuate at the base, thin, nearly glabrous, minutely punctate and pale beneath ; lateral nerves 8 pairs, distinctly looping within the margin ; blade 2-5 by ·5-1·75 in. ; petiole 0-·25 in. long. Stipules short, acute, caducous. Cymes few or many flowered, mostly terminal, 1-3 in. long, branches opposite or verticellate, slender, as long as or longer than the peduncle. Flowers small, sessile. Bracts and bracteoles minute, linear, caducous. Calyx short, tubular, 4-toothed. Corolla white, tubular or slightly funnel-shaped, about ·12 in. long, limb with 4 spreading or reflexed lobes, mouth of the corolla hairy within. Stamens at the mouth of the tube ; filaments very short. Ovary 4-lobed ; style as long as the corolla tube. Fruit ovoid, curved, black, shining, ridged, about ·5 in. long, crowned with the toothed calyx. Seeds ridged along the back, ventrally flat ; albumen equable.

Fairly common in the forests near the falls of Gairsoppah in North Kanara. Flowers during the rainy season. Fruit ripe during December and January.

COMPOSITÆ.

VERNONIA ORNATA, Talb., sp. nov. (*Plate XIII.*)

A stout handsome flowered herb, 2-4 ft. high. Branches striate, glabrous or pubescent. Leaves ovate, lanceolate, acute or acuminate, gradually narrowed into the petiole, distinctly and strongly serrate, membranous, sparsely hairy above and beneath, midrib strong beneath, lateral nerves about 8 pairs, distinct, blade 6-4 by 2-1·25 in.; petiole

·25 in. or 0. Heads 5-·75 in. across, inbracteate, axillary or terminal slender corymbs longer or shorter than the leaves ; peduncles slender, about 1 in. long. Involucral bracts linear, acute, apiculate or obtuse, dark coloured and hairy towards the tips on the outside ; glabrous, silvery shining within, gradually becoming ovate and smaller outwards ; receptacle pubescent. Corolla ·3 in. long, pink, glabrous or glandular pubescent. Akenes glabrous or hairy, ·2 in. long, slender, distinctly and strongly 10-ribbed ; pappus longer than the invol. bracts, reddish ; hairs barbellate, outer very short.

This handsome plant is very common in the forests near the falls of Gairsoppah. I have never seen it elsewhere. As it could not be matched either at Kew or Calcutta I have named it as above. It comes in my opinion near *V. pectiniformis*, DC. It flowers throughout the cold season.

EBENACEÆ.

DIOSPYROS CRUMENATA, Thw., Enum. 179 ; Fl. Br. 1, 3, 567 ; Bedd., Fl. Syl., 145. Vernacular name, *Kan tumri*, K. (*Plate XIV.*)

A very large tree. Leaves ovate, bluntly acuminate, coriaceous, glabrous, shining beneath, drying brown ; midrib and venation conspicuous ; blade 3-6 by 2-1·25 in., petiole ·5 in. long. Male fl. ·5 in. long, in small, peduncled, deflexed, 3-5 flowered cymes, cyme branches ·2 in. long. Calyx tubular, tomentose, lobes 4, shallow, teeth acute. Corolla tubular, silky, tomentose, lobes 4, spreading. Stamens 12, glabrous ; anthers apiculate. Female fl. axillary, articulated on a very thick, short peduncle ; peduncle ·25 in. long, pubescent at the top. Calyx large, ·75 in. across, tube short, lobes deeply plicate, accrescent in fruit. Ovary hairy, 4-celled, cells 2-ovuled ; stigmas 4 ; staminodes 6-8, glabrous, acuminate. Fruit globose, 2-2·5 in. in diameter, rather obscurely 4-ridged at the apex ; calyx accrescent, forming a thick woody quadrangular cup, about 1·25 in. wide ; peduncle thick, short, woody ; seeds large, about 1 in. long, ovoid, flattened, wedge-shaped, immersed in white stringy pulp ; testa shining brown ; albumen ruminated.

A very large tree with a cylindrical trunk 100-150 ft. high, and 4-5 ft. in diameter at the base. Bark thin, scaly, cinerous. Wood

reddish, close-grained, tough, hard. Pores few, medium-sized. Medullary rays numerous, very fine, transverse bars indistinct. No ebony heart-wood. Weight 54lbs. to the cubic foot. Wounds in the trunk caused by broken branches or cutting instruments rapidly turn very black. *D. pruriens* and some other species of *Diospyros* act in a similar manner, locally forming a kind of black ebony-like wood.

This tree is common in North Kanara in the evergreen forests between the Gairsoppah and Dodmune Ghats. It flowers and fruits during the hot season, March-May. Flowering specimens sent to Kew were doubtfully referred to *D. crumenata*, Thw.; but specimens sent to Dr. Prain in Calcutta were declared to be exactly similar to those of *D. crumenata*, from Ceylon. As this tree is an addition to the flora of Bombay, I have described and figured it in this journal.

A NOTE ON THE ZOOLOGICAL DIVISIONS OF SIKHIM.

By H. J. Elwes, F.R.S.

(*Read before the Bombay Natural History Society on June 14th*, 1898).

In Mr. Dudgeon's Catalogue of the *Heterocera* of Sikhim to which some notes of mine are added, I find he has adopted from Dr. Waddell in the Gazetteer of Sikhim, what I consider to be a very unnatural and misleading zoological sub-division of that part of the Himalayas. In my Catalogue of the Butterflies of Sikhim, published in the Transactions of the Entomological Society of London for 1888, pages 269-465, I made the observations quoted below, which have probably been overlooked by Mr. Dudgeon, but as no one has, in the nineteen years which have elapsed since I first wrote on the subject, so far as I know, attempted to controvert those views, I think that if Mr. Dudgeon does not agree to their being applicable to Moths as they are to Mammals, Birds and Butterflies he should give his reasons. Now that the genera of Indian *Heterocera*—which, when I wrote, were in a state of absolute chaos—are to some extent put on a sound basis by Sir G. Hampson, it would be possible to analyse them, in order to see how far their geographical distribution falls into line with that of other orders.

"The Eastern Himalayas have been divided by Hodgson (see "Journal of the Asiatic Society of Bengal for 1835) into three zones "of elevation, each of which has a very distinct fauna and flora; "and, when writing on the distribution of Asiatic birds (Proc. Zool. "Soc., 1873, p. 65), I showed that these three zones are perfectly "characteristic of three different zoological provinces. The lower or "tropical zone extending up to about 5,000 feet, which is inhabited "by plants, birds and insects characteristic of the Indo-Malay region. "The middle or temperate zone from 5,000 up to about 10 or 12,000 "feet, which, though mostly of a subtropical character, is largely "peopled by birds, plants, and insects peculiar to the mountainous "region extending from Kashmir to Sumatra and Formosa, which "I then christened the Himalo-Chinese subregion. Thirdly, the "alpine zone, above 12,000 feet, which belongs to and is inhabited "by forms peculiar to or characteristic of the Palæarctic region."

"But, though the distribution of *Lepidoptera* is very similar to that "of birds, yet many of the genera as at present recognised are much

"more cosmopolitan in their range, and I do not find that the middle "zone contains anything like the same proportion of peculiar species "or genera of *Lepidoptera* in proportion to the lower one, as it does "in the case of birds and plants. I also notice that the upper zone, "especially in the outer hills, where the rainfall is much heavier "than in the interior, is much poorer both in abundance and variety "of species than might be expected from its great extent and "elevation, and from the great number and variety of species which "are found in the adjoining regions of Turkestan and China. This, "however, may be accounted for by the extreme moisture of the "climate, and the prevalence of rain and mist during the summer "or rainy season, which lasts almost without intermission from May "till October. It is also probable that a better knowledge of the "drier valleys and mountains of the interior at an elevation of "9—14,000 ft. will add many new species to the few which we at "present have obtained through our native collectors, as it must "be remembered that no European has hitherto collected insects "systematically at a higher elevation than 12,000 ft. in the Eastern "Himalayas, and that the interior valleys are as yet practically "untouched." (l. c., pp. 272, 273.)

ON *AFRIDIA*, A NEW GENUS OF *LABIATÆ* FROM THE NORTH-WEST FRONTIER OF INDIA.

By J. F. Duthie, F.L.S.

(*Read before the Bombay Natural History Society on June 14th*, 1898.)

Afridia, nov. gen. Calyx tubular, fifteen-nerved, slightly curved; mouth oblique, entire. Corolla-tube slender towards the base, exserted, without a ring of hairs within; limb two-lipped; posterior or upper lip erect, concave, bifid; lower spreading, 3-fid.; middle lobe larger than the laternal ones, concave, bifid. Stamens four, nearly equal, ascending beneath the posterior lip, exserted or included, the posterior pair slightly overtopping the front pair; anthers two-celled, lobes diverging, and at length divaricate. Disk deeply divided into four equal lobes. Style included or exserted, bifid; lobes subulate, nearly equal. Nutlets obovoid, minutely tuberculate; areole at the base V-shaped. Suffruticose with many branching stems. Flowers in densely packed verticillasters forming compact terminal spikes, or with the lower clusters more or less interrupted. Corolla pale yellow tinged with lilac.

Afridia nepetæformis, nov. sp. Whole plant more or less hoary-pubescent. Stems 1 to 2 feet high. Leaves shortly petioled, ½ to 2 inches long by ¼ to 1 inch broad, ovate or ovate-lanceolate, obtuse, cordate, margin crenate, rugose on upper surface, veins beneath prominent. Lower bracts leaflike; bracteoles shorter than the calyx, ovate, acute or acuminate, three-nerved, membranous. Calyx reddish-purple, clothed with spreading hairs. Corolla hairy outside. Filaments with spreading hairs towards their bases.

Fine specimens of both forms of this interesting plant were recently obtained during the Tirah expedition by Inayat Khan, the head plant-collector of the Botanical Department of Northern India, at elevations between 4,500 and 8,500 feet above the sea. This plant was first discovered by Dr. Griffith in Afghanistan at about the time of the first Afghan War. I have not seen Griffith's specimens, but his No. 4060 is quoted by Dr. Aitchison as identical with his Kurram valley specimens collected in 1880. In his report on the "Flora of the Kurram Valley," Aitchison refers to it under his No. 648 as "*Nepeta* sp."

Some additional material was obtained from the Kurram valley some few years afterwards by Harsukh, another plant-collector belonging to the Botanical Department.

Afridia is most nearly related to *Nepeta*, differing from that genus by the absence of calyx-teeth.

It may be mentioned that the form with small included stamens has shorter and more congested flowering spikes than in the form with exserted stamens; also that the anther-lobes of the former remain confluent.

A plate representing both forms is being prepared, and will shortly be published in the "Annals of the Royal Botanic Garden, Calcutta."

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

PART III.

By Sir G. F. Hampson, Bart., F.Z.S., F.E.S.

(*Continued from page* 462 *of this Vol.*)

2810*a*. Bleptina mimica, n. sp.

♂. Antennæ bipectinate ; forewing with vein 10 given off beyond the areole. Differs from *B. hadenalis* in the structure of the antennæ only.

Habitat.—Sikhim. *Exp*. 34 mm. *Type*.—In British Museum.

2815. *Bleptina* ochracealis trans. ad. Nodaria after externalis.

♂ with the ground-colour grey-brown.

2817*a*. Bleptina figurata, n. sp.

♂. Head and thorax black-brown ; palpi largely ochreous ; abdomen fuscous, pale at base and middle and banded with black. Forewing with the basal and outer areas black, the medial area ochreous-brown ; fine ante- and post-medial black lines, parallel to the margins of ochreous area, the former nearly evenly curved, the latter dentate outwards below costa, very strongly dentate on veins 3 and 4, then incurved to below angle of cell ; a black spot in cell and discocellular lunule with white lunule beyond it and slight black suffusion before it ; an indistinct waved submarginal line with ochreous striga at costa ; a marginal series of black lunules. Hindwing fuscous with traces of medial and submarginal lines, a marginal series of black lunules and pale patch at anal angle ; underside with black spots in, at end of, and beyond cell, and crenulate postmedial and submarginal lines.

Habitat.—Khásis. *Exp*. 32 mm. *Type*.—In British Museum.

2819*a*. Bleptina impuralis, n. sp.

Palpi of male recurved over head, the third joint tufted with hair ; fore tibiæ with a sheath ; forewing with the costal fold narrow. Head and thorax reddish-brown ; tufts on palpi blackish ; abdomen fuscous. Forewing rufous with a fuscous tinge to the postmedial line, the outer area fuscous, indistinct waved antemedial, medial, and post-medial lines, the last excurved round the cell ; a white speck with black scales round it in cell ; reniform whitish with black outline and

centre; an irregularly waved whitish submarginal line; a marginal series of black points. Hindwing blackish, with indistinct sinuous medial line defined by whitish; a crenulate submarginal white line; a marginal series of black points; underside with black point in cell and discocellular lunule; crenulate postmedial and submarginal lines defined by whitish.

Habitat.—Sikhim (Dudgeon); Khàsis. *Type.*—In British Museum.

2831*a*. MASTIGOPHORUS PICTICILIA, n. sp.

♀. Head and thorax yellow-brown; abdomen darker; base of palpi, thorax and abdomen below, fiery-red. Forewing olive yellow-brown, irrorated with dark scales; costa fiery-red; waved subbasal and antemedial red lines; a pale speck in cell and large obscure pale reniform stigma, often with two black specks on it; two sinuous postmedial brownish lines with a more or less developed pale-edged deep black lunule on them below vein 2; an irregularly sinuous submarginal line. Hindwing fuscous, the anal area yellow-brown, irrorated with fuscous; both wings with the veins of outer area streaked with fiery-red; a marginal series of black specks; cilia fuscous at base, crimson at tips.

Habitat.—Khásis. *Exp.* 54 mm. *Type.*—In British Museum.

2833*a*. MASTIGOPHOROUS PERDENTALIS, n. sp.

♂. Head and thorax black-brown, palpi fringed with ochreous hair on third joint; abdomen fuscous-black. Forewing dull purplish, the costal and outer areas fuscous, a black point near base of cell; traces of an erect antemedial line bent inwards to costa; a large deep black discoidal lunule, squarely truncate at top, defined by a brown line and extending just below angle of cell; a highly dentate postmedial black line, defined by grey, oblique from costa to vein 4, then incurved; a grey submarginal line, straight from costa to vein 6, strongly angled inwards above vein 5, then excurved, and from vein 2 to inner margin dentate. Hindwing fuscous with indistinct black discoidal lunules; a medial line oblique to vein 4, then dentate; indistinct submarginal dentate line; both wings with marginal series of black lunules and pale line at base of cilia. Underside grey irrorated with black; forewing with black spot in cell and curved postmedial line; hindwing with spot in cell, discocellular lunule and dentate postmedial and submarginal lines.

Habitat.—Khásis. *Exp.* 36 mm. *Type.*—In British Museum.

2835. *Masticophorus* (?) DUBIUS is a Hypena allied to 2942, H. DENTICULATA, *Moore*.

Genus Trilophonota, nov.

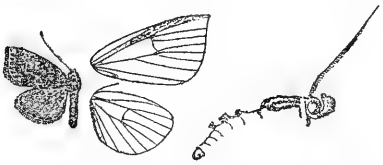
Type.—T. CÆRULILINEATA, *Hampson*.

Range.—Assam.

Palpi upturned, the second joint thickly scaled and reaching above vertex of head, the third short and blunt; antennæ ciliated; abdomen with three large dorsal tufts. Forewing with the outer margin evenly curved; vein 7 from angle of cell; 8-9-10 stalked. Hindwing with vein 5 from close to lower angle of cell; 6-7 from upper angle.

2839*a*. Trilophonota cærulilineata, n. sp.

♂. Black-brown. Forewing with waved metallic-blue subbasal ante- and post-medial lines, the last excurved round cell; diffused sinuous subbasal, medial and submarginal blacker bands, the last angled below costa and at middle; a black spot in cell and two white discocellular spots; a marginal series of black specks. Hindwing pale, slightly or deeply suffused with fuscous; a marginal series of black specks; underside with discocellular spot and curved postmedial line.



Trilophonota cærulilineata ♂ 1/1.

Habitat.—Khásis. *Exp*. 20 mm. *Type*.—In British Museum.

2840*c*. Falcimala sagittifera, n. sp. (Pl. A, Fig. 5.).

♀. Fuscous and grey. Forewing with the basal half suffused with purplish-red; two black marks on basal part of costa, the second giving rise to a sinuous grey line with some dark scales on its outer edge, the purplish area bounded by a sinuous black and grey line with a fuscous line parallel to its inner edge; outer area grey-brown, with a V-shaped black mark beyond the cell in a sinus of the very indistinct postmedial line; some white specks on costa towards apex; an irregularly dentate pale submarginal line with blackish mark on its inner edge below costa, angled inwards above vein 3, and with the area beyond it fuscous; a marginal series of black points. Hindwing fuscous.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp*. 22 mm. *Type*.—[illegible] Museum.

2854*a*. NODARIA PLANILINEA, n. sp.

Differs from *N. errecta* in being grey-brown. Forewing with the antemedial line slightly curved, not angled below costa; the discocellular lunule larger; the postmedial line more excurved beyond cell and less oblique towards inner margin. Hindwing with the ground-colour grey-brown.

Habitat.—Sikhim; Khásis. *Exp.* ♂ 30; ♀ 34 mm. *Type.*—In British Museum.

2866*a*. NODARIA MACULIPEX, n. sp.

♂. Grey-brown. Forewing with irregularly waved antemedial line; a discocellular lunule; the postmedial line oblique and stronger from costa to vein 6, then crenulate and slightly bent inwards at vein 2; a white submarginal line slightly incurved at costa; defined by blackish on inner side, the area beyond it whitish, suffused with fuscous, with a prominent black apical spot; a fine black marginal line. Hindwing with discocellular lunule and waved medial line; the marginal area as on forewing, but terminating on the margin at vein 2, and with no apical spot.

Habitat.—Khásis. *Exp.* 22 mm. *Type.*—In British Museum.

2868*a*. NODARIA SIMPLEX, n. sp.

Antennæ of male slightly knotted and contorted at middle; fore tibiæ with the sheath covering the first joint of tarsus only. Pale, suffused with yellowish-brown and slightly tinged with fuscous. Forewing with curved antemedial line; a large, very prominent black discocellular lunule; the postmedial line oblique from costa to beyond cell, when it is obtusely angled, erect from vein 2 to inner margin; an irregularly sinuous whitish submarginal line with fuscous suffusion on its inner edge and angled outwards below costa and at middle; a marginal series of black points. Hindwing paler, with indistinct antemedial, medial and waved postmedial lines, the last with blackish spot above anal angle; a marginal black line; underside with prominent discocellular lunule and waved medial and postmedial lines.

Habitat.—Khásis. *Exp.* 24 mm. *Type.*—In British Museum.

2869*a*. NODARIA PERUMBROSA, n. sp.

Black-brown. Forewing with waved antemedial line defined by brown; reniform large and dull brown; an irregularly sinuous post-

medial line defined by brown and excurved below costa and lower angle of cell ; an indistinct sinuous pale submarginal line excurved below costa, and with a pale patch on it above middle ; a marginal series of black lunules. Hindwing and abdomen fuscous ; underside with discocellular lunule and indistinct medial and submarginal lines.

Habitat.—Khásis. *Exp.* 36 mm. *Type.*—In British Museum.

2873*a*. NODARIA PERDENTALIS, n. sp.

♂. Antennæ of male strongly knotted at middle. Ochreous-brown irrorated with fuscous. Forewing with indistinct very highly crenulate antemedial line ; two indistinct discocellular specks ; a broad straight fuscous submarginal line arising from a black spot at apex ; a fine black marginal line and two lines through the cilia. Hindwing paler, with ochreous-brown and black irroration below vein 2 ; an indistinct discocellular speck ; postmedial and submarginal lines angled on vein 2 and obsolete towards costa, the latter broad and prominent ; a black marginal line.

Habitat.—Khásis. *Exp.* 38 mm. *Type.*—In British Museum.

2875*b*. CATADA POSTMEDIA, n. sp.

Differs from *C. rasalis* in the second line of the forewing being medial, erect, and slightly excurved at middle to near the discocellular black lunule, which is placed beyond it, instead of oblique from costa and strongly bent outwards round the lunule ; the area before the medial lines slightly suffused with fuscous. Hindwing whitish, with discocellular lunule and medial line angled outwards beyond it ; a submarginal line ending on margin at vein 2, and marginal line as in *C. rasalis*.

Habitat.—Ceylon (Green). *Exp.* 12 mm. *Type*—In British Museum.

C. rasalis is known from Dharmsála, Bhután, Khásis ; not Ceylon.

2875*c*. CATADA UMBROSA, n. sp.

Differs from *C. postmedia* in the forewing being more uniform brownish, with the irregular submarginal line defined outwardly by whitish. Hindwing fuscous without markings ; cilia greyish.

Habitat.—Dharmsála (Hocking) ; Ceylon (Green). *Exp.* ♂ 20 ; ♀ 22 mm.

2875*d*. CATADA TAU-SIGNA, n. sp.

♂. Differs from *C. umbrosa* in being fuscous instead of brownish ; the medial line strongly angled outwards on vein 1 ; the discoidal

stigma ⊨- shaped, its leg joined to medial line ; a marginal series of white points.

The Bhután specimen is fuscous, with the area between the antemedial and medial lines whitish, the whitish edging of the submarginal line only showing. The Khási specimens are greyer, uniformly irrorated with fuscous.

Habitat.—Bhután (Dudgeon) ; Khásis. *Exp.* 20-22 mm. *Type.*—In British Museum.

2877*a*. CATADA FASCIATA, n. sp.

Forewing with vein 10 arising from 11. ♀. Pale red-brown ; palpi with the first joint and the extremities of the second and third black ; distal half of abdomen blackish. Forewing with traces of fine waved antemedial and medial lines ; black specks in cell and on discocellulars ; a broad postmedial red-brown band edged by black lines, angled inwards and obsolescent towards costa ; some black points on costa towards apex ; a short oblique black streak from apex ending in a black spot ; a very prominent medial submarginal black spot sending a black fascia to extremity of cilia ; a marginal series of points. Hindwing with medial red-brown band edged by waved black lines, the area beyond it irrorated and mostly suffused with black, with obscure crenulate submarginal line with blackish patch at middle, emitting a fascia to extremity of cilia. Underside fuscous except base of hindwing.

Habitat.—Khásis. *Exp.* 20 mm. *Type.*—In British Museum.

2883*a*. CATADA LOPHONOTA, n. sp.

Fore tibiæ of male tufted with hair ; abdomen with three dorsal tufts. Brown, strongly irrorated and suffused with black. Forewing with oblique slightly sinuous ochreous subbasal and antemedial lines defined by black lines on outer side ; a diffused medial black line with prominent black discocellular lunule beyond it ; a sinuous ochreous postmedial line defined by a black line on inner side, excurved at middle, and slightly angled at veins 6 and 4. Hindwing with medial black line ; a postmedial nearly straight ochreous line defined by a black line on inner side ; both wings with diffused irregular submarginal line ; a marginal series of black lunules and fine ochreous line.

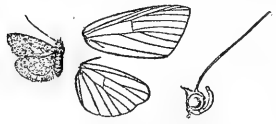
Habitat.—Khásis. *Exp.* 18 mm. *Type.*—In British Museum.

Genus PSEUDCRASPEDIA, nov.

Type.—P. PUNCTATA, *Hampson.*

Range.—Sikhim.

Palpi upturned, the second joint smooth, slender, and reaching just above vertex of head, the third short and blunt; antennæ of female almost simple. Forewing narrow, the apex produced, and outer margin oblique; veins 3 and 4 shortly stalked; 5 from above angle; 7, 8, 9, 10 stalked; 11 from cell. Hindwing with veins 3 and 4 shortly stalked; 5 from near middle of discocellulars; 6 and 7 on a long stalk.



Pseudcraspedia punctata, ♀ 1/1.

28865. PSEUDCRASPEDIA PUNCTATA, n. sp.

♀. Grey-brown; palpi tinged with black. Forewing with six black spots on costa, which is whitish; a black spot below middle of cell, one beyond middle of discocellulars, another beyond upper angle and one on vein 1, these last three with the last costal spot forming an oblique postmedial series; basal and subbasal crimson spots on inner margin, and a crimson spot in cell. Hindwing with black and red spot near base of inner margin. Both wings with faint waved red medial, postmedial and submarginal lines, and a marginal series of black points.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 14 mm. *Type.*—In British Museum.

2889*a*. OLULIS ABSIMILIS, n. sp.

♀. Head and thorax ochreous, mixed with dark brown; abdomen pinkish. Forewing ochreous irrorated with dark brown and fuscous; a fuscous patch on costa near base followed by a black speck; a very oblique antemedial dark line with some fuscous beyond its costal half; an indistinct black-edged attenuate reniform stigma; the postmedial line black-edged, minutely waved, excurved beyond cell and bent outwards to inner margin; a nearly straight submarginal line sinuous below vein 2; a prominent series of black points just inside the margin; a marginal brown line. Hindwing pink; a fine marginal brown line; cilia whitish; underside with discocellular point; oblique postmedial line and series of points just inside the margin.

Habitat.—Khásis. *Exp.* 26 mm. *Type.*—In British Museum.

2889*b*. Talapa confluens, n. sp.

Antennæ of male bipectinate. Dark brown, irrorated with blue-grey scales. Forewing with oblique antemedial dark line acutely angled below costa ; a black discocellular lunule and traces of a medial line ; two oblique postmedial lines filled in with rufous and converging towards inner margin, the outer line from near apex strong and defined outwardly by blue-grey ; an indistinct minutely waved submarginal line obtusely angled at middle and with no blue-grey irroration between it and the postmedial line ; a fine crenulate marginal line. Hindwing similar, the blue-grey irroration confined towards the anal angle ; the double postmedial line obsolete towards costa.

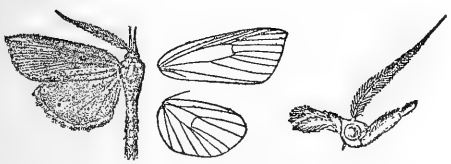
Habitat.—Khásis. *Exp.* 44 mm. *Type.*—In British Museum.

Genus Plumipalpia, nov.

Type.—P. lignicolor, *Hampson.*

Range.—North-West Himalayas.

Palpi obliquely upturned, the second and third joints fringed with long hair above, the second about three times the third, about the length of head ; frons with conical tuft ; antennæ of male bipectinate, the terminal portion simple ; metathorax with tuft of scales. Forewing with raised tufts of scales, long and narrow, the apex rectangular ; veins 8 and 9 anastomosing to form the areole. Hindwing with the outer margin obtusely angled at vein 2 ; vein 5 from near lower angle of cell, 3-4 and 5-6 from angles.



Plumipalpia lignicolor, ♂ ½.

2894*a*. Plumipalpia lignicolor, n. sp.

♂. Pale yellowish-brown ; palpi blackish ; patagia fringed with ferruginous. Forewing with the costal area suffused with purplish-brown ; a tuft of raised black scales in middle of cell and another below origin of vein 2, with two short lines from it to inner margin ; a few black scales on inner area, and an oblique submarginal fine ochreous streak defined by black below vein 2 ; a subapical black speck and marginal series of specks. Hindwing fuscous-brown, the cilia paler.

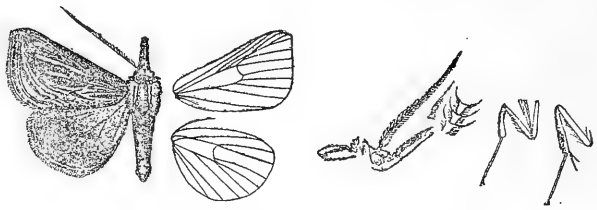
Habitat.—Kasauli, North-West Himalayas. *Exp.* 36 mm. *Type.*—In British Museum.

Genus SCHISTORHYNX, nov.

Type.—S. ARGENTISTRIGA, *Hampson.*

Range.—Assam.

Palpi oblique, the second joint moderate, the third twice its length, the two joints fringed above with long hair to near apex of third joint and forming a fork with the apex; a sharp frontal tuft; antennæ of male with bristles and cilia; thorax with dorsal tuft; forelegs with tuft of long hair from joint of coxa and femur; fore and hind tibiæ fringed with spinous hair. Forewing with the costa arched towards apex, which is somewhat produced, the outer margin rounded; veins 7 and 10 from the areole which is formed by 8 anastomosing with 9. Hindwing with veins 3-4 and 6-7 from angles of cell, 5 from just above angle.



Schistorhynx argentistriga, ♂ $\frac{1}{1}$.

2898*b*. SCHISTORHYNX ARGENTISTRIGA, n. sp.

Head and thorax purplish-grey; palpi black-brown at sides; collar fringed with black-brown; abdomen grey-brown. Forewing purplish-grey; costa brown to beyond middle; some fine brown streaks at base; a pale oblique antemedial striga from costa; a wedge-shaped olive-brown patch from near base of cell to the postmedial line, with yellowish-white streak in cell conjoined to another beyond the cell, a similar streak beyond lower angle, these streaks being defined by fine black lines; four lines curving from apex towards base of inner margin, the two outer ending at vein 2, the others with a yellowish-white streak above them at base of wing; two fine marginal lines, and a line through the cilia. Hindwing fuscous-brown, with indistinct pale postmedial band; underside pale, with discocellular lunule and waved postmedial and submarginal line.

Habitat.—Khásis. *Exp.* 42 mm. *Type.*—In British Museum.

2904*b*. MARAPANA COSTIPLAGATA, n. sp.

♀. Dark purplish red-brown; palpi with the extreme tips white. Forewing with orange-red spots at base of costa and before middle, a

larger subtriangular postmedial patch, with three white specks beyond it; an oblique double postmedial line from apex of the triangular patch to middle of inner margin of hindwing; outer area of both wings paler red-brown, with a submarginal series of obscure fuscous marks, and series of black specks just inside the margin; cilia purplish. Palpi with the third joint naked; forewing with vein 10 from areole, the outer margin excised below apex.

Habitat.—Khásis. *Exp.* 34 mm. *Type.*—In British Museum.

2980*a*. HYPENA OXYDATA, n. sp.

♂. Differs from *H. glaucescens* in the forewing being tinged with greenish-grey, the outer area, except towards costa, bright rufous; the antemedial line obscure and waved; the postmedial line less prominent, obtusely angled below costa, then waved and defined with grey, more strongly towards inner margin. The palpi of these two species are oblique as in *H. rectilinea*, but with the second joint longer than the third.

Habitat.—Khásis. *Exp.* 34 mm. *Type.*—In British Museum.

2981*a*. HYPENA DISSIMULANS, n. sp.

♀. Forewing with the outer margin slightly angled at middle, the outer angle hooked. Greyish, suffused with pale red-brown. Forewing irrorated with dark brown and fuscous, black specks in cell and at upper angle, faint traces of an antemedial line angled below costa; a postmedial line acutely angled below costa, then crenulate to vein 3, and with more or less developed black marks beyond it in the interspaces, then very oblique, and defined by a pale outer edge to inner margin; submarginal and marginal series of black specks; a black patch at the angle of margin sometimes developed. Hindwing fuscous.

Habitat.—Khásis. *Exp.* 24 mm. *Type.*—In British Museum.

2986*a*. HYPENA IGNIARIA, n. sp.

♀. Head, thorax, and abdomen leaden-fuscous; the end of patagia, metathorax, and base of abdomen ochreous and fiery-red. Forewing with the costal area leaden-fuscous; the basal half of wing ochreous, largely suffused with fiery-red; a black speck in cell and another at lower angle; a straight dark medial line, the area bounded by a crenulate yellowish-white line bent inwards below cell; outer area leaden-fuscous, broadly suffused with red below the costal area; some white specks on costa towards apex; an irregularly waved double dark submarginal line with

some red on it; a marginal series of black specks. Hindwing similar, the yellowish-white line bounding the red area angled outwards at middle.

Habitat.—Khásis. *Exp.* 24 mm. *Type.*—In British Museum.

2986*b*. HYPENA PERDRICIPENNIS, n. sp.

♂. Head, thorax, and abdomen dark fuscous. Forewing purplish-grey, suffused and very thickly striated with dark brown; traces of an olive-yellow diffused antemedial line and a similar more distinct obliquely curved postmedial line, sometimes with indistinct series of spots beyond it in the interspaces; a diffused grey shade from apex of forewing to inner margin beyond middle. Hindwing dark fuscous; both wings with grey line at base of cilia. ♀. With the palpi as in Section I.

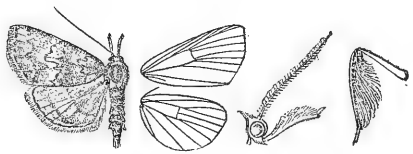
Habitat.—Khásis. *Exp.* 32 mm. *Type.*—In British Museum.

Genus MIXOMELIA, nov.

Type.—M. DECIPIENS, *Hampson.*

Range.—Assam.

Palpi obliquely upturned, the second joint curved forward, fringed with hair above, and about four times the length of head, the third minute; frons rounded; antennæ of male with bristles and cilia; fore tibiæ with a sheath containing masses of flocculent hair covering almost the whole tarsus, abdomen with lateral tufts of hair. Forewing with vein 7 from cell, 8-9-10 stalked. Hindwing with veins 3-4 and 6-7 shortly stalked, 5 from near middle of discocellulars.



Mixomelia decipiens ♂ 1/1.

2991*a*. MIXOMELIA DECIPIENS, n. sp.

♂. Grey-brown; abdomen dark brown tinged with grey. Forewing with waved antemedial line bent outwards from below costa to below cell; a diffused medial brown band from cell to inner margin; two discocellular black specks; a crenulate postmedial line excurved beyond cell; a crenulate submarginal line angled outwards at middle; the outer area suffused with brown except towards costa; a marginal series of black specks. Hindwing pale, suffused with fuscous beyond lower angle of cell; a sinuous medial line and submarginal line angled outwards to the margin at vein 2; a marginal line; underside grey

irrorated with brown ; a discocellular speck, medial and submarginal lines and marginal series of specks.

Habitat.—Khásis. *Exp.* 30 mm. *Type.*—In British Museum.

3003*a*. CHUSARIS METERYTHRINA, n. sp.

Forewing with vein 10 from the cell. ♂. Ochreous-brown, irrorated with fuscous. Forewing with faint traces of oblique antemedial line angled below costa ; two discocellular black spots; an oblique postmedial line widening and diffused towards costa; an indistinct slightly curved submarginal line ; a series of black points just inside the margin. Hindwing bright pink with diffused fuscous on inner margin ; cilia white.

Habitat.—Khásis. *Exp.* 24 mm. *Type.*—In British Museum.

EPIPLEMIDÆ.

3035. DECETIA NUMICUSARIA, insert var. *sinelinca*, Warr., Nov. Zool., iv, p. 24.

3040*a*. EPIPLEMA ARCUATA, Warr., Nov. Zool., iii, 3, p. 307.

Forewing with outer margin excised from apex to vein 6 and from 6 to 4 ; hindwing produced to a point at vein 7 and tail at vein 4. ♂. Dark red-brown; wings thickly striated with dark brown. Forewing with slight dark discocellular mark ; a postmedial rufous line slightly angled at vein 6 and strongly at vein 4, defined by a pale line on outer side ; a fuscous marginal lunate mark, defined by a black line on inner side from below apex to vein 4. Hindwing with rufous fascia on median nervure ; a postmedial rufous line defined by a pale line on outer side, produced to an acute angle on vein 4, and with an ochreous patch beyond it from vein 4 to anal angle. ♀. Much paler brown.

Habitat.—Khásis. *Exp.* ♂ 26 ; ♀ 34 mm.

3041*b*. EPIPLEMA RETRACTA, n. sp.

♀. Differs from *E. tenebrosa* in the outline of forewing ; the costa and outer margin with ochreous specks ; the antemedial line nearer the base and strongly angled at middle ; the postmedial line defined by ochreous and much retracted to costa.

Habitat.—Sikhim (Dudgeon). *Exp.* 18 mm. *Type.*—In British Museum.

3044. EPIPLEMA MOZA, insert (syn.) *Epiplema flavigutta*, Warr., A. M. N. H., (6), xviii, p. 231.

3056*a*. EPIPLEMA FULVATA, Warr., Nov. Zool., iii, 3, p. 307.

♂. White; head and thorax tinged with yellow. Forewing with light brown striæ on costal and inner areas; dark antemedial and medial specks on costa; a large medial black spot above inner margin; an irregular ill-defined orange band from middle of costa to outer angle; orange marks on costa and a patch on outer margin below apex; a black subapical point. Hindwing with orange patch below base of cell; nearly the whole outer half of wing orange, reduced to striæ towards costa; two indistinct postmedial lines, black just below vein 4; a fulvous marginal line between the tails and black point below lower tail.

Habitat.—Khásis. *Exp.* 16 mm.

3058. EPIPLEMA BICAUDATA, insert (syn.) *Epiplema fuscifrons*, Warr., Nov. Zool., iii, p. 348.

3060. EPIPLEMA INSTABILATA, insert var. *semifulva*, Warr., Nov. Zool., iv, p. 25.

3063*d*. EPIPLEMA RUFIMARGO, Warr., Nov. Zool., iii, p. 349.

Antennæ of male bipectinate. Differs from *E. bicaudata* in the whole outer area of both wings being evenly suffused with rufous without fuscous patches, but leaving slight white patches towards inner margin of each wing.

Habitat.—Sikhim. *Exp.* 26. mm.

3063*e*. EPIPLEMA CLATHRATA, Warr., Nov. Zool., iii, p. 347.

♂. Forewing with the outer margin indented below apex, excised to vein 3, the outer angle strongly hooked. Hindwing with the costa excised at middle, with tufts of scales before and after the excision; the outer margin produced to points at veins 3, 6, and 7; veins 4 and 5 absent; the inner area with a fold and tuft of hair. Grey-brown; frons black. Forewing with antemedial and postmedial pale lines, the former angled at middle, the latter excurved beyond cell, then incurved, black patches separated by the pale veins on outer side of former and inner side of latter; two brown subapical specks and a curved line on inner side of the excision. Hindwing with pale antemedial line, with a dark fascia from base to its very acute angle on vein 3; a black band interrupted by the pale veins on its outer edge; the postmedial pale line excurved at vein 3 and obsolete below 2, with a brown band on its inner side interrupted by the pale veins; a submarginal fine dark line between the tails and points above and below lower tail.

Habitat.—Khásis. *Exp.* 20 mm.

3063*f*. EPIPLEMA CASTANEA, Warr., A. M. N. H., (6) xviii, p. 231.

Forewing with the outer margin produced to a point at vein 7, then deeply excised to vein 3; hindwing with the costa excised at middle, with tufts of hair before and after the sinus; the outer margin produced to a tail at vein 4 and points at veins 3 and 1*b*; veins 2, 5, 6, 7, the discocellulars, and upper margin of cell absent; a fold on inner area containing a tuft of long hair; antennæ laminate. ♂. Frons black; head, thorax, and abdomen dark grey; wings grey, with fine dark striæ. Forewing with a broad medial purple-brown band bounded by dark brown lines, the inner slightly angled on subcostal and median nervures, the outer angled on veins 7 and 3, then excised to vein 1; a dark brown marginal line at the sinus; some fuscous suffusion near outer angle. Hindwing with broad medial purple-brown band, bordered on inner side by an oblique brown line, on outer side by a line angled on vein 1*b*; some ferruginous suffusion on margin between veins 2 and 1*b*.

Habitat.—Khásis. *Exp*. 28 mm.

3069*a*. DIRADES HEPATICATA, Warr., Nov. Zool., iii, p. 345.

♀. Dark purplish grey-brown. Forewing with pale medial line acutely angled at middle; an almost straight and erect postmedial line, the area between the two very dark brown; a subapical black speck and brown lines on margin and base of cilia. Hindwing with pale antemedial line angled at middle, and curved sinuous postmedial line defined by brown, the former on outer side, the latter on inner; some leaden suffusion near the lower tail, and a black and white speck below it; a fine leaden marginal line on a brown band.

Habitat.—Khásis. *Exp*. 16 mm.

3069*b*. DIRADES AMBIGUA, Warr., A. M. N. H., (6), xviii, p. 230.

Hindwing of male with no fold and tuft of hair on inner margin or tufts on costa; the tails at veins 7 and 4 well developed; venation normal. ♂. Pale grey; frons black; wings irrorated with fuscous. Forewing with obscure almost medial line highly excurved below costa; the postmedial line more distinct and rufous, highly excurved between veins 7 and 3, then incurved to vein 1; a curved series of four submarginal black specks on fuscous suffusion below apex. Hindwing with obscure antemedial line; a sinuous postmedial line oblique from costa to vein 4; some rufous on margin, and a black speck at base of each tail. ♀. Darker grey.

Habitat.—Khásis. *Exp.* ♂ 20 ; ♀ 24 mm.

3073*a*. GATHYNIA PERNIGRATA, Warr., Nov. Zool., iii, p. 350. (Pl. A, Fig. 24.)

♂. Hindwing with only one median nervule, veins 2, 4, and 5 being absent. Pale and dark brown, thickly irrorated and striated with black. Forewing with ground-colour of costal half pale, of inner half rufous ; some pale patches on costa ; oblique, sinuous, ante- and postmedial lines not reaching costa, rather near together, and with leaden grey suffusion between them ; a short oblique black subapical streak with black marks below it. Hindwing with the inner area white ; a white spot in cell ; traces of a curved black medial line ; a highly dentate submarginal line, with leaden grey suffusion beyond it from vein 7 towards anal angle.

Habitat.—Khásis ; Ceylon. *Exp.* 22-28 mm.

GEOMETRIDÆ.

3087*a*. URAPTERYX CONVERGENS, Warr., Nov. Zool., iv, p. 75. (Pl. A, Fig. 14.)

♀. White. Forewing with fuscous blotches on basal part of costa ; a very oblique irregular subbasal blotch extending to middle of submedian interspace ; a fascia on basal three-fourths of vein 1 and another on inner margin ; an oblique band, conjoined to a discocellular patch which reaches costa, from costa before middle to outer angle, where it is joined by a postmedial band, a submarginal triangular band of conjoined spots ending below vein 2 ; a marginal band from below apex to vein 2. Hindwing with fuscous fasciæ on median nervure and vein 1, the former joined on vein 2 by an oblique medial band with spot below it ; a bisinuate postmedial line with fuscous specks beyond its costal portion ; a series of fine marginal spots ; cilia brown.

Habitat.—Simla. *Exp.* 54 mm.

3088. SIRINOPTERYX RUFIVINCTATA, insert var. *interfuscata*, Warr., Nov. Zool., iv, p. 122.

The interspaces of both wings suffused with fuscous, except below the cell and basal part of vein 2 of forewing and in and below cell of hindwing.

Genus SCHISTOPHYLE.

Schistophyle, Warr., Nov. Zool., iii, p. 101 (1896).

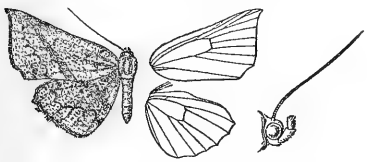
Range.—Assam.

Type.—S. FALCIFERA, Warren.

Palpi upturned, reaching above vertex of head, the second and third joints fringed with scales in front ; antennæ of female simple. Forewing with the costa arched near base ; the apex produced and acute ; vein 3 from before angle of cell ; 7, 8, 9 stalked from long before upper angle ; 10 absent ; 11 anastomosing with 12. Hindwing with vein 3 from well before angle of cell ; 7 from before upper angle ; 8 connected with 7 by an oblique bar.

3092*a*. SCHISTOPHYLE FALCIFERA, Warr., Nov. Zool., iii, p. 101.

♀. Yellowish-white, thickly irrorated with orange-red ; abdomen dorsally suffused with fuscous on medial segments. Forewing with the costa red-brown, broadly so towards apex ; an antemedial brown line very acutely angled below costa ; both wings with discocellular brown point: a strong brown band from costa of forewing before apex to middle of inner margin of hindwing ; a very highly crenulate submarginal line bent inwards below vein 3 of each wing ; a strong marginal brown line.



Schistophyle falcifera, ♀ ½

Habitat.—Khásis. *Exp.* 36 mm.

3103. TASTA MICACEATA, insert (syn.) *Tasta chalybeata*, Warr., Nov. Zool., iv, p. 76.

3108*a*. BAPTA PARTICOLOR, Warr., Nov. Zool. iii, p. 128.

♀. Forewing with vein 11 from cell, anastomosing with 12, then with 10, which anastomoses with 8-9. Red-brown ; head, thorax and extremity of abdomen yellowish-white, basal part of abdomen with dark segmental lines. Forewing with large basal whitish patch irrorated with fuscous and defined by a purplish line angled below costa ; a rounded apical whitish patch irrorated with fuscous and defined by a dark edge ; the rest of wings lightly irrorated with fuscous. Cilia purplish ; hindwing with small basal fuscous-irrorated whitish patch ; a discocellular black speck ; a crenulate purplish-fuscous postmedial line with fuscous-irrorated whitish patch beyond it from vein 6 to inner margin ; a black marginal line.

Habitat.—Khásis. *Exp.* 36 mm.

3119*a*. CABERODES RUFINERVIS, Warr., Nov. Zool., iii, p. 317.

♀. Orange-yellow; head, thorax, and abdomen tinged with red; collar edged with fuscous; wings thickly striated with red. Forewing with the base of costa fuscous; a curved fuscous antemedial line; both wings with a discocellular speck; a nearly straight oblique prominent postmedial line, slightly excurved at middle of hindwing; traces of a sinuous submarginal red line; a fine marginal crenulate line.

Habitat.—Khásis. *Exp.* 36 mm.

3120. CABERODES COSTALIS, insert var. *intensa*, Warr., Nov. Zool., iv, p. 120.

Without any of the pink tinge, and with more fuscous irroration.

3132. SCARDAMIA METALLARIA, insert (syn.) *Scardamia rectilinea*, Warr., Nov. Zool., iii, p. 127.

3135. STEGANIA STRIGATA, insert (syn.) *Chiasmia radiata*, Warr., Nov. Zool., iv, p. 82; *Chiasmia maculata*, Warr., Nov. Zool., iii, p. 137.

Var. whiter; forewing with the yellowish subbasal, ante- and postmedial lines more distinct; the dark marks reduced to some patches on costa and a discocellular spot, with a complete black band beyond it in a Sikhim specimen, reduced to spot on costa and band from vein 2 to inner margin in the type from Khásis; a dark marginal blotch or line below apex, and blotch near outer angle; hindwing with yellowish ante- and postmedial lines more distinct; the dark markings reduced to marginal marks near apex and anal angle.

3141*a*. *Stegania micans* is a synonym of HYPEPHYRA SUBANGULATA, Warr., Nov. Zool., iii, p. 319, and is a *Hypephyra*.

3142. STEGANIA LATIFASCIATA, insert var. *flavidior*, Warr., Nov. Zool., iii, p. 128.

The Khási form has the dark markings of forewing reduced, and the white band of hindwing broader.

3143. SYNEGIA IMITARIA, insert *Syntaracta maculosata*, Warr., Nov. Zool., iii, p. 129.

Var. with fuscous patches beyond the postmedial line from below apex of forewing to outer angle, and from below apex of hindwing to the postmedial line, then on it to inner margin.

3147. SYNEGIA LIDDERDALII, insert (syns.) *Parasynegia atomaria*, Warr., Nov. Zool., iii, p. 129. *Parasynegia convergens* and *Parasynegia nigriclavata*, Warr., Nov. Zool., iv, p. 79.

Var. *atomaria=convergens* is without any of the fuscous patches on fore- and hindwing, whilst *nigriculata* has small black spots on the ante- and postmedial lines, and an irregular black mark above middle of outer margin of each wing, with black point beyond it on cilia. Khásis.

3157*a*. HYPOCHROSIS CINEREA, Warr., Nov. Zool., iii, p. 320.

♂. Grey-brown; wings thickly striated with dark brown; forewing with the antemedial line indistinct, and represented by an oblique line from costa to subcostal, and line further from base from median nervure to inner margin; an irregular eliptical discocellular spot; an oblique line from apex to middle of inner margin of hindwing, slightly incurved below vein 4 of forewing and excurved below costa of hindwing; the area beyond it slightly more suffused with brown, especially towards inner margin of forewing.

Habitat.—Khásis. *Exp.* 32 mm.

3157*b*. HYPOCHROSIS INFORMIS, Warr., Nov. Zool., iv, p. 120.

♂. Pale chestnut, irrorated with fuscous; forewing with discoidal black point; traces of an oblique postmedial line curved below costa; a subapical white speck; hindwing with slightly curved medial line, blackish below vein 6, and with two pale spots beyond it between veins 2 and 4.

Habitat.—Chandkhira, Sylhet. *Exp.* 30 mm.

3162. PRIONIA *squalidaria*, insert RONDELARIA, Fabr., Ent. Syst., p. 623 (1775).

3175. ANONYCHIA GRISEA, insert (syns.) *Anonychia diversilinea*, Warr., Nov. Zool., iv, p. 101.

A brownish form with the lines defined by deep black, and *Anonychia pallida*, Warr., Nov. Zool., iv, p. 102.

3193. CORYMICA ARNEARIA, insert var. *brunnea*, Warr., Nov. Zool., iii, p. 143.

3197*a*. ILICRINIA SUFASCIATA, Warr., Nov. Zool., iii, p. 143.

♂. Antennæ bipectinate, with very short branches dilated at extremity; hind tibiæ dilated with fold and tuft; wings with the outer margin evenly curved; rufous, thickly irrorated with fuscous; palpi orange-red; forewing with traces of oblique rufous medial line; a postmedial fuscous line slightly curved below costa; traces of a waved submarginal line; hindwing with oblique medial line and traces of waved submarginal line; underside orange-red; the medial line of hindwing waved.

Habitat.—Khásis; Amboina. *Exp.* 42 mm.

3199*c*. EURYTAPHRIA PALLIDULA, Warr., Nov. Zool., iii, (3), p. 321.

♀. Pale yellow; head brownish; wings slightly irrorated and striated with brown; forewing more thickly striated on base of costal area and in cell; an indistinct antemedial line highly curved below costa, then obliquely sinuous; both wings with discocellular black spot; an olive-brown line from an oblique black striga at apex of forewing to middle of inner margin of hindwing, with large black spot above inner margin and angled below costa of hindwing; traces of a submarginal band of striæ; underside suffused with fuscous.

Habitat.—Sikhim. *Exp*. 40 mm.

3203*a*. XENOGRAPHIA DENTICULOSA, Warr., Nov. Zool., iii, p. 128.

♀. Head, thorax, and abdomen yellow and rufous; wing orange-yellow, thickly irrorated with rufous; forewing with white spot on median nervure at origin of vein 2; a black discocellular point; both wings with highly crenulate dark postmedial line, with fuscous-tinged band on its inner edge and some white specks on it; hindwing with the outer margin crenulate.

Habitat—Khásis. *Exp*. 44 mm.

3205*a*. SPILOPERA SUBCINEREA, Warr., Nov. Zool., iii, p. 139.

Forewing of male with fovea; both wing with the outer margin very slightly angled at vein 4; antennæ minutely serrate and fasciculated. ♂. Dark brown; wings irrorated with fuscous; forewing with the base and outer area slightly darker; an indistinct antemedial dark line angled below costa; a black discocellular spot; a medial line excurved round the cell; a minutely waved postmedial line excurved below costa; a dentate submarginal line with white speck on it at vein 4; hindwing with indistinct antemedial, minutely waved postmedial, and dentate submarginal line, the last with white speck at vein 4.

Habitat.—Khásis. *Exp*. 30 mm.

3206*a*. SPILOPERA MACULIFERA, Warr., Nov. Zool., iii, p. 146.

♂. Red-brown; wings slightly suffused with grey and striated with black; both wings with discoidal black points and traces of crenulate submarginal line; forewing with fuscous submarginal patches below apex and above outer angle; cilia blackish from apex to vein 4; hindwing with dark rufous suffusion from vein 3 to anal angle.

Habitat.—Khásis. *Exp*. 30 mm.

3212*a*. SPILOPERA ANGULATA, Warr., Nov. Zool., iii, p. 139.

Antennæ of male bipectinate; hind tibiæ dilated with fold and tuft; forewing with fovea; veins 7, 8, 9, 10 stalked, 11 free; outer margin angled at vein 4; hindwing with the outer margin crenulate and produced to points at veins 4 and 6; frenulum apparently absent. Ochreous-white, irrorated with red-brown; forewing with ill-defined oblique rufous antemedial, medial, and postmedial lines, the first angled below costa, the last with a broad area of dark suffusion beyond it; a dark discoidal point and marginal series of points; hindwing with discoidal point; rufous ante- and postmedial lines; outer area suffused with rufous; a marginal series of dark points.

Habitat.—Khásis. *Exp*. 28 mm.

P. 194. Under **Rhynchobapta**, insert (syn.) *Phanauta*, Warr., Nov. Zool., iii, p. 147 (1896).

3218. RHYNCHOBAPTA FLAVICEPS, insert (syn.) *Nadagara diversilineata*, Warr., Nov. Zool., iii, p. 143.

3218*b*. RHYNCHOBAPTA EBURNIVENA, Warr., Nov. Zool., iii, p. 147.

♀. Ochreous-white, thickly irrorated and striated with brown; wings with black discoidal points; an oblique dark line defined by white on outer side, and with slight brown suffusion on inner side, from costa of forewing near apex to middle of inner margin of hindwing; the veins whitish; cilia whitish, with a fuscous line through them; hindwing with the margin highly crenulate as well as angled at vein 4.

Habitat.—Khásis. *Exp*. 42 mm.

P. 201. Under **Macaria**, insert (syn.) *Chiasmiodes*, Warr., Nov. Zool., iii, p. 138 (1896).

3239. MACARIA ODATARIA, insert (syn.) *Gonodela ruptifascia*, Warr., Nov. Zool., iii, p. 139.

A form with the double postmedial line less distinct, especially on hindwing, the maculate marks on it more prominent; the outer area greyer.

3241. MACARIA MYANDARIA, insert (syn.) *Gonodela olivescens*, Warr., Nov. Zool., iii, p. 408.

3245. MACARIA FIDONIATA, insert (syn.) *Peridela triumbrata*, Warr., Nov. Zool., iv, p. 111. Penang.

3245*a*. MACARIA VARIOLINEA, Warr., Nov. Zool., iii, p. 138.

♂. White, variegated with olive-yellow and brown ; wings striated with fuscous. Forewing with the veins fulvous ; an antemedial curved blackish line ; a discocellular black spot ; a medial line very strongly bent outwards round the cell ; a postmedial line acutely angled below costa ; an oblique streak from below apex, and another above outer angle. Hindwing with the veins fulvous ; medial and postmedial nearly straight blackish lines ; both wings with marginal line.

Habitat.—Khásis. *Exp.* 24 mm.

3248. MACARIA ACUTARIA, insert var. *olivata*, Warr., Nov. Zool., iii, p. 407.

3249. MACARIA TEMERARIA, insert var. *fumosa*, Warr., Nov. Zool., iii, p. 320.

A grey-brown form, with the outer area of forewing suffused with fuscous.

3250. MACARIA OLIVA, insert (syns.) *Semiothisa brunneata*, Warr., Nov. Zool., iii, p. 140 ; *Semiothisa maculosata*, Warr., Nov. Zool., iii, p. 141 ; and *Semiothisa pennumbrata*, Warr., Nov. Zool., iii, p. 141.

The form *brunneata=maculosata* has the medial line of hindwing slightly curved and sinuous, whilst *pennumbrata* is much greyer. Forewing with a dark band on postmedial line from costa to the dark mark below costa. Hindwing with the medial line curved and strongly dentate.

3279. HYPERYTHRA LUTEA, insert (syn.) *Hyperythra rufifimbria*, Warr., Nov. Zool., iii, p. 140.

A variety with the wings entirely suffused with red and fuscous, leaving the cilia red and the inner margin of hindwing yellow.

3291. PERICALLIA LUGENS, insert (syn.) var. *castanea*, Warr., Nov. Zool., iii, p. 320.

3298*a*. FASCELLINA FUSCOVIRIDIS, Warr., Nov. Zool., iii, p. 320.

♂. Differs from *F. plagiata* in the basal area of forewing being suffused with red-brown and striated with dark brown ; a highly waved leaden-coloured line beyond the postmedial line. Hindwing with the medial line finer and less oblique. Underside irrorated and striated with brown ; forewing with sinuous medial red-brown line ; the postmedial line outwardly defined by white, increasing towards costa ; hindwing with the medial line obsolescent.

Habitat.—Khásis. *Exp.* 38 mm.

P. 231. Under **Crocallis**, insert (syn.) *Ctenoctenucha*, Warr., Nov. Zool., iv, p. 114 (1897).

3315. CROCALLIS LENTIGINOSARIA, insert (syn.) *Ctenoctenucha imitata*, Warr., Nov. Zool., iv, p. 115.

P. 233. Under **Garœus**, insert *Drapetopsis*, Warr., Nov. Zool., ii, p. 144 (1896), for Sect. ii.

3322. GARŒUS COLORATUS, insert (syn.) *Hygrochroa albipuncta*, Warr., Nov. Zool., iii, p. 145; and *Hygrochroa amethystina*, Warr., Nov. Zool., iii, p. 146.

3326. GARŒUS ARGILLACEUS, insert (syn.) *Drapetopsis ferrugata*, Warr., Nov. Zool., iii, p. 145, for the Khási form.

P. 236. Under **Heteromiza**, insert *Polyscia*, Warr., Nov. Zool., iii, p. 147, for Sect. ii.

3331*a*. HETEROMIZA OCHRILINEA, Warr., Nov. Zool., iii, p. 148.

♂. Olive-yellow; abdomen pinkish at extremity; fore and hind tibiæ and tarsi with fine black lines; wings sparsely irrorated with fuscous. Forewing with indistinct very oblique antemedial line angled below costa; a strong black line arising from a pink spot at apex of forewing and ending on middle of inner margin of hindwing; a very indistinct submarginal line.

Habitat.—Khásis. *Exp*. 38 mm.

3333*a*. DALIMA GIGANTEA, Swinh., A. M. N. H., (6), xix, p. 166.

Forewing with two excisions in outer margin below apex. ♀. Ochreous, irrorated with black. Forewing with black striæ on costal area; a diffused rufous antemedial band not reaching costa; a black discoidal spot; a medial rufous line obtusely angled below costa, its angle crossed by a short band; a diffused patch beyond it on inner area; an obscure waved postmedial line with the area beyond it rufous, leaving ochreous submarginal patches at apex and middle. Hindwing with fuscous antemedial line slightly angled below costa; the outer half rufous, with postmedial and submarginal series of slight ochreous patches.

Habitat.—Jaintia Hills. *Exp*. 108 mm.

3371. GNOPHUS EOLARIUS, insert (syn.) var. *fuscobrunnea*, Warr., Nov. Zool., iii, p. 318.

P. 257. Under **Boarmia**, insert *Diphurodes*, Warr., Nov. Zool., iii, p. 132 (1896), and *Enautioides*, Warr., Nov. Zool., iii, p. 133.

3380. BOARMIA CONSPURCATA, insert (syn.) *Enautioides stellifera*, Warr., Nov. Zool., iii, p. 133.

3394. BOARMIA BOARMIARIA, insert var. *sordida*, Warr., Nov. Zool., iii, p. 137, with all the markings almost obsolete.

3394*a*. **Boarmia** *coremiaria*, insert *DIPHURODES* VESTITA, Warr., Nov. Zool., iii, p. 132, which has precedence. Sikhim ; Khásis.

3394*b*. BOARMIA HARMONICA., n. sp.

♂. Head and thorax brown, mottled with black ; abdomen fuscous, irrorated with grey ; the base brown, followed by a black line, then two pairs of black spots. Forewing clothed with dark red-brown, black, olive, and grey scales ; traces of a waved antemedial black line ; a postmedial dentate oblique line excurved beyond cell ; a submarginal dentate white line with three white spots on it below middle ; a marginal series of black points. Hindwing with curved sinuous postmedial black line ; a submarginal black line angled outwards in discal and submedian folds, incurved, and with some white on its outer edge between those points ; a marginal series of black striæ. Underside of forewing with black spot in cell and prominent discocellular spot ; hindwing with discocellular spot, and spot on costa above it ; outer area of both wings reddish-fuscous.

Habitat.—Puttalam, Ceylon (J. Pole). *Exp.* 36 mm. *Type.*—In British Museum.

3399*a*. BOARMIA SUBOCHREA, Warr., Nov. Zool., iii, p. 136.

♂. Grey-brown, thickly irrorated and suffused with brown ; abdomen with white line at base. Forewing with indistinct dark sinuous antemedial and medial lines ; a black discoidal speck ; a sinuous postmedial series of black specks approaching the medial line at inner margin, and with a dentate olive line just beyond it ; a dentate submarginal grey line with fuscous patches on its inner edge ; a marginal series of black specks. Hindwing with indistinct antemedial black line ; discoidal speck ; medial series of black specks, with a dentated olive line beyond them ; a submarginal dentate grey line with fuscous patches on its inner edge ; a marginal series of black specks. Underside orange-yellow irrorated with fuscous ; a broad fuscous marginal band with yellow spot at apex of forewing, and becoming obsolescent towards anal angle of hindwing.

Habitat.—Khásis. *Exp.* 34 mm.

3399*b*. BOARMIA RUFARIA, Warr., Nov. Zool., iii, p. 136.

♂. Bright rufous, irrorated with black; abdomen with white line at base. Forewing with whitish ante- and postmedial lines, the latter oblique, minutely waved and incurved below vein 2, the area between them blackish; a dentate grey submarginal line with fuscous suffusion on its inner edge; a marginal series of black specks. Hindwing with discoidal point; an indistinct medial dark line and obscure diffused submarginal shade; a marginal series of black striæ. Underside pale, with broad fuscous shade on outer area diffused in places to the margin.

Habitat.—Khásis. *Exp*. 34 mm.

3400*a*. BOARMIA SERRATILINEA, Warr., Nov. Zool., iii, p. 318.

Grey, thickly irrorated with brown scales; palpi black, except at tip; abdomen with paired black points on second and third segments. Forewing with waved antemedial line; both wings with discoidal point and waved medial lines; highly crenulate postmedial line and minutely dentate white submarginal line defined on inner side by a dark line; a crenulate dark marginal line. Underside slightly suffused with fuscous.

Habitat.—Khásis. *Exp*. ♂ 32, ♀ 38 mm.

3412. BOARMIA SEMICLARATA, insert var. *fasciata*, Warr., Nov. Zool., iii, p. 405.

3413. BOARMIA ATROSTIPATA, insert (syn.) *Pœcilalcis deceptrix*, Warr., Nov. Zool., iii, p. 319.

A form with the first band slightly angled below costa.

3419. BOARMIA CINERACEA, insert var. *subalbida*, Warr., Nov. Zool., iii, p. 403.

3434. BOARMIA GRANITARIA, insert (syn.) *Scotopteryx squamosa*, Warr., Nov. Zool., iii, p. 318.

3429*a*. BOARMIA SQUAMOSA, Warr., Nov. Zool., iii, p. 131.

♂. (Hind tibiæ wanting). Fuscous-brown, thickly irrorated with black; wings irrorated with small iridescent scales. Forewing with indistinct waved antemedial and medial lines, the latter with blackish discoidal spot on it; an oblique series of black postmedial specks, curved below costa; a dentate grey submarginal line, with some fuscous patches and a dull rufous spot on its inner side below costa, and a white spot above inner margin. Hindwing with indistinct black ante-

medial line ; a black discoidal spot ; a postmedial series of black points ; a submarginal series of obscure black and white points.

Habitat.—Khásis. *Exp.* 30 mm.

3429*b*. Boarmia orbifer, Warr., Nov. Zool., iii, p. 131.

♂. (Hind tibiæ wanting.) Pale brown with a reddish tinge ; head, thorax, and abdomen suffused with fuscous ; wings irrorated with fuscous. Forewing with black suffusion on costal area, widest before apex ; an obscure medial line angled at lower angle of cell ; an oblique postmedial series of black specks ; a dentate whitish submarginal line ; a marginal series of black points. Hindwing with diffused black antemedial line ; a black discoidal spot ; a postmedial line highly excurved beyond cell, then bent inwards to near the antemedial line ; a dentate white submarginal line with fuscous patches on it towards apex and anal angle ; a marginal series of black points.

Habitat.—Khásis. *Exp.* 26 mm.

3429*c*. Boarmia minima, Warr., Nov. Zool., iii, p. 132.

♂. (Hind tibiæ wanting.) Pale brown, irrorated with black and almost entirely suffused with fuscous. Forewing with the base and costa brown, the latter with series of black striæ ; traces of an antemedial line angled below costa ; a discoidal lunule ; a postmedial line obtusely angled at vein 6, and with a pale rufous patch beyond it above the angle ; traces of a submarginal waved line ; a marginal series of black points. Hindwing with obscure antemedial line ; a discoidal lunule ; a dentate whitish postmedial line with rufous patch beyond it between vein 2 and inner margin.

Habitat.—Khásis. *Exp.* 26 mm.

3441*a*. Boarmia serpentinaria, Warr., Nov. Zool., iii, p. 134.

Pale red-brown ; palpi, frons, and collar marked with darker brown ; metathorax and abdomen banded with fuscous. Forewing with the antemedial line double, black, with two very deep and acute sinuations between costa and median nervure, then extremely oblique, and with its inner part red-brown to inner margin near base ; a discocellular black speck ; a diffused pale olive fascia in and beyond the cell ; a very oblique pale rufous line from below apex to middle of inner margin ; a postmedial series of black specks on the veins, angled inwards below costa and outwards on vein 6, then very oblique ; the outer area more rufous, with traces of waved submarginal line and olive and fuscous

patch near outer angle. Hindwing much more striated; a black discocellular speck; an oblique rufous medial band; a fine crenulate black postmedial line with rufous band beyond it, partially conjoined to a submarginal rufous band.

Habitat.—Khásis. *Exp.* 54 mm.

3441*b*. Boarmia costistrigata, Warr., Nov. Zool., iii, p. 134.

♂. Differs from *B. serpentinaria* in the ground-colour being ochreous. Forewing with the costa suffused with fuscous and brown; the lines pale rufous, the strong dentitions of the ante- and postmedial lines on the costal area black; the area beyond the postmedial line tinged with olive; a whitish mark on margin at the angle at vein 4, with a diffused rufous band from it to inner margin. Hindwing with the lines and striæ on basal two-thirds olive; the postmedial line nearly straight, the area beyond it olive with black striæ; a diffused submarginal rufous line.

Habitat.—Khásis. *Exp.* 52 mm.

3441*c*. Boarmia trilineata, Warr., Nov. Zool., iii, p. 135.

♂. Differs from *B. serpentinaria* in the wings being yellower; the medial rufous line stronger; a bright fulvous oblique line from outer margin below apex to inner margin beyond middle, with black marks beyond it near outer margin and above inner margin. Hindwing with the medial line less oblique; a postmedial straight line with some grey beyond it, beyond which is a yellow line angled outwards to the margin above middle.

Habitat.—Khásis. *Exp.* 40 mm.

3444*a*. Boarmia ochricostata, n. sp.

Forewing with vein 11 anastomosing with 10, which arises from 7, 8, 9. Hindwing with tuft of hair on inner margin; abdomen with tufts of hair below. ♂. Head blackish; thorax and first segment of abdomen grey, the rest blackish, grey towards extremity; wings blackish, with broad grey fuscous-irrorated fascia from base of hindwing along costa of forewing, with an oblique fuscous bar on it near apex; forewing with antemedial line curved and reduced to specks on the grey costal area, then oblique; a postmedial line curved and reduced to specks on the grey fascia, then very oblique to lower angle of cell, then waved, and on hindwing very indistinct; an indistinct waved grey submarginal line.

Habitat.—Khásis. *Exp.* 34 mm. *Type.*—In British Museum.

3445. Boarmia dentilinea, insert var. *pulverosa*, Warr., Nov. Zool., iii, p. 403.

3448*a*. Boarmia flavisecta, n. n.

Prochasma minima, Warr., Nov. Zool., iv, p. 81 (preocc.).

Whitish, tinged with yellow and irrorated and suffused with black. Forewing strongly suffused and irrorated with black; a yellow fascia from base along median nervure and vein 4 to outer margin; a narrow white antemedial slightly curved band; a similar postmedial band slightly incurved below vein 2, and with a series of black points on its inner edge; a black discocellular spot; an obscure waved submarginal white line; a marginal series of black points. Hindwing with the inner and outer area striated with black; a discoidal black spot with line from just beyond it to inner margin; a fuscous blotch below apex; a marginal series of black points.

Habitat.—Khásis. *Exp.* 24 mm.

3451*a*. Boarmia conjunctiva, Warr., Nov. Zool., iii, p. 136.

♀. Pale reddish-brown suffused with dark red-brown and irrorated with black. Forewing with indistinct irregularly sinuous antemedial black line with a mark before it on inner margin; traces of a medial line; a postmedial waved line incurved and connected by a streak, with the antemedial line below vein 2, the three lines arising from black spots on the costa; a diffused black streak beyond the postmedial line above vein 5; traces of a submarginal line, with some pale points and a diffused fuscous patch beyond it below apex. Hindwing with ante- and postmedial fuscous lines; a discoidal point; traces of a submarginal series of points and a marginal series.

Habitat.—Khásis. *Exp.* 42 mm.

3474. Medasina mucidaria, insert (syn.) *Lassaba tephosiaria*, Warr., Nov. Zool., iii, p. 135.

3487*a*. Medasina reticulata, insert (syn.) *Sinameda intricata*, Warr., Nov. Zool., iii, p. 137.

3547. Percnia belluaria, insert (syn.) *Percnia longimacula*, Warr., Nov. Zool., iv, p. 89.

3583. Rambara luminaria, insert (syn.) *Rambara costalis*, Warr., Nov. Zool., iii, p. 101.

(*To be continued.*)

Photographed by Cap. P.Z. Cox. Mintern Bros. Photo mp. London.

THE BAIRA ANTELOPE.

Oreotragus megalotis.

MISCELLANEOUS NOTES.

No. I. THE BAIRA ANTELOPE OF SOMALI LAND.

(*With a Plate.*)

The Somali Coast Protectorate has during the last decade deservedly become a very favourite hunting ground for sportsmen from India and elsewhere, and, as not a few have put their experiences on record, there is now a good deal of literature dealing directly or incidentally with the mammalia of the country, so that from a non-scientific point of view little remains to be said about the several species of big game which usually find a place in the bag of a sportsman hunting on this side of the Webbe Shebeyli. Interesting papers on the subject have appeared in our Journal from Messrs. Inverarity and Dodgson, accompanied in the former case by a set of excellent photographs, delineating six of the antelope to be met with—pictures which, I doubt not, have since imbued many a reader of the Journal, as they did me at the time, with the determination to see in their own haunts the beautiful creatures of which they are the counterfeit presentments.

As however little or nothing was known of the Baira Antelope at the time their papers appeared, and as neither sportsman met with it nor makes any reference to it, a few notes on the subject may prove of interest.

It will be well in the first place to come to a clear understanding as to the proper pronunciation of the word. Captain Swayne spells it "Baira." Messrs. Sclater, Thomas, and others "Beira." I have followed the former. As to which is the more correct rendering, I am not prepared to argue; the main thing is to know what sound the spelling is meant to convey. The word is the Somali name for the animal, and the first syllable of it is pronounced the same as the English word "buy" (purchase). It is a pity that we have not yet arrived at any Volapuk system for the spelling of new names; one would be saved so many atrocities in the way of pronunciation if the spelling conveyed any reliable idea of the sound required. I remember well how much I pained the local celebrities at Aden and on the Somali Coast, when on first introduction to the neighbourhood and for some time afterwards I persisted in calling the small seaport on the Somali Coast, "Zyla," instead of "Zéla," a mispronunciation which, having never before heard the word spoken, I had acquired from seeing the name spelt "Zaila" in maps and in books.

That the Baira is decidedly rare and very locally distributed, there can be no question, and an additional reason for its never having come in the way of sportsmen is the extremely inhospitable nature of the particular class of country which forms its habitat—country which is, as a rule, shunned both by the traveller and the nomad Somali, for reasons which I shall presently explain

As the result of constant inquiries during two and a half years' sojourn in the Protectorate, I have come to the conclusion that nine out of ten Somalis have never even heard of the Baira, much less seen it, and even in Somali encampments in the neighbourhood, where I know the Baira to exist and where I eventually shot a specimen, I found it was an even chance that any man, from whom I asked for news of the whereabouts of Baira, would reply that he did not know the animal. From this it may be inferred that, apart from its rarity and local distribution, it is also a creature of extremely shy and retiring habits.

Captain H. G. Swayne in his admirable book "Seventeen Trips through Somali Land" mentions that he first heard of the Baira as far back as 1891, when his brother saw two of them in the Gadabursi Highlands, but failed to get a shot. It was not, however, until 1894 that native shikaris, whom he had commissioned to procure him a specimen, sent him home some skins, and one Herr Menges at the same time obtained specimens upon which the animal was described as a new species. Herr Menges was the collector and agent of Herr Hagenbeck, the well known animal provider of Hamburg (who, by the bye, now offers to supply Siberian camels for Klondyke transport), and resided at Berbera for some years collecting live specimens for shipment to Europe ; and the preserved specimen or specimens of the Baira sent home by him were, I believe, brought in by his native hunters. I left Somali land in the Autumn of 1896, and up to that time, so far as I know, no sportsman (except the brothers Swayne as above mentioned) had met with a specimen, and the fact that Dr. Donaldson-Smith, in a fifteen months' exploration from Berbera *via* Lake Rudolph to Lamu,* during which he made a most careful and complete zoological collection, never heard of the animal, makes it probable that its distribution is confined to the plateaux of the Somali Coast Protectorate, and possibly the highlands of Abyssinia.

It was at Ali Maan in the Gadabursi country that Captain Swayne first heard of the animal, and, as he says, very possibly it exists on the Wagar Mountain, some forty miles from Berbera. Herr Menges' specimens were, I believe, obtained from the Hegebo Plateau near Berbera, and it was on a similar plateau, a little further to the west, that I met with the herd, of which one member fell to my rifle.

I was on a short trip from the Coast at the time, accompanied by my wife and a friend from the Aden Garrison—ten days' hard-earned casual leave, taken with a special view to looking up quite the biggest lion that ever was, of whose recent movements I had reliable *khubber*. We had the most extraordinary ill-luck with this particular lion, who was evidently a magnate of extended experience. Quite contrary to all leonine precedent, he behaved very much in the same way that the hill tiger often does, or any tiger in a populous locality when the weather is cool, namely, killed his quarry, had

* Vide *Through Unknown African Countries*, Arnold & Co.

a hurried gorge, and then found he had urgent business ten or twelve miles off. He did this time after time, and we spent the whole of our leave, following him from place to place, vainly trying to make his acquaintance, and finally had to return without an introduction. On one occasion we made certain that we had found him at home. The country generally was the worst possible for tracking; but on this particular morning our friend had strolled up the bed of a stream, in which his pugs, which were enormous, were very much in evidence. They led into a small strip of elephant grass about 150 yards long by 70 yards wide. Our trackers, who had been sent on ahead to scout, came back to meet the caravan, and told us excitedly that they had tracked his majesty into the small patch of grass, that he had not come out of it, and that they had left men to watch it. On one side of the patch was the river-bed and on the other the low rocky bank running off on to shingly ground, over which it was impossible to track. Anyhow there were the fresh pugs leading from the river-bed into the grass, and there were no apparent tracks out of it, so we believed in our Shikaris' story that they had watched the lion in, and that he had not come out. There was a Kurria (Somali encampment) not far off, to which we sent to borrow the village band instruments, with a view to a beat, and in a short time several tomtoms, the ubiquitous kerosine tin, and various other tin-pots provided material for the making of a very respectable noise. Having collected about twenty men, my friend and I took up our positions behind two friendly babul bushes, about twenty yards from that end of the beat from which he was certain to break, and having given the word for the music to begin at the other end, we anxiously awaited the lion's appearance; but in vain. After a deafening noise had been kept up for some minutes, we beat the patch carefully to make sure that he was not lying clever; but there was no sign of him, and it became evident that our scouts had not kept a careful watch over the patch, and that the lion must have sneaked out over the stony ground on the bank side of the cover. After vainly trying to pick up his track and having relieved our feelings to some extent with abuse of the scouts who had made fools of us, we returned disappointed to our camp, which had since been pitched close by. That night our friend was heard roaring round camp from the same rock-strewn ravine, and next day we were again out after him, but did not succeed in finding any trace of him. The next night, however, he killed a donkey, and after having a hurried meal on the spot went clean away. In the morning we tracked him for seven or eight miles and then the trail took us over rocky ground where we lost it. The people of the neighbouring Kurrias told us that the lion was an old one and well known to them, and that he always behaved in this way; but they assured us that he would be back in two or three days, and begged us to await his return; but our leave would not admit of it, and we reluctantly had to give up the quest and set our faces seawards again.

A gallant sportsman, who arrived at Berbera just after we had started and followed in our wake, came across what I have every reason to believe was the same lion. He also ran him to the ground in a similarly small strip of grass cover, and tried conclusions with him in the same way, with the result that his shooting trip was brought to an abrupt conclusion. He, too, organised a beat, and soon after it began, the lion slowly walked out of the cover and looked disdainfully round. My friend had a steady shot at him at about twenty yards, but with no result, except that the lion turned back into the cover; he soon, however, broke again in the same dignified way a few yards further down, and, if I remember right, another shot was fired, with the same negative result, but this time the lion advanced, evidently becoming excessively annoyed. Not understanding how he could have missed, and coming to the conclusion that he must be shaky, the Nimrod fell on his knee, and with the utmost deliberation put in a third barrel from that position. This bullet apparently grazed the beast's withers, and while the sportsman was still on his knee at the present and before the smoke had cleared, the lion had charged and was on top of him; fortunately the Shikaris, with spare rifles behind, fired as they saw the beast charge, and this had the effect of sending him on. The only injuries which he inflicted were a bite through the palm of the left hand and a score from the claws on the left elbow; the left hand and arm, raised as it was at the present, having been the first object to come in the lion's way. Neither wound happily gave much trouble, but necessitated some weeks' care and rest, and put an end to the expedition. The weapon used was a heavy express rifle, and though the owner had tested its accuracy on a range at the sighted distances, he found, on retrying it after this mishap, that at the short distance at which he was firing, about 20 yards I believe, it carried very high; and thus no doubt his shots had passed over the lion's withers, except the last one which must have just seared him. The brute went clean away, and the experience he gained on that occasion has, I doubt not, proved useful to him since.

But to return to our muttons. It was on the return journey to the Coast after our fruitless stern chase of this lion, that our road led us through the country where I believed the Baira to exist, namely, the ravine-cut plateau-land between the Assa Range and Bulhar, on either side of the Issutugan Nullah. The country is difficult to describe. The general level of it is the gradual slope from the foot of the Assa Range to the sea; from this general level rise insulated plateaux of all sizes. I have never heard an expert geologist's opinion as to how these plateaux have been formed, and they have always puzzled me much.

The country which is now as it were studded with them would seem to me to have at some remote period been a compact steppe abutting from the lower slopes of the Assa Range; this steppe must in course of time have become cut up by the action of watercourses rushing down from the heights

of the parent range, until the general idea of one big plateau has been lost, and the country now looks as if these numerous islands of the plain had been deposited independently on its surface. It is difficult to imagine anything more forbidding than these tablelands. Most of them are entirely covered with coarse black shingle and boulders, rounded and weather-beaten, and looking like the shingle of a rock-bound coast which the sea has forsaken and left exposed, to scorch and blacken in the rays of the pitiless sun. As may be imagined, they offer little attraction either to man or beast and, as a rule, caravans make long detours through the sandy ravines which separate the plateaux sooner than attempt to negotiate them. It is only in the case of some of the larger ones, on which perhaps the occasional sparse sprinkling of shingle has rendered a serpentine camel path possible, that caravans are sometimes taken over them in preference to making a long detour to get round.

It will be readily believed that there can be little vegetation on these arid and waterless tracts, but here and there a tuft of coarse grass struggling for existence through a crevice in the shingle, or a few flimsy bushes do make a feeble attempt to relieve the black monotony of the picture.

It was while our caravan was wending its way from day to day through the broad gullies that separate these rock-crested plateaux, that I essayed to explore the surface of some of them. I had with me, carrying a spare rifle, a man named Abdillahi, of much experience in the roll of Shikaris, he having been on several sporting expeditions with Lord Delamere, whose fortunes he is no doubt sharing at the present moment in the neighbourhood of Lake Rudolph and the Upper Nile. Abdillahi had at all events heard of the Baira, and, if I remember right, had once met with it. After drawing two or three of these plateaux blank during a couple of days' march, Abdillahi and I had on the morning in question arrived at the top of a small plateau after a hard and hot climb up its rugged side. This plateau was about ½ mile long, and at the place where we topped it, some 300 yards broad. After scanning the surface carefully with the glasses and seeing no living thing, we stumbled across the rough hot shingle to the further edge of the crest, and there, about 300 yards to our right front, in a rocky ravine running down the slope from an indentation in the crest was a herd of five animals grazing on the tufts of grass and scrub jungle which sprang up among the boulders. In the distance, half concealed as most of them were by intervening rocks or shrubs, they looked to me like Déroo (*Gazella pelzelni*), which were plentiful in the plains below; but it seemed to me to be an extraordinary place to find Déroo grazing in, and after a moment's thought, Abdillahi and I both ejaculated "Déroo nahin hain," and the latter followed his remark with another "Baira hain, Saheb, Baira hain." I was sceptical for a moment, for having read of the Baira as being a Klipspringer, this was hardly the animal I expected to see, but a careful application of the field-glasses satisfied me that they were

certainly not Déroo, and so I came to the conclusion that Abdillahi must be right. They had not seen us and were browsing unconcernedly, but they were too far off for me to risk a shot ; moreover, there was no cover between them and me, and had there been, I knew I could not move a yard over the intervening boulders in my shooting boots without making noise enough to awaken the dead ; so we had to retire well behind the crest and discuss in a whisper the best means of getting a shot at them. From the crest on the further edge of the ravine in which they were, one would have been within easy range, but there were two difficulties in the way of getting a shot from there—in the first place, in order to get there it would be necessary to make a long detour over the rocks, which I did not feel competent to negotiate without dislodging stones, even with bare feet ; and secondly, by the time I had got half way they would have the wind of me, and would probably be off before I reached the crest. If, however, made to move from fear of some thing the other side of them, the formation of the ground made it probable that they would turn up the ravine (which curled round towards me) and break away to my right rear, as the ground below them seemed to be very precipitous. Following up this idea I finally decided as follows : I was to stay where I was, while Abdillahi was to make a detour, back below the rear crest, if necessary, round to the further side of the ravine ; once arrived there he was to whistle to let me know the fact, and then show himself to the herd. I hoped that the Baira would then make tracks in my direction. The plan was not destined to come off however, for before he had got half way he stumbled and dislodged a great boulder, thereby making noise enough to disturb game half a mile away. In a moment the Baira were up and off ; they started up the further side of the ravine away from me, round in front of Abdillahi, and disappeared below the rear crest ; but finding the descent too precipitous, they turned up again and raced across the shingle along the surface of the plateau to my right rear. Not being a Dr. Carver, I knew it was useless my risking a shot, and I held my hand, hoping that they would pull up ; meanwhile I had time to see that there was one buck with gazelle-like horns and four does. Sure enough, after going a little further, they did pull up in a bunch among a cluster of low bushes. It was impossible to spot the buck, as their heads were all mixed with the branches of the bush, but I knew the halt would be but a momentary one, so, long though the distance was, I had a hurried shot at the one which gave me the best broadside, and was overjoyed to see that only four went on. I fired two more shots as they raced away for the further crest, but both fell very short, and the herd disappeared over the edge, and by the time I had accounted for the 300 or 400 yards of break-neck ground between me and their vanishing point, there was nothing to be seen of them, but the descent was easy, and I imagine they went down into the river bed below and up on to another plateau on the other side of it. I subsequently sent men in all directions to scout for them,

but without result, and before departing from the neighbourhood I left word with the nearest Kurria that, if reliable news of the whereabouts of the herd were brought to me, the bearer of it would be well rewarded ; but I never heard of them again.

On going to where the one I shot had fallen, I found it was a female, but I am afraid the fact only partially marred the pleasure I felt at having made the acquaintance of this rare antelope. A few minutes later Abdillahi and I were struggling down the side of the plateau, Abdillahi with the Baira on his back, and after reaching the bottom where I had left a man with my camera, the photo was taken which accompanies these notes. The specimens of black rock, lying strewn about in the background of the picture are pieces that have become detached and have rolled down the sides of the plateau to the plain below ; they present a less rounded and weather-beaten appearance than those with which the surface is covered.

The following are the measurements and description of the animal as noted down at the time :—

Measurements.—

Height at shoulder, 23″.	Ear in front, $6\frac{1}{4}$″.
Length, $36\frac{1}{2}$″.	,, at back, $5\frac{3}{4}$″.
Tail, $5\frac{1}{2}$″.	,, breadth, $2\frac{3}{4}$″.

Description.—Warm pinkish fawn-colour above, a little darker where it joins the white on the sides. Belly, buttocks and inside of legs down to knees and hocks white. Around the mammæ, of which there are two, and under the elbows the skin is black and hairless. The head from between the ears to nose bright rufous, also the upper part of the cheeks, which get paler towards the throat. The nape and neck are the same warm fawn-colour as the back. The forelegs from the elbow and the hindlegs from the hip downwards the same bright rufous colour as the face.

The measurements of this specimen, of which the skin and skeleton are in the British Museum, correspond very nearly with those of the Indian Gazelle.

The peculiarity of the animal is the abnormal size of its ears—a pecularity which is apparent in the photograph. On this account the animal was first named *Oreotragus megalotis*, or the large-eared Klipspringer. Whether it has any anatomical resemblance to the Klipspringer, by reason of which it received this name, I am not able to say, but certain it is that the herd that I met with neither looked nor behaved like "Alakud" (*Oreotragus saltator*) would have under similar circumstances ; and I am not surprised to find that Sclater and Thomas, referring to it as *Dorcotragus megalotis* in their "Book of Antelopes," say : " . . . after a careful consideration of its characters we think it may best be treated as an aberrant Gazelle, and as such, therefore, we propose to treat it."

I may mention that I had two young ones in captivity at different times after obtaining the specimen above described, and they were invariably mistaken by visitors for the young of the Déroo (*Gazella pelzelni*). They were very delicate, and, I am sorry to say, did not long survive in captivity. I had a large menagerie at the time, and was successful in rearing several of the Somali antelope, but the climate of the Coast seemed too much for the Baira.

One of the specimens in the Natural History Museum, South Kensington, is a male carrying horns about 5″ long, but the buck of the herd that I met with had horns which seemed to me at the time to be 9″ or 10″—one is, however, doubtless inclined to overestimate the length of horns when taking a fleeting view of them in the field, and time will perhaps show that I looked at them with a magnifying eye.

P. Z. COX, Capt.

Baroda, *April*, 1898.

No. II.—NOTES ON TWO SPECIMENS OF *HYPSIRHINA SIEBOLDII*.

Whilst stationed at Delhi last year I was fortunate enough to secure two specimens of this rare snake, both being caught in the Jumna.

The first, a small specimen, I saw my snakeman catch. He was rummaging about with a stick in a heap of decaying vegetable matter, chiefly composed of dead rush. Through this he searched very carefully, lifting up strand after strand of rush, and when he had burrowed about a foot deep and had about reached water level, he dived his hand into the heap and brought out a snake by the tail; it was embedded in the mud and required some force to pull it out from its retreat. This proved to be a *Hypsirhina sieboldii*, and measured 1 foot 1¾ inches.

My second specimen was brought in to me by the same man, and was a very fine specimen, exceeding the measurement given in Boulanger's work, *viz.*, 6½ inches, its total length being 2 feet 6½ inches.

It was remarkably active and strong like all the water snakes I have observed, and very quick in its movements and menacing on every attempt to capture it, striking out with a velocity almost equal to the *Echis carinata*, and throwing itself at the same time forcibly forward. It was continually on the move in my verandah, progressing very rapidly in its attempts to escape. The man who brought me this and a great many other snakes, who is justly celebrated locally for his daring and skilful manipulation of snakes, I have seen repeatedly pick up cobras and kraits and other snakes by the tail and hold them out at arm's length with the greatest *sang froid*.

The only snake he paid any respect to was the *Echis*, and these he was extremely cautious in handling. He seemed very much taken aback and

alarmed when he attempted to take this snake up by the tail and got as a reward a pretty severe bite before he had time to collect himself, and in his endeavour to shake the reptile off his finger, he threw it out of the verandah some 20 feet where it fell with its back broken in the lower third of its body. In spite of this injury I managed to keep it alive for about five weeks. It lived in a *ghurrah* of water and was given daily exercise in my bath. It ate frogs when shut up in the *ghurrah*, but it never tackled any of the fish put with it in the bath.

In the bath after stretching itself with a few turns round, it usually sank to the bottom and there remained quite still, coming up at intervals of about five minutes to the surface presumably to breathe. If molested, however gently, when it appeared to be coming to the surface, it at once drew back and kept at the bottom for another interval, and by a succession of gentle molestings in this way I kept it on one occasion at a stretch for 30 minutes under the water. This does not appear so wonderful since I believe a term of an equal or longer time without respiration must occur frequently with snakes during deglutition. Where one sees a small snake, as I have done a *Gongylophis conicus*, swallow a full grown squirrel, the compression of the lungs must be almost or quite complete and effectually prevent the act of respiration for some time.

This specimen eventually died in the act of swallowing a fish which did not appear to me disproportionately large. One peculiar habit I noticed on dry land, that it frequently indulged in, *viz.*, crouching down on the ground by means of flattening itself so as to increase its lateral width at the expense of its ventro-vertebral.

Specimen No. 1—Captured 8th August, 1897. Length, 1 foot $1\frac{3}{4}$ inches; tail, $2\frac{1}{4}$ inches.

Head—Height at about $\frac{2}{3}$rds that at occiput.

Body—Distinctly laterally compressed.

Tail—Distinctly laterally compressed.

Scales—Neck 27-29, smooth, mid-corporeal 29, smooth, extreme part corporeal 20-21, smooth. Imbricate and convex-like bottom of a shallow spoon. A supra-anal band of small scales encircles the body smaller than post corporeal or anterior caudal.

Ventrals—Narrow, equal in breadth to 5 rows of adjacent scales, beginning low down in throat. The two fore anal divided—155.

Anal—Divided.

Sub-caudal—Divided, 52.

Rostral—Pentagonal, broad as high.

Nasals—Contiguous, superior, semi-divided by fissures running from transverse slit-like nostrils, downwards and backwards to 1st labial scale.

Internasals—2, cone-shaped, with the bases of the cones in apposition.

Prefrontals—2.

Frontal—Longer than broad.

Parietals—Large and confluent with the ant. temporals and thus coming into contact with the 6th labial on both sides.

Supraroclars—Single ; less broad than frontal.

Loreals—Present, single.

Autoculars—R 1, L. 1, reaching well on to crown.

Postoculars—R 2, L 2.

Labials R 8, L 8, progressively increasing in size from 1 to 6. 7th and 8th very small and separate ; a large labial-like scale from the labial margin on both sides ; 4th only enters eye R and L.

Temporals—Absent.

Eye—Small, as much anterior as lateral, with decided inclination upwards.

Pupil—Round (Sub-elliptical ?).

Ant. Chin Shields—In contact with four labials.

Post Chin Shields—Absent.

Coloration—Ventrally beautifully mottled with buff and dull olive-green, the mottling acquiring a distinct arrangement laterally so that a zig-zag buff line is formed with dull olive in green spots below the arches. The superior angles of the zig-zag are produced upwards forming a limb which passes on to the back. Many of these limbs meet their corresponding fellows of the opposite side across the back to form complete buff arches ; others end in convex extremities on the vertebral region. The intervening parts are dull olive-green.

Specimen No. 2 differs only in the following points. Captured 7th Nov., 1898. Length, 2 feet 6½ inches; tail, 4⅜ inches. Body only laterally compressed at back part.

Scales—Neck, 31-32, smooth ; mid.-corporeal, 29, smooth ; post-corporeal, 20, smooth.

Ventrals—153, no divided pre-anals.

Sub-caudals—48, double.

Coloration—Ventral region same as No. 1 ; the buff arches on dorsum are replaced by a pale shade of dull olive-green, picked out with an ill-defined outline of a darker shade of olive-green than rest of body.

Notes worthy of remark on both specimens—Absence of Ant. temporals on both sides. Very small 7th and 8th labials on both sides.

F. WALL, Surg.-Capt., I.M.S.

AGRA, *February*, 1898.

No. III.—A PANTHER WITH 20 TOES.

I write to ask if the above peculiarity has been before brought to notice, as during a long acquaintance with panthers and tigers I have never observed it myself. The panther, an average size female, was shot a few days ago, and

has five fully developed toes and claws in each hind foot. My attention was attracted to this abnormal condition when the claws were counted before handing over to the skinner. I can find no mention of a similar variation in Blanford.

S. EARDLEY-WILMOT.

OUDH, *February*, 1898.

No. IV.—THE GROWTH OF THE GREEN TREE FROG.

Can any of our members inform me whether the life histories of our Indian frogs have been worked out and, if so, where such particulars can be found, as one looks in vain for such interesting details in the latest standard work on the subject (the "Fauna of British India—Reptilia and Batrachia," by G. A. Boulenger, of the British Museum).

I am sending up, for our collection in Bombay, a series of spirit specimens consisting of the following :—

(*a*) The male Green Tree Frog (*Rhacophorus malabaricus*).
(*b*) The female Green Tree Frog.
(*c*) The Spawn.
(*d*) The Tadpole, 3 days old.
(*e*) The Tadpole, ready to cast its tail ? ? ?

The spawn was laid on the 8th July, 1897, and it hatched out on the 13th of the same month. The tadpole's hind legs appeared on the 28th November, 1897, and the fore legs on the 25th January, 1898.

If series, similar to the above, could be collected, showing the development of each species of our Indian frogs, they would, I think, form a very valuable collection.

JOHN A. GRAHAM.

HALLERY MERCARA,
NORTH COORG, *February*, 1898.

No. V.—SAPPHIRES FOUND IN THE GIZZARD OF A JUNGLE FOWL.

I am sending you 17 small sapphires which a friend of mine found in the gizzard of a hen jungle fowl in their neighbourhood. Why the bird should have chosen these bright blue stones in preference to the others, is an interesting question, and I shall be glad to know whether similar occurrences have been recorded. Have any experiments been made with domestic-fowls which throw any light on the subject ?

S. B. BATES, F.Z.S.

CHINDWIN, UPPER BURMA,
February 1898.

No. VI.—DISTRIBUTION OF THE SLENDER LORIS.

I write to record the finding of a Slender Loris (*Loris gracilis*), on these hills at an elevation of about 4,700 feet. A friend wrote the other day to tell me he had found an animal on his Coffee Estate, which no one in these parts had ever seen, and that it was something like my wife's pet Gibbon, *Hylobates lar*, so I rode over to see it, but found it had died and was buried. We had the body exhumed, and I at once recognized the Slender Loris. My friend had tried feeding it on raw meat and fruit, but it would not eat. According to Jerdon it is common in the forests of the Eastern Ghats, though I see that Blanford, in his Mammalia of British India, says it is found "in lowland forests, not so far as is known, at any considerable elevation above the sea."

ANGUS M. KINLOCH.

KOTAGIRI, NILGIRIS, *4th March*, 1898.

No. VII.—THE NIDIFICATION OF THE INDIAN LORIKEETS.

In the "Fauna of British India, Birds," Vol. III, p. 262, Mr. Blanford says that *Loriculus vernalis* lays its eggs "in a hole or hollow of a tree without any nest." My limited experience has been different from this. Last year I recorded in the Journal the taking of three nests of *Loriculus indicus* in Ceylon, in each of which the eggs were deposited on a thick pad of green leaves and halves of leaves torn off lengthwise along the midrib, and to-day I found a nest of *Loriculus vernalis*, in which the same material was again used to form a layer half an inch in thickness at the bottom of the hollow. I enclose for your inspection a sample of these pieces of leaves, bitten into shape by the birds.

An old convict jemadar here tells me that he has seen lots of nests of the bird, and that it always makes a nest of green leaves, and as this has been the case in the four nests of the two Indian species which I have taken, I am inclined to think that this lining of the nest-hole is the rule and not exceptional, as I imagined when I took my first nest of *Loriculus indicus*.

Lorikeets sit close, and when disturbed on their eggs utter a long-drawn querulous note like "*chee-ee*." Perhaps other members of the Society will give their experience of the nesting of these birds; common as the Lorikeets are, there is very little on record about their nidification.

A. L. BUTLER.

PORT BLAIR, *2nd February*, 1898.

No. VIII. PIED VARIETY OF *HIRUNDO JAVANICA*.

I shot a very prettily pied specimen of *Hirundo javanica* here the other day. The head and throat were pure white, and a few blue-black feathers on the crown; wings with the second, third, fourth and fifth primaries

Mintern Bros. Photo imp. London.

THE MOTTLED POLECAT.

Putorius sarmaticus.

with their coverts, and several of the secondaries, white ; shoulders white with a few black feathers ; upper back as usual, a few white feathers intermingled ; rump and three central pairs of tail feathers white, with a few black feathers ; the rufous breast band and pale smoke-grey lower parts mingled with white, and most of the lower tail coverts white.

At first glance the bird looked very unswallow-like ; for a few seconds as it was flitting over a rather rough sea, I took it for some sort of small stint ! It provided me with a good deal of shooting as a strong wind was whirling it hither and thither in a most erratic way, and shooting from a rocking boat and avoiding firing at too close a range, it was not until the sixth shot that I hit it.

A. L. BUTLER.

PORT BLAIR, *January*, 1898.

No. IX.—POLECATS AS PETS.

(*With a Plate.*)

Having had three mottled polecats (*Putorious sarmaticus*) in my possession during the last few months, I have noted down a few observations made on their ways and habits when domesticated. They may be of interest to some of the readers of the Society's Journal.

The first polecat was given to me by a sepoy of the regiment (who had bought it from a fakir) shortly after we arrived at Chaman last Spring, and a strange little creature she looked with her curious markings of black, yellow and white. In shape she resembled a weasel, having a long narrow body and arched back. The fur on the legs and underneath the body was jet-black and very glossy, and the back and tail were spotted with patches of bright canary-yellow. The large bat-like ears were black, fringed with pure white, and a broad white band ran across the head just above the eyes; the chin also was white. The fur was very soft and silky, and the bushy tail could be fluffed out till every hair stood on end.

When I first had this polecat she showed no sign of timidity, but allowed me to handle her freely, and would follow closely at heel when I took her out. When tired she would attempt to clamber up my dress, and when I put down my hand she would climb on to it and let me carry her in my arms. Later on, she gained a companion, another female who was much less tame and tractable. Evil communications had their usual effect on good manners, and No. 1 lost much of her trustfulness. No. 2 much resented being handled, and was very ready to use her sharp little teeth in self defence. She was a dainty little vixen however, and one forgot one's bleeding fingers and could only admire her as she danced to and fro, every hair erect, the bushy tail curved bristling over her back, her tiny head flung back, and the white teeth gleaming as she gave sharp little growls of defiance. The two polecats had

battles royal together, with so much squealing and scuffling that one really felt surprised at the end of the fray to find that neither seemed a penny the worse, and that the famous story of the Kilkenny cats had not been repeated; but no, bushy tails and all appeared absolutely intact. All, however, was not war, many were the frolics and gambols in which the two indulged, they were as lively as kittens, and a dangling string or a fluttering piece of paper would afford endless amusement to them as well as to the on-lookers. With leaps and bounds, headlong rushes and much scurrying of pattering feet, the curving tails arched in the air, they would enact the maddest of revels till, wearied out, they would curl themselves up and fall asleep from sheer exhaustion. Their greatest enjoyment, however, was in digging burrows for themselves in the garden, in and out of which they would play with never-failing delight. Directly they were let loose from the bungalow they scampered straight for their holes, which were side by side in a bank about 15 yards from the verandah. Often both polecats darted into the same hole, whereupon tremendous scuffling ensued, and the vanquished one would then make a hasty exit and seek refuge next door. Their digging powers are great, as they have strong paws with long serviceable claws, and they excavate deep, roomy burrows. On hearing any unusual sound, they would rush to the mouth of the hole and there raise themselves on their hind legs, remaining erect for a remarkably long time, turning their heads on every side to discover what was happening. They were most fearless little animals, and would face a dog or a man with calm self-possession, even moving close to the stranger to obtain a better view. Some time later a third polecat, a male, came into my possession. He was larger than the other two, but the marking and colouring in each case were almost identical. This last one is exceedingly gentle, and allows himself to be picked up and petted, and never growls or attempts to bite. Unfortunately, No. 2 broke her string one night and made her escape, and all search for her proved fruitless. The two others are still flourishing, and lead a happy, though uneventful, existence. They each have their own particular whims, which it is amusing to watch. No. 1, for instance, insists on wrapping herself up in a cloth every night, which is put down for her to sleep on. She will spend 5 or 10 minutes sometimes before she can arrange it to her satisfaction. She first creeps under it, and then carefully pulls in all the edges by the aid of her teeth and claws until she has gathered them round her and completely packed herself into a tight bundle. No. 3, the male, never does this. He, however, has a fancy for an empty basket, into which he climbs and there goes to sleep contentedly. They are fed on raw meat, chopped finely, and milk.

They are allowed to run loose in a room for part of the day and enjoy a romp, playing hide-and-seek with each other or with a little Persian mongoose, their stable companions. Shoes, or better still, long riding boots, in and out of which they can dive and chase each other, are among their favourite

playthings. They can climb very little, and have a great objection to jumping from a chair or across a gap. No. 2, however, was an expert climber, and always scrambled to the top of a high wooden box, on which her dinner was regularly placed for her. The male polecat weighs 22 ounces, and is about 21 inches in length, 8 inches of which is tail. When very much alarmed or exceedingly angry, these polecats, like others of their race, can emit the most unpleasant smell, but this, I am thankful to say, occurs but seldom.

I hear that a family of mottled polecats (wild) inhabits a garden in Quetta.

Natives of Northern Afghanistan state that they have never seen any of these animals there. The name the natives give for them is "naulai" (نولي), which Raverty translates "ferret, weasel, mongoose"—a somewhat comprehensive definition.

M. T. YATE (MRS.).

CHAMAN, *October*, 1897.

No. X.—PANTHERS AND THEIR WAYS.

The record of an ordinary panther shoot over a goat, or any thing else, is far too commonplace to receive publicity and take up the space of this valuable journal; but the following account is, so far as my experience goes, not only of some interest, but from the point of view of wild beasts and their ways, possibly noteworthy and of general value to the sportsman.

On the afternoon of the 6th instant, I took up a position with my brother on a "machan" close to a small hill, of peculiar shape, composed of large basaltic boulders. The "khubber" that two panthers were located here became quickly apparent by the roaring and gurglings that periodically issued from the hillock in question. In this connection it may be noted that I have never known panthers roar in the day time, unless the procreative instinct outweighs all consideration of secrecy and silence. We sat on that "machan" and listened until it became too cold to remain any longer, and then releasing the goat repaired to camp.

On returning to the spot on the morning of the 7th, my astonishment was considerable to find that neither of the panthers had left the hill all night. They could not—as a matter of fact—have well done so without the marks of their pads being seen. Nor did they visit the tank close at hand. I ought to point out here that three days prior to my arrival, one of the panthers—probably the female—made the Forest Reserve untenable for the Forest fire patrols at night, by reason of the terrific row she made. My impression is that she was calling for the male, and when they were mated, they took up their abode in what was practically an unassailable position. Not having drunk water for 48 hours, the presumption was strongly in favour of an early

departure to the tank. We consequently decided to divide up, I sitting over the goat and my brother over the water. We took up our respective positions at precisely 5-30 P.M. It is an excellent plan, I find, in taking up one's position over a goat to accompany a small herd of cattle. The goat is then casually tied up, while the men and cattle depart, making plenty of noise.

Shortly after the departure of the cattle, both panthers gave vent to spasmodic roaring, and their lair being within 100 yards, the noise they made was distinctly impressive. At 6 P.M. one of the panthers came out on to a rock and, carefully surveying the goat and its surroundings, returned to continue attentions to its mate, which were, to all appearances, much resented.

By 6-30 P.M. both panthers had gradually worked their way down the boulders of the hill, roaring and snarling at each other, and when 60 yards off were perceived by the goat, who promptly sneezed in the vigorous and characteristic manner well known to that quadruped under critical circumstances. It was still daylight, and every now and again I could catch glimpses of both panthers through the green foliage of my "machan" well within shot. The male's attitude appeared to be all attentive, and the female's attitude all resentive throughout, and they sat facing each other for quite half an hour. More or less suddenly a compromise seems to have been arrived at, for one panther skulked off to the right, and the other disappeared in a direction invisible to me. Presently footsteps were audible quite close to the machan on the side hidden by leaves, towards the hill, and if I were to venture to make a guess, not only from these footsteps, but from the alarmed manner in which the goat conducted itself at this stage, I should say that one of the panthers was stalking within 20 paces. The sequel will show that the object of this stalk is a trifle obscure. Up to this point neither of the panthers had made the slightest effort to hide its presence from the goat. They stalked about in a bold and barefaced manner never observed by me before. After an interval of 10 minutes or so, the panther, assumed to be 20 paces off, appeared to have departed, for the goat now began to display a general indifference to its surroundings. The light at this stage was very indifferent, the moon throwing great slanting shadows towards me. At 7 P.M. I heard a rustle of leaves, and the next moment one of the panthers was in mid-air and the goat pinned down. The neatness with which a panther always kills is remarkable, and death must be almost instantaneous. The panther had stalked the goat from the side away from the hill, and that animal like myself must have been absolutely unaware of its close proximity. The goat uttered no sound and, owing to the presence of a thick shadow, the panther and the goat were practically invisible to me. Considering the circumstance the silence was now profound and was undisturbed for quite a quarter of an hour until an appalling howling and screeching in the hill told me that the second panther was perambulating about and had disturbed a porcupine. The gradual rise of the

moon enabled me to now discern the outlines of the panther sitting over the kill, and I was thankful when he presently started to feed, thereby rendering movement in the "machan" just possible. At 7-28 P.M. precisely (as recorded by my brother), I took the best shot offered me. That the panther was badly hit became at once certain. In an hour's time I left the "machan," using every possible precautions, and we returned to camp. This morning the panther was recovered dead fifty yards from the hill in the direction of the caves. Two peculiar events had occurred : (*a*) The kill had been removed by the male to the old lair notwithstanding the shot fired, the carcase being dragged *past* the dead female ; and (*b*) from the appearance of slight teeth-marks on the abdomen and chest of the female, the male had clearly tried to induce her to rise to the occasion, and this event can moreover only have taken place after sunrise, as the skin where the male had seized the female was still damp from saliva. It looked just as if the male, alarmed at the protracted sleep of its mate, notwithstanding the rise of the sun, had decided to awaken her and failed. I cannot help giving prominence also to the chivalrous conduct of the male in apparently relinquishing his right to kill. A careful examination of the skin revealed recent abrasions of some depth on both buttocks about 6 inches from the root of the tail. Only one deduction of their presence in this locality is, I presume, possible.

W. A. WALLINGER,
Divisional Forest Officer.

PANCH MAHAL, *7th January*, 1898.

No. XI.—REASONING POWER IN BEES.

A friend communicates the following facts. He was out shooting in the Dehra Dun when his companion disturbed a hive of forest bees which, with their usual fury, attacked and defeated the enemy. As is generally the case, it was also here noticed that the bees confined their revenge to the actual destroyers of their peace ; and the incident would have closed without further remark, save for the fact that the same individual was attacked later on in the day on two or three other occasions. In fact, whenever he approached the vicinity of a hive, the bees sallied forth, taking the initiative and confining their attacks to the same luckless person. My friend informed me that it was an accepted fact that an onslaught by wild bees is much aggravated if any of them are killed, and suggested that his companion had in self-defence killed some bees from the first hive whose corpses carried in the howdah or elsewhere occasioned the wrath of other bees in the vicinity. I can only vouch for the facts without offering any explanations. I was not aware that killing

attacking bees increased the rage of the survivors, though I knew in practice that bees will not sting a perfectly motionless man or animal. The former has not the courage to attempt this without the aid of a blanket, but I have seen an elephant stand quiet in the midst of an angry swarm and not suffer in consequence. As to the attack by undisturbed hives at a distance from the first, I see no more difficulty in a bee being attracted to the corpse of a friend one hundred yards off, than to a bank of flowers one mile off. But the unprovoked attack would imply either an offensive alliance between all individuals of a species or temporary madness occasioned by the presence of death. Will some of our members help us in this difficulty ?

S. EARDLEY-WILMOT.

LUCKNOW, *February*, 1898.

No. XII.—BAHMEEN FISHING IN BOMBAY HARBOUR.

The Bahmeen (*Polynemus tetradactylus*), or Rous Fish, known to our butlers as the "Indian salmon," used to be fairly common in Bombay Harbour in the neighbourhood of the Sunk Rock Lighthouse, but of late years it does not seem to have appeared in such numbers, although I cannot find any reason for the fact. They were seen congregating about the rock when the lighthouse was being built, and for some years afterwards they used to make their appearance regularly at the beginning of the ebb-tide. The rock on which the lighthouse is built has short channels on the north and west sides, which seem to provide shelter to the bummalo, mullet and other small fish when the tide is running strong, and the Rous take advantage of these shelters to be in wait for their prey. There may be and I presume there are other places about the harbour where the Rous might be taken with a rod, but I have been unable to find them although I have tried several likely spots without success. The best time for fishing I have found to be in the monsoon months, June to September, and about one hour after the tide has begun to ebb. Spring tides are the best and the fish cease feeding, or, more probably, leave the place, about two hours before low water. I have never caught a fish on the incoming tide, although I have taken them exactly at high water. I first fished for them in August, 1885, with Mr. J. L. Symons, and as the Sunk Rock as a fishing place was little known, we had it mostly to ourselves, with the exception of the lighthouse-keeper, who with his primitive arrangement of a bamboo, thick string with a bit of tin and a hook at the end, used to catch a good many. That year and the following there were a great many fish about, and as we were both new at the game we did not kill as many as we ought to have done. We had plenty of runs and breakages in proportion, but averaged about seven fish during the two or three

hours we fished. A large prawn is the most killing bait, but they take a spoon bait well, and I have also caught them with natural bait; in fact, they will take almost anything when properly on the feed. Although the monsoon months are the best, I have caught them each month from May to October, but during the cold weather they do not come much into the harbour. My best day alone was ten fish, 51 lbs., all caught with a 1½ inch spoon in two hours. This was on the 14th August, 1888, and on 21st September, 1890, two rods took fourteen fish, 41 lbs. The largest fish I have heard of caught at Sunk Rock was 16 lbs., though of course there have been larger ones which have broken away. Although I have taken notes of the state of tide, wind, colour of water, &c., each time I have been out, I have always found the chances of sport most unreliable. One day the fish are about and the next, although the conditions are the same, they are conspicuous by their absence, and I can only agree with the gillies' remarks about the salmon that "the habits of the fish are no properly kenned."

E. L. BARTON.

BOMBAY, *February*, 1898.

No. XIII.—THE YOUNG OF THE HUNTING LEOPARD.

Major Rodon in his interesting article on the young of the hunting Leopard which appeared in the last number of the Journal, says: "Possibly, like lion cubs, they were born with their eyes open." In 1892, when shooting in Somali Land, I shot a lioness over a kill, and afterwards found her three cubs. All three had their eyes closed. On the following day two of the cubs had their eyes open, but the other one did not open its eyes till the morning of the third day. The Somalis with me said that the cubs, when I found them, were nine or ten days old; but, from the condition of the mother and from the appearance of the cubs, I did not think they could have been more than two or three days old.

I wrote to several people to try and ascertain whether there was any definite time for lion cubs' eyes to remain closed after birth as with dogs, cats, &c., but could not obtain any definite information, nor was I able to find out anything from the few books on natural history in my possession. The general opinion appeared to be that lion cubs' eyes opened two or three days after birth, and it would be interesting to know whether this is a recognized fact.

I presume the period would be the same in wild animals, as in those born in captivity!

H. F. CLEVELAND, SURGEON-CAPTAIN,

NEEMUCH, 8*th April*, 1898. 3rd Bo. Cavalry.

No. XIV.—THE NESTING OF THE MALABAR RUFOUS WOOD-PECKER (*MICROPTERNUS GULARIS*).

It may perhaps be of interest to some of the members to record that recently whilst I was out nesting at Thana in company with two friends, I found what I consider must be the eggs (2) of the Madras Rufous Woodpecker (*Micropternus gularis*). Very little is known of the nesting of this bird, though in Vol. III of the "Fauna of British India" (Blanford), it is stated on page 57 that Davi (d ?) son and Aitken found these eggs in ants' nests. The same fact is mentioned in Hume's "Nest and Eggs," Vol. II, page 308, about the sister bird(*M. phæceps*) of Northern India, with measurements and descriptions of the eggs. I was directed to the nest in question by some native boys who were acting as guides, &c., to my party, and I may mention I had never seen them before, or did they know I was coming out on that day. They said that two days before they had noticed a bird (described by them as the Lal Sutar) pecking at an ant's nest in a mango tree. We sent them off to examine the nest, and they returned to say that there were two eggs. On hearing this, we started off and soon came to the place, where we found in a mango tree, about 8 feet from the ground, a black ant's nest (*Cremastogaster ebinis*), looking for all the world like a big sponge, with a circular hole in it about 2½ in. wide at the mouth, and descending downwards into a fairly large cavity containing two perfectly fresh white eggs, measuring respectively 1·15 in. and 1·13 × ·85 and ·8 in. They were moderately long ovals without any gloss, and looked extremely fragile. A curious thing noticed about them was a sort of sparkle, resembling the frosted appearance one sees on a 'Xmas Card. This has disappeared since blowing the eggs. The nest (of the ants) was absolutely alive with these insects, and I thought at the time that it had not been long enough in occupation for them to quit, for in the note on *M. phæceps* quoted above, Mr. Gammie states that in three nests out of four taken in Sikkim, the ants had left the birds in sole possession. This opinion I must now modify, as writing on this date the 21st, I am able to send you a black ant's nest with a woodpecker's nest and one young bird in it. This I took to-day in the jungle not far from Thana. I foolishly had the nest cut down before examining it, and instead of eggs, as I hoped, I found a young bird. There may be two, but the ants are too thick for examination to be a pleasant operation. This disposes of the idea that, when the birds take possession, the ants leave.* My native assures me that they form the young bird's food, and to-day when I was looking at the nestling I certainly saw it pecking away vigorously. I hope it is old enough to survive removal to the Society's care; when all doubt will be set at rest as to the identity of these robbers, who apparently not only break into the ant's nest but feed on the original occupants. I am sorry to say that on neither occasion did I see the parent bird.

* This fact has already been noticed by Mr. E. H. Aitken in the Society's Journal, Vol. VII, page 198.—ED.

We waited till nearly dark in the first instance. To-day the afore-mentioned native assured me it was no use waiting because the parents never returned to look after their young, as they had all they wanted on the premises.

N. F. T. WILSON, LIEUT.,

BOMBAY, *April*, 1898. R.I.M.S. "Clive."

No. XV.—THE HYBERNATING OF INDIAN BEARS, ETC.

With reference to Major Rodon's note at the head of page 548 in your last number (Vol. XI, No. 3), it may interest some members to know that I found a black bear (*Ursus torquatus*) hybernating in a hollow which the Kafirs had cut in the stem of a large deodar, about three feet from the ground, at about 7,000 feet in the Utzan Nullah, near Drosh, on the 20th January last, and shot him. He had a splendid coat, a half-inch lining of fat and an empty stomach. The drowsy way in which he twisted his head backwards and forwards in the hole when first aroused was distinctly ludicrous. He is a very small bear, as was also another (a female), which I got last summer.

The Markhor heads up here are very interesting. I have seen the two largest heads *in the same herd*, and they are entirely different; one has a widespread and a fine spiral with the curve at a low angle to the horizontal, and the other has horns close together and perfectly straight with a very high-angled curve. This last is quite unlike the trans-Indus variety in Kinloch's book, and I have not seen a specimen like it in any Mess or Museum.*

F. E. G. SKEY, CAPTAIN, R.E.

DROSH, *April*, 1898.

No. XVI.—THE PROTECTIVE POWER OF SCENT IN ANIMALS.

I confess to a feeling of astonishment when I read Mr. Macleod's notes on the protective powers of scent in Animals, for I gathered that he is of opinion that the deer of Bombay possess these powers to a very limited extent. This evidence, he admits, is of a negative character, and for the credit of the animals in that part of India I trust it will be long before it can be proved that they have so degenerated. There can, of course, be no doubt that protective powers develope with necessity, but as man possessing no protective instinct in this form can wind a tiger or a boar at twenty paces, a deer which with its more delicate organs, cannot do the same at ten times that distance may, I think, be taken to have merited the term above used. It was only yesterday that I observed an old cow-buffalo nosing out a six hours' old tiger track merely for curiosity, and she had her protective powers of scent dulled by generations of domesticity. I can speak from experience only of

* From a comparison between the photographs sent by Capt. Skey and the illustrations of the different varieties of Markhor given in Blanford's Mammalia (*Fauna of British India, &c.*), pages 506-7, it is quite evident that the two varieties referred to *in the same herd* are the Pir-Panjál var. (Fig. 165) and the Cabul var. (Fig. 166).—ED.

the N.-W. Provinces, and here, all deer, and especially sambhar and chital, have the power of scenting and of winding developed in a very marked degree; it is probable that the former, if placed in similar circumstances, would be found to be no whit behind the red deer of Scotland in this respect, and no sportsman who has witnessed the stealthy departure of the sambhar stag when he has winded his enemy, or the retreat of the chital, would for the future doubt that in the great majority of cases the success of the stalker is dependent on the wind. In these parts too the tiger is not incapable of following up a drag; he will do it if he likes for long distances; and also he has been observed tracking a sambhar hind whose evident anxiety pointed to suspicion of danger. When a tiger returns on a dark night to his kill from great distances, I believe that in the majority of cases he runs a back trail, and that he has no better memory than any other jungle animal. As a rule when the presence of danger is indicated from a distance, the animal affected removes itself silently, and the hunter generally knows nothing about it; but it may not at times suit the convenience of an animal to do this. A fed stag will often lie low in the hope that he may be overlooked, although he may have winded, heard, and even seen his pursuer. A tiger which has been much hunted will not follow up a drag if the careless shikari has permitted a man to walk on the new trail. Those footsteps must, to any animal possessed of instinct, reveal the agency of man and arouse suspicion; a different case surely to that when domestic animals are openly tied up, and the tiger hopes to elude discovery by dragging the carcase for a distance. One is open to assume that in the one case the stag had no sense of hearing or scent, and in the other that the tiger was phenomenally stupid, but my experience would in the circumstances lead me to conclude that not only scent but cunning was highly developed. To question in deer the power of winding and scenting, one must first deny these powers to the natural enemies, for otherwise the handicap would be too outrageously unfair. Let a strong breeze be blowing through the forest in the spring when the deer are lying in the undergrowth and can hear or see nothing but the rush of falling leaves and sweeping boughs; or take a foggy winter morning when all sound is deadened on the sodden leaves and reeking grass, without the power of winding a danger, the deer would have absolutely no protection against either man or carnivora; and this they know full well, for they will change their forest quarters with each change in wind direction and will always feed up wind in cases of doubt. With regard to alarm calls I have seen stags call as well as hinds, but I have never known a note to be sounded when danger is winded. This leads to an undemonstrative departure; but danger seen, heard or suspected will be advertised by repeated cries if at a safe distance; if inconveniently close however, one sharp cry is followed by headlong flight. Many animals will stand and gaze at the sportsmen if they are not observed; the serow is a past master at this trick, the panther

runs in a good second, and the tiger does not disdain to follow the lead. When detected, they rush wildly away, or even towards you if it happens to be a tiger in a bad temper and possessed of sufficient courage. I have already replied to some of Mr. Macleod's remarks on the practice of alarm calls by writing in our magazine on the persistent way deer remain in the vicinity of a known danger. But my first difficulty still remains, and I more than ever want to know why in a country where deer can smell, they do not notice a man in a tree, and why, when that man can smell a tiger, the tiger cannot or will not return the compliment. I believe that the explanation is simply referable to the rising of scent, for I have proved that the same results would not follow if one were posted behind a tree instead of on it.

S. EARDLEY-WILMOT.

LUCKNOW, *April*, 1898.

No. XVII.—THE "KOL-BHALU."

I think it may be taken as proved by what Messrs. Eardley-Wilmot and Wallinger have written in their papers published in No. 3 of the Society's Journal, Vol. XI, that one of the animals that makes the cry of the Kol-Bhalu is a jackal. But my experience leads me to believe that there are other animals that make a similar cry, and it would be interesting to know if this can be confirmed by any one else! One morning some years ago in the wet weather I was climbing the hills at a place called Ubliada-Mogra in the Igatpuri Taluka of the Nasik District. I had left my camp before it was light and reached the foot of the ridge running up to the high hill of Pimpalgaon. I had three dogs with me, two greyhounds and a fox terrier, when suddenly about half way up the ridge I heard the cry of the Kol-Bhalu. I at once set my dogs off and they started three animals, ran them about a quarter of a mile, and then disappeared with them in the jungle. After some little time my dogs came back, but they had not tackled the animals, although accustomed to running jackals and killing them. I am sure they did not tackle for they were not bitten at all, nor were their mouths blood-stained. I had a very good view of these animals, for they were not fifty yards off when the dogs brought them into view. Although dark when I left my camp, it was quite light by the time I got to the foot of the hill, and I could see quite distinctly. They were in a dip the other side of the small ridge I was climbing when I heard the cry, and though not in sight when the cry was uttered, still one of them must have been responsible for it. They were reddish animals, not so red as a wild dog, and they had reddish bushy tails. They were not unlike jackals in shape, but appeared to me to be much larger, and *they were decidedly not jackals.*

KARWAR, *April*, 1898.

W. G. BETHAM,
Indian Forest Service.

With regard to the various Miscellaneous Notes on the "Kol-Bhalu," which have appeared of late in the Society's Journal, an experience which happened to me some little time ago will, I think, help to support Mr. Eardley-Wilmot's contention that the cry is, as a rule, the jackal's warning note of danger. One afternoon out stalking I got a snap-shot at a tiger as he bounded away through some long grass, and on following up to see if I had wounded him I came across a doe sambhar which the tiger had been eating when I disturbed him. As I had missed the tiger, I thought it highly probable that he would return to the kill very soon, and so I determined to wait for him. I had, however, only one man with me and no means at hand for making a "machan." I therefore sent this man back to my camp, some two miles away, for the necessary help, and in the meantime I climbed up into a tree near the dead sambhar. In a very short time a jackal appeared, which I had excellent opportunities of observing, as he was quite unconscious of my presence, and passed me time after time within a few yards. There was nothing in any way peculiar about him, and judging from his condition and the glossiness of his coat he was evidently in excellent health. He was, however, with that curious instinct which these animals seem to possess, fully aware that the tiger had not finished his meal and that he might be expected back shortly. He therefore would not touch the carcase, but contented himself with wandering round and round it, sometimes coming quite near, at other times making circles of about 100 yards radius. In one of these peregrinations he came suddenly on to the tiger, who had evidently not been much alarmed at my shot, and was creeping back to the kill through some low bushes. The jackal seemed much startled, bounded back a few yards, and then gave vent to the peculiar "Kol-Bhalu" cry.

T. MACPHERSON, Lieut.-Colonel.

Poona, *April*, 1898.

PROCEEDINGS

OF THE MEETING HELD ON THE 28th OF FEBRUARY, 1898.

A meeting of the members took place on Monday last, the 28th February, when Mr. J. D. Inverarity presided.

NEW MEMBERS.

The election of the following new members was announced :—Mr. R. M. Thompson (Banda) ; Colonel St. G. C. Gore, R.E. (Dehra Dun) ; Mr. John A. Graham (Mercara) ; Mr. W. W. B. Warner (Mozambique) ; Mr. Charles S. F. Crofton, I.C.S. (Ahmednugger) ; Captain T. Jermyn (Kohat) ; Lieutenant R. E. Roome (Jacobabad) ; Mr. R. C. Brown, I.C.S. (Ahmednugger) ; Mr. Mitchell Hall (Jalpaiguri) ; Mr. S. J. Stone (Mussoorie) ; Mr. W. E. Copleston, I.F.S. (Yellapur) ; Mr. Vinayak N. Hate (Bombay) ; Mr. Langford

Whitehouse (Upper Burma); Sir Edward Buck, K.C.S.I. (London); Lieutenant P. Watson (Cawnpore); Colonel George D. Stawell (Deesa); Mr. H. J. Elwes, F.R.S. (London); and Mr. Rowland Ward (London).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since last meeting :—

Contribution.	Description.	Contributor.
1 Crested Lapwing	Vanellus cristatus	Surg.-Major F. W. Jones.
1 Green Tree Snake	Dryophis mycterizans	Mr. A. Simkins.
Freshwater shells	.....	Mr. F. J. Ede.
46 species of Ferns from Western India.	.....	Mr. G. M. Woodrow.
3 Snakes (alive)	Cerberus rhynchops	Mr. F. Spencer.
1 Sand Lizard	Lygosoma punctatum	Mr. Scott Elliott.
2 Snakes	Simotes arnensis. Trop. piscator.	Mr. C. Hudson, I.C.S.
1 Red-billed Curlew	Ibidorhynchus struthersii	Capt. F. J. B. Barton.
2 Wild Cats (alive)	Felis chaus	Mrs. J. Counsel.
1 Hawk-Cuckoo (alive)	Hierococcyx varius	Mrs. F. A. Little.
1 Albino Jack Snipe	Gallinago gallinula	Mr. M. C. Gibb, I.C.S.
2 Red-crested Pochards	Netta rufina	Mr. H. C. Wright.
1 Gadwall	Chaulelasmus streperus	Do
1 Skull of Wart Hog	Phacochærus æthiopicus	Capt. A. Swayne, R.E.
2 Snakes (alive)	Trop. piscator	Mr. C. Merrony.
1 Snake (alive)	Psammophis longifrons	Do.
2 Jackals	Canis aureus	Do.
6 Black Partridges (alive)	Francolinus vulgaris	Hon'ble W. O'Brien.
1 Bustard's skin	Eupodotus edwardsi	Lieut. G. Knowles.
A collection of Snakes, Bats, etc.	.....	Mr. J. A. Betham.
1 Panther (alive)	Felis pardus	Mrs. F. L. Simpson.
2 Chameleons	Chamæleo arabica (?)	Col. W. S. Birdwood.
1 Painted Bat	Cerivoula picta	Mr. J. Gidney.
3 Weaver Birds (alive)	Ploceus baya	Mrs. H. Pearson.
1 Snake (alive)	Eryx johnii	Do.
1 Head of Chinkara	Gazella bennetti	Maj. J. B. Butler.
1 Malabar Civet Cat (alive)	Viverra civettina	Mr. C. R. Brendon.
1 Chameleon (alive)	Chamæleo calcaratus	Mr. H. M. Page.
2 Water Tortoises (alive)	.....	Capt. Whitehead.
Freshwater shells	.....	Mr. D. George.
Do.	.....	Mr. W. Mahon Daly.
1 Snake (alive)	Lycodon strigatus	Surg.-Capt. E. Harold Brown.
1 Snake (alive)	Zamenis fasciolatus	Purchased.
A series showing the development of the Green Tree Frog.	Rhacophorus malabaricus	Mr. J. Graham.
4 Snakes	Trop. monticolor. Callophis bibronii. Mel. wynadense.	Do.
17 Sapphires out of the gizzard of a Jungle Fowl.	.....	Mr. S. B. Bates.
Land and Freshwater shells	.....	Do.
1 Snake	Gongylophis conicus	Mrs. H. Pearson.
Freshwater shells	.....	Mr. C. O. Tanner

CONTRIBUTIONS TO THE LIBRARY.

The Cambridge Natural History, 2 Vols., from Mr. W. F. Sinclair ; Annals of the Queensland Museum, in exchange ; Der Tibethund (Siber), Mr. A. Corrodi.

THE ACCOUNTS FOR 1897.

The Honorary Treasurer submitted the accounts for the year ending 31st December, 1897, showing a credit balance of Rs. 870-5-8 in cash and Rs. 4,800 invested in Government Paper. The expenditure during the year amounted to Rs. 14,180-0-6. It was resolved that the accounts be passed subject to the usual audit.

ELECTION OF THE COMMITTEE.

The President, Vice-Presidents, and members of the Managing Committee for 1897 were duly re-elected for the present year.

PAPERS READ.

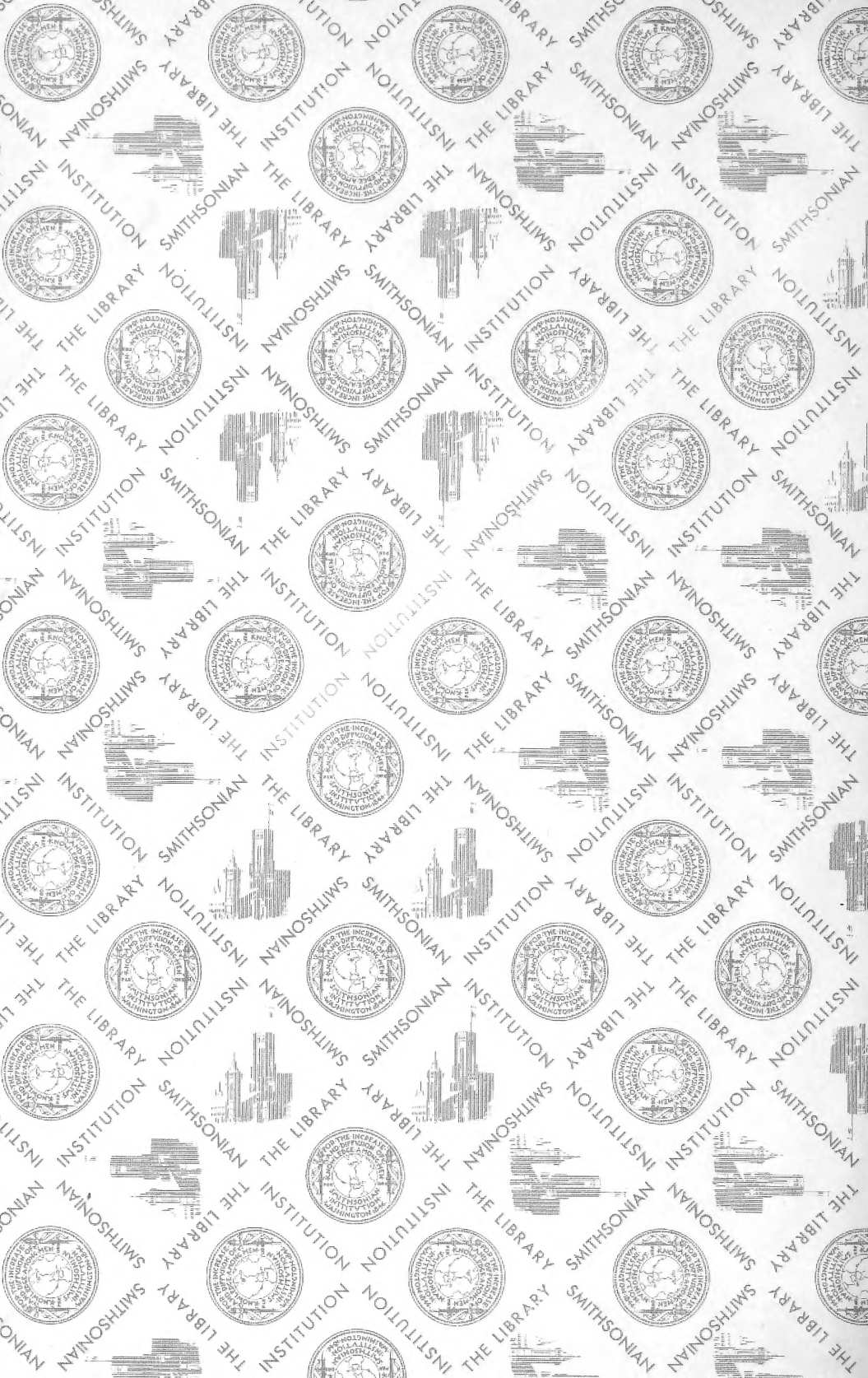
The following papers were read and discussed :—1. The Birds of North Canara, by J. Davidson, I.C.S. 2. On some new Species of Indian Hymenoptera, by Lt.-Colonel C. T. Bingham, F.Z.S. Miscellaneous Notes :—(*a*) The Large Pied Wagtail in Captivity, by Captain A. Newnham ; (*b*) Notes on Man-Eaters and other things, by J. Straker, F.Z.S. ; (*c*) Snakes at Trincomalee, by Doctor P. W. Bassett Smith, R.N. ; (*d*) The Young of the Hunting Leopard, by Major G. S. Rodon ; (*e*) Seedling Orange Trees, by G. Marshall Woodrow ; (*f*) The Comb Duck or Nukhta, by Major J. H. Sewell ; (*g*) Does the Brown Bear hybernate ?, by Major G. S. Rodon ; (*h*) The "Kol Bhalu" and the Instinct of Fear in Wild Animals, by S. Eardley-Wilmot; (*i*) The Breeding of the Comb Duck, by E. H. Aitken ; (*j*) The "Kol Bhalu," by W. A. Wallinger ; (*k*) On the Distribution of the Black-capped Kingfisher, by G. W. Vidal ; (*l*) Extract from Pedro Teixeira, by W. F. Sinclair ; (*m*) Occurrences of the Lesser Flamingo near Bombay, by J. M. Mason.

Mrs. A. C. Yate also read an interesting paper describing the habits of the Mottled Polecat (*Putorius sarmaticus*) in captivity, illustrating her remarks by means of photographs taken in Chaman.

Index to Volume XI.

Names of New Genera and Species have an asterisk (*) prefixed.

Specific Names are written with a small initial letter; Generic, Sub-family, Family, and Order Names are written with a capital initial letter.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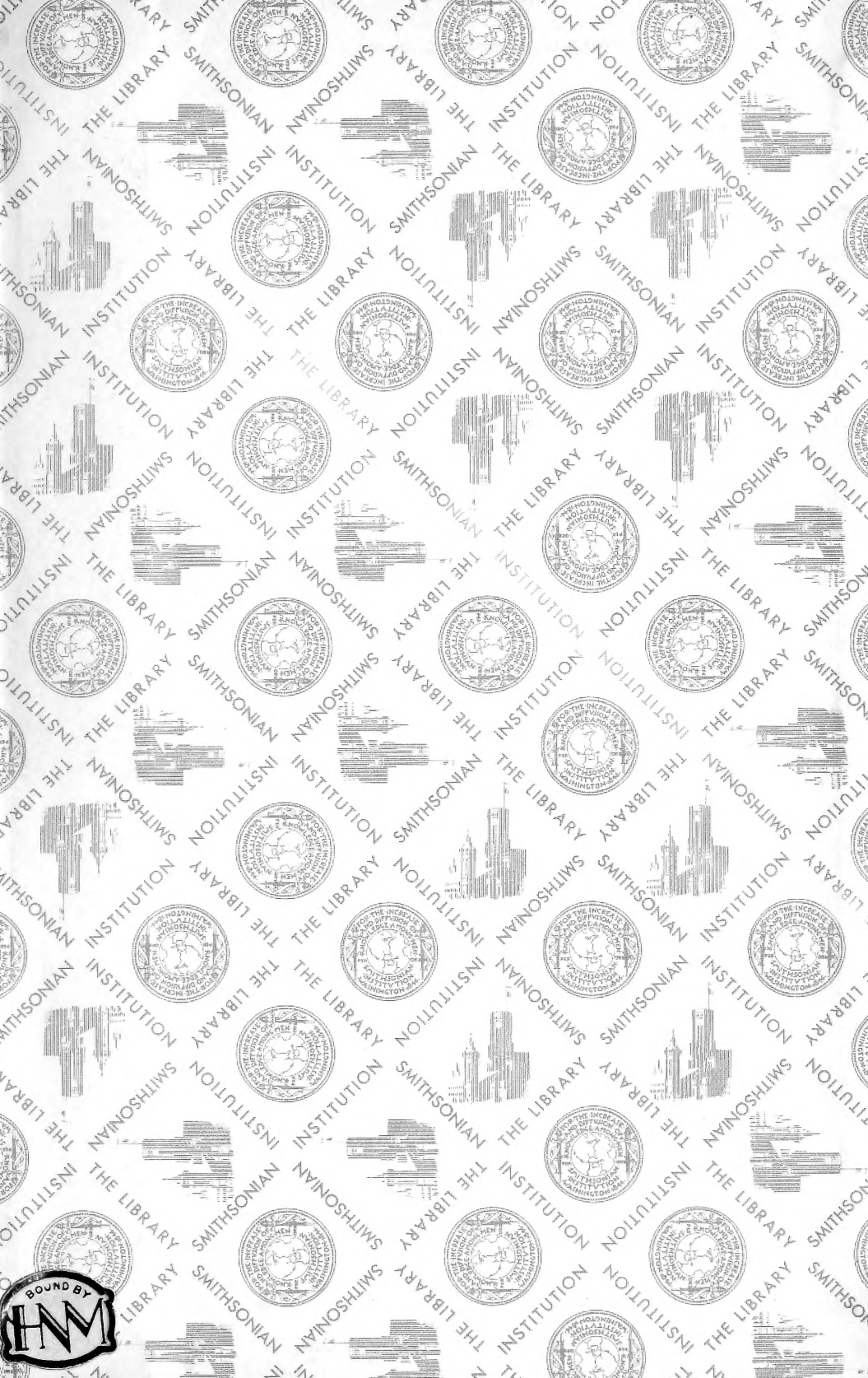
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