

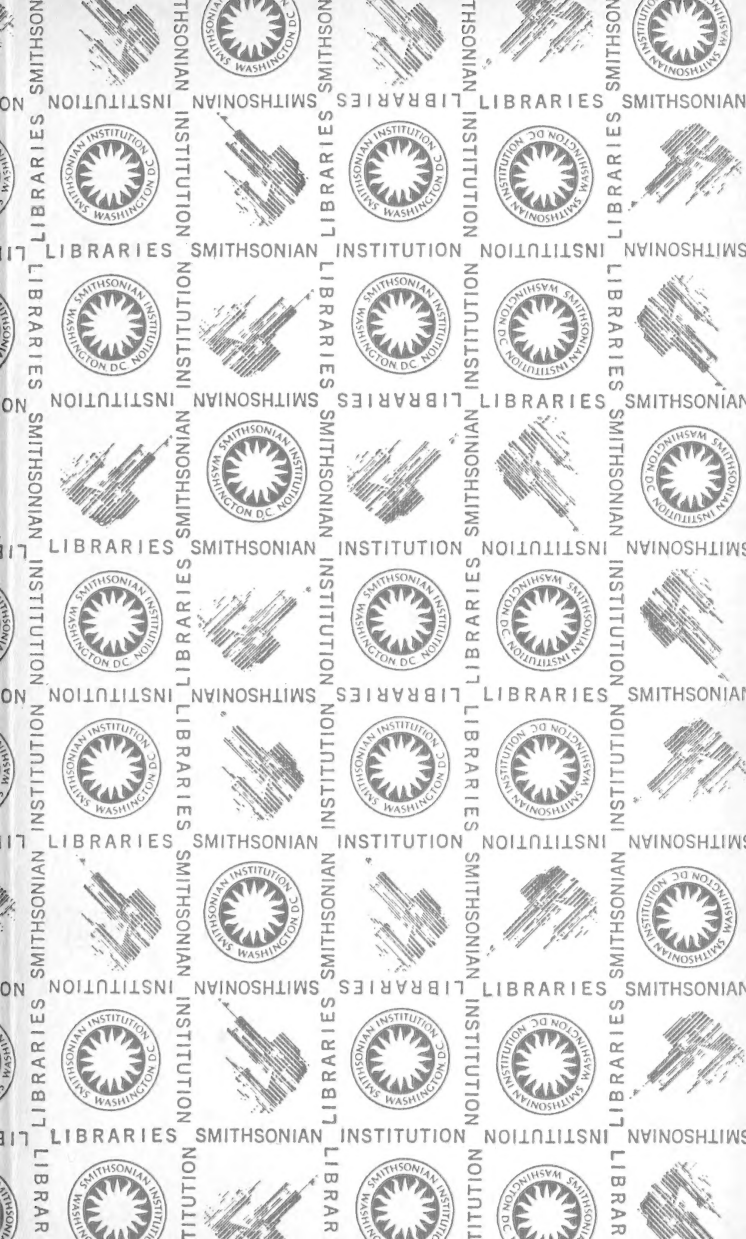
1902

USNM

EX LIBRIS

William Healey Dall

Division of Mollusks  
Sectional Library









1  
143  
187  
S.V.  
69379  
30

Division of Mollusks  
Sectioned Library

PROCEEDINGS

OF THE

MALACOLOGICAL SOCIETY OF LONDON.

—  
VOL. VII.

1906—1907.

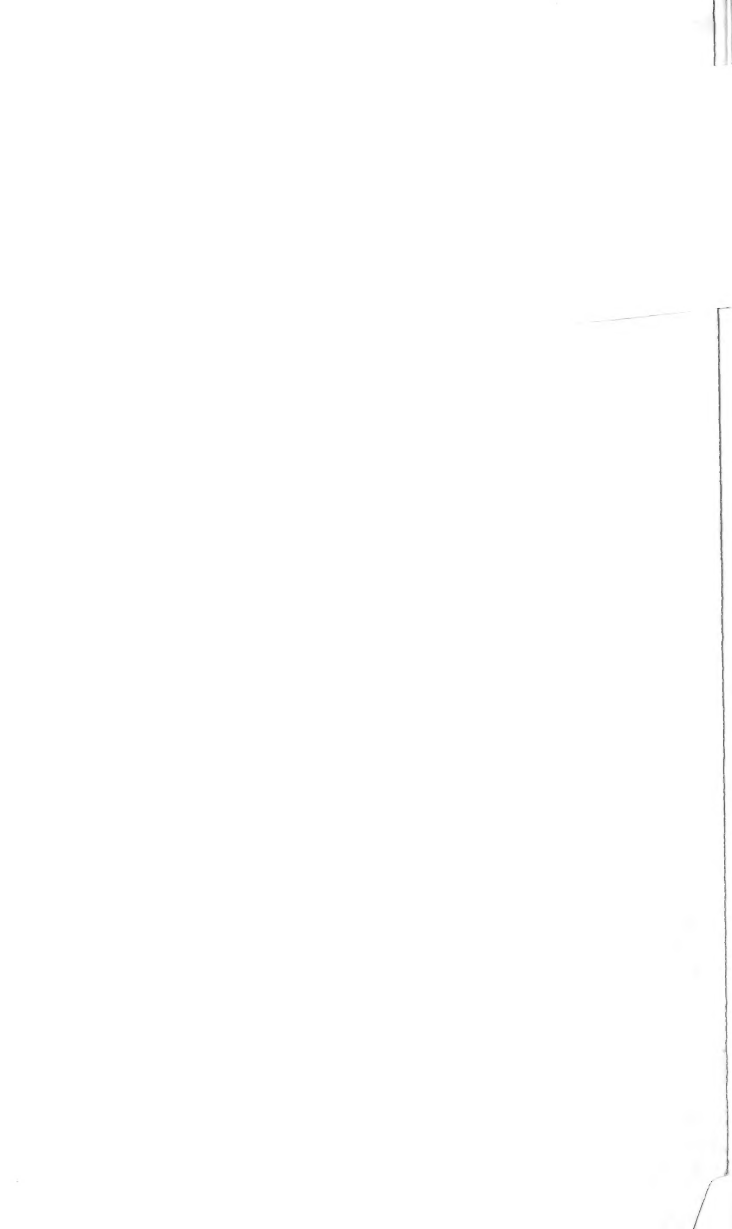




NOTICE

AFTER CAREFUL EXAMINATION OF THE  
INNER MARGIN AND TYPE OF MATERIAL  
WE HAVE SEWN THIS VOLUME BY HAND  
SO IT CAN BE MORE EASILY OPENED  
AND READ.

HERTZBERG NEW METHOD, INC







*G. B. Howes*  
*G. B. Howes*

---

PRESIDENT 1895 AND 1896.

PROCEEDINGS

OF THE

MALACOLOGICAL SOCIETY

OF LONDON.

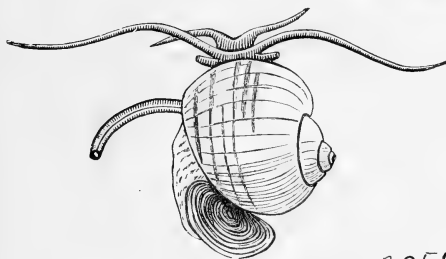
EDITED BY

E. A. SMITH, I.S.O., F.Z.S.

*Under the direction of the Publication Committee.*

VOLUME VII.

1906—1907.



205095

AUTHORS ALONE ARE RESPONSIBLE FOR THE STATEMENTS IN THEIR RESPECTIVE PAPERS.

LONDON:  
DULAU & CO.,  
37, SOHO SQUARE, W.

BERLIN:  
R. FRIEDLÄNDER & SOHN,  
11, KARLSTRASSE, N.W.  
1907.

## DATES OF PUBLICATION, VOL. VII.

---

No. 1	..	..	..	..	..	9th March, 1906.
No. 2	..	..	..	..	..	29th June, 1906.
No. 3	..	..	..	..	..	5th October, 1906.
No. 4	..	..	..	..	..	3rd April, 1907.
No. 5	..	..	..	..	..	25th June, 1907.
No. 6	..	..	..	..	..	12th September, 1907.

## CONTENTS OF VOL. VII.

---

### PROCEEDINGS :—

	PAGE
Ordinary Meeting, Nov. 10th, 1905 .. .. .	1
"    "    Dec. 8th,    "    .. .. .	1
"    "    Jan. 12th, 1906 .. .. .	2
 Annual Meeting, Feb. 9th, " .. .. .	60
Ordinary Meeting, Feb. 9th, " .. .. .	61
"    "    Mar. 9th, " .. .. .	62
"    "    April 6th, " .. .. .	63
"    "    May 11th, " .. .. .	121
"    "    June 8th, " .. .. .	121
"    "    Nov. 9th, " .. .. .	201
"    "    Dec. 14th, " .. .. .	201
"    "    Jan. 11th, 1907 .. .. .	202
 Annual Meeting, Feb. 8th, " .. .. .	242
Ordinary Meeting, Feb. 8th, " .. .. .	243
"    "    Mar. 8th, " .. .. .	243
"    "    April 12th, " .. .. .	244
"    "    May 10th, " .. .. .	309
"    "    June 14th, " .. .. .	309

## NOTES :—

	PAGE
On the Dates of Publication of J. D. Wilhelm Hartmann's "Erd- und Süßwasser-Gasteropoden." By B. B. WOODWARD, F.L.S.	3
On the Dates of Publication of C. L. F. von Sandberger's "Die Land- und Süßwasser-Conchylien der Vorwelt." By B. B. WOODWARD, F.L.S.	3
Cement as a Slug-killer ! By B. B. WOODWARD, F.L.S. (Fig.)	4
A Pteropod Alias. By C. HEDLEY, F.L.S., & E. R. SYKES, B.A.	5
On the Locality of the Melanotic <i>Helicigona arbustorum</i> exhibited Nov. 10th. By G. W. SWANTON	5
On <i>Conus Waterhouseæ</i> , Brazier, var. By A. F. KENYON	5
On <i>Voluta papillosa</i> , Swainson, var. By A. F. KENYON	6
<i>Cassidaria rugosa</i> . By A. REYNELL	67
Note on <i>Neptunea antiqua</i> . By E. A. SMITH, I.S.O.	68
On the name <i>Pilsbryella</i> , von Ihering. By Dr. H. VON IHERING	68
Note on <i>Fistulana mumia</i> perforating a valve of a <i>Dosinia</i> . By E. A. SMITH, I.S.O. (Figs.)	203
Note on <i>Paludestrina Jenkinsi</i> . By E. A. SMITH, I.S.O.	203
<i>Glessula parabilis</i> (Benson). By Colonel R. H. BEDDOME, F.L.S.	204
Note, to correct the name <i>Jousseaumia</i> . By Prof. G. C. BOURNE	260
A Correction. By H. H. BLOOMER	260
The Pairing of <i>Limnæa pereger</i> with <i>Planorbis corneus</i> . By W. D. LANG, F.G.S.	310
Note on an 'Octopus' with branching arms. By E. A. SMITH, I.S.O.	310
On some Holocene Mollusca from Staines. By J. E. COOPER	310
Note on the occurrence of Pearls in <i>Haliotis gigantea</i> and <i>Pecten</i> sp., from Japan. By E. A. SMITH, I.S.O.	311
Note on the name <i>Bourcieria</i> . By E. R. SYKES, B.A.	312

## OBITUARY NOTICES :—

Dr. W. T. Blandford. By E. A. SMITH, I.S.O.	64
Captain F. W. Hutton. By E. A. SMITH, I.S.O.	66
Richard Rimmer. By E. A. SMITH, I.S.O.	67
César Félix Ancey. By E. A. SMITH, I.S.O.	245

## PRESIDENTIAL ADDRESS :—

What evolutionary processes do the Mollusca show? By B. B. WOODWARD, F.L.S.	246
---	-----

## PAPERS :—

Descriptions of new species of <i>Drymæus</i> , <i>Amphicyclotus</i> , and <i>Neocyclotus</i> , from South and Central America. By S. I. DA COSTA. (Plate I.)	7
Description of a new species of <i>Achatina</i> from Mashonaland. By S. I. DA COSTA. (Fig.)	11



PAPERS ( <i>continued</i> )—	PAGE
On some Land and Fresh-water Mollusca from Sumatra. Part I. By the Rev. R. ASHINGTON BULLEN, B.A., F.L.S., F.G.S. (Plate II.) . . . . .	12
Description of a new species of <i>Oliva</i> . By F. G. BRIDGMAN. (Fig.) . . . . .	17
On the Anatomy of <i>Ensis macha</i> , <i>Solen Fonesii</i> , and <i>S. viridis</i> . By H. H. BLOOMER . . . . .	18
A Revision of the species of Cyclostrematidæ and Liotiidæ occurring in the Persian Gulf and North Arabian Sea. By J. COSMO MELVILL, M.A., F.L.S. (Plate III.) . . . . .	20
Description of <i>Cyclostrema Prestoni</i> and <i>Nassa Tindulli</i> , n.spp., from Ceylon. By J. COSMO MELVILL, M.A., F.L.S. (Fig.) .	29
On some 'Feeding-tracks' of Gastropods. By B. B. WOODWARD, F.L.S. (Figs.) . . . . .	31
Descriptions of four new species of Marine Shells, probably from Ceylon. By H. B. PRESTON, F.Z.S. (Figs.) . . . . .	34
Description of a new species of <i>Limnæa</i> from North-West Australia. By H. B. PRESTON, F.Z.S. (Fig.) . . . . .	36
On new species of <i>Siphonaria</i> , <i>Terebra</i> , and <i>Mangilia</i> , and a remarkable form of <i>Cypræa cruenta</i> , from South Africa. By G. B. SOWERBY, F.L.S. (Figs.) . . . . .	37
Critical remarks on certain forms of <i>Chloritis</i> , with descriptions of twelve new species. By G. K. GUDE, F.Z.S. (Plates IV and V.) . . . . .	40
Notes on the Anatomy of South African Aplysiidæ, with descrip- tions of two new species. By R. H. BURNE, B.A. (Figs.) . .	51
Descriptions of thirty-one Gastropoda and one Scaphopod from the Persian Gulf and Gulf of Oman, dredged by Mr. F. W. Townsend, 1902-1904. By J. COSMO MELVILL, M.A., F.L.S. (Plates VII and VIII.) . . . . .	69
<i>Capulus lissus</i> , Smith, as type of a proposed new subgenus ( <i>Malluvium</i> ) of <i>Amalthea</i> , Schumacher. By JAMES COSMO MELVILL, M.A., F.L.S. (Figs.) . . . . .	81
Notes on a Holocene deposit at Harlton, Cambs. By the Rev. R. ASHINGTON BULLEN, B.A., F.L.S., F.G.S. (Figs.) . . . .	85
On a small collection of Land and Fresh-water Shells from Uganda, with descriptions of a new species of <i>Martensia</i> and two new species of <i>Limnicolaria</i> . By H. B. PRESTON. (Figs.) . .	88
On new species of Polyplacophora from South Australia. By W. T. BEDNALL and E. H. V. MATTHEWS. (Plate IX.) . .	91
On a species of the Land Molluscan genus <i>Dyakia</i> from Siam. By Lieut.-Colonel H. H. GODWIN-AUSTEN, F.R.S. (Plate X.) . .	93
Descriptions of new species of Land Shells from Peru and Colombia and two new species of <i>Curvella</i> from the Philippine Islands. By S. I. DA COSTA. (Plate XI.) . . . . .	97

PAPERS ( <i>continued</i> )—	PAGE
Notes on Swainson's genus <i>Volutilithes</i> . By R. BULLEN NEWTON, F.Z.S. (Plate XII.) .. .. .	100
Further remarks on the genus <i>Chloritis</i> , with descriptions of eleven new species. By G. K. GUDE, F.Z.S. (Plate XIII.)..	105
On the occurrence of <i>Vertigo parcedentata</i> , Al. Braun, in Holocene deposits in Great Britain. By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S. .. .. .	119
Note on the subgenus <i>Malluvium</i> , Melvill. By EDGAR A. SMITH, I.S.O. .. .. .	122
Notes on some species of Mitridæ, with the description of <i>M. Brettinghami</i> , n.sp. By EDGAR A. SMITH, I.S.O. .. ..	124
On some Land and Fresh-water Mollusca from Sumatra. Part II. By Rev. R. ASHINGTON BULLEN, F.L.S., F.G.S. (Figs.) ..	126
Report upon a collection of Nudibranchiata from the Cape Verd Islands, with notes by C. Crossland. By Sir C. N. E. ELIOT, K.C.M.G. (Plate XIV.) .. .. .	131
Notes on Indian and Ceylonese species of <i>Glossula</i> . By Colonel R. H. BEDDOME, F.L.S. (Plate XV.) .. .. .	160
On the Mollusca procured during the "Porcupine" Expeditions, 1869-1870. Supplemental Notes, Part III. By E. R. SYKES, B.A. (Plate XVI.) .. .. .	173
On the Dates of Publication of Sowerby's "Mineral Conchology" and "Genera of Recent and Fossil Shells." By E. R. SYKES, B.A. .. .. .	191
Note on a new variety (var. <i>longispira</i> ) of <i>Oliva ispidula</i> . By F. G. BRIDGMAN. (Fig.).. .. .	195
On <i>Chloritis heteromphalus</i> , Pilsbry. By Professor HENRY A. PILSBRY, Sc.D., etc. (Figs.) .. .. .	196
On <i>Burtoa Nilotica</i> (Pfeiffer) and its relationship to <i>Achatina</i> , etc. By ALEXANDER REYNELL. (Plate XVII.) .. .. .	197
Description of a new species of <i>Calliostoma</i> from South Formosa. By EDGAR A. SMITH, I.S.O. (Fig.) .. .. .	205
Description of a new subgenus and species of <i>Alycæus</i> from Ke-lan-tan. By H. B. PRESTON, F.Z.S. (Fig.) .. .. .	206
Descriptions of some Tertiary Shells from New Zealand. By HENRY SUTER. (Plate XVIII.) .. .. .	207
Descriptions of six new species of shells and of <i>Leptomya lintea</i> , Hutton, from New Zealand. (Plate XVIII.) By HENRY SUTER.	211
Description of a new species of <i>Latirus</i> . By JAMES COSMO MELVILL, M.A., F.L.S. (Fig.) .. .. .	217
On the Anatomy of <i>Tagelus gibbus</i> and <i>T. divisus</i> . By H. H. BLOOMER. (Plate XIX.) .. .. .	218
Description of two new species of Helicoid Land-Shells from German New Guinea. By J. H. PONSONBY, F.Z.S. (Figs.)..	224

PAPERS ( <i>continued</i> )—	PAGE
Descriptions of seven new species of <i>Achatina</i> from the Congo Free State. By S. I. DA COSTA. (Plate XX.) . . . . .	226
A further contribution to our knowledge of the genus <i>Chloritis</i> , with descriptions of eleven new species. By G. K. GUDE, F.Z.S. (Plate XXI.) . . . . .	228
Description of a new species of <i>Papuina</i> , and illustrations of some hitherto unfigured shells. By G. K. GUDE, F.Z.S. (Plate XXI.) . . . . .	234
Descriptions of new non-marine shells from New Zealand. By HENRY SUTER. (Plate XXII.) . . . . .	236
Notes on the Post-Pliocene Mollusca of the Mylne Collection. By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S. . . . .	261
Notes on some Holocene Shells from Ightham. By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S. . . . .	264
Descriptions of four new species of <i>Melania</i> from New Ireland and Kelantan. By H. B. PRESTON, F.Z.S. (Figs.) . . . . .	266
On the Arms of the Belemnite. By G. C. CRICK, F.G.S., etc. (Plate XXIII.) . . . . .	269
Relics of Coloration in Fossil Shells. By R. BULLEN NEWTON, F.G.S. (Plate XXIV.) . . . . .	280
Notes on New Zealand Polyplacophora, with descriptions of five new species. By HENRY SUTER. (Figs.) . . . . .	293
Descriptions of new marine Mollusca from New Caledonia, etc. By G. B. SOWERBY, F.L.S. (Plate XXV.) . . . . .	299
Descriptions of new species of <i>Drymæus</i> from Peru, Mexico, etc. By S. I. DA COSTA. (Plate XXVI.) . . . . .	304
Description of a new species of <i>Vallonia</i> from South India. By G. K. GUDE, F.Z.S. (Figs.) . . . . .	306
Notes on <i>Achatina Dennisoni</i> , Reeve, and <i>A. magnifica</i> , Pfeiffer. By EDGAR A. SMITH, I.S.O. (Fig.) . . . . .	313
Review of the New Zealand Acmaeidae, with descriptions of new species and subspecies. By HENRY SUTER. (Plate XXVII.)	315
Nudibranchs from New Zealand and the Falkland Islands. By Sir CHARLES ELIOT, K.C.M.G. (Plate XXVIII.) . . . . .	327
Descriptions of new species of Australian <i>Planispira</i> and <i>Chloritis</i> . By H. C. FULTON. (Figs.) . . . . .	362
On the presence of a double wall in some species of the <i>Diaphora</i> group of <i>Ennea</i> . By H. C. FULTON. (Fig.) . . . . .	364

# LIST OF ILLUSTRATIONS IN VOL. VII.

	PAGE
The late Professor T. G. B. Howes, LL.D., F.R.S., President of the Society 1895 and 1896 .. .. .	Frontispiece
Cement as a Slug-killer. Slug track .. .. .	4
New Land Shells from Central and South America. (Plate I.) ..	10
<i>Achatina Jacobi</i> , n.sp. .. .. .	11
Land and Fresh-water Shells from Sumatra. (Plate II.) .. ..	16
<i>Oliva Smithi</i> , n.sp. .. .. .	17
<i>Cyclostrema</i> from the Persian Gulf, etc. (Plate III.).. .. .	28
<i>Nassa (Hima) Tindalli</i> , n.sp. .. .. .	29
'Feeding-tracks' of Gastropods .. .. .	31-33
<i>Bullia cinerea</i> , <i>Nassa Nevilliana</i> , n.spp. .. .. .	34
<i>Marginella subflava</i> , <i>M. eburnea</i> , n.spp. .. .. .	35
<i>Limnæa (Bulinus) egregia</i> , n.sp. .. .. .	36
<i>Siphonaria cyaneomaculata</i> , n.sp. .. .. .	37
<i>Terebra Filmeræ</i> , <i>Mangilia Beckeri</i> , n.spp. .. .. .	38
<i>Cypræa cruenta</i> , var. <i>tortirostris</i> , var. nov. .. .. .	39
Species of <i>Chloritis</i> . (Plates IV and V.) .. .. .	41, 50
<i>Tethys operta</i> , n.sp. .. .. .	51, 52
<i>Tethys Burnapi</i> , n.sp. .. .. .	54, 55
<i>Tethys nigrocincta</i> . Intestine.. .. .	57
Portrait of Dr. W. T. Blanford, F.R.S. (Plate VI.) .. .. .	64
New species of Gastropoda, etc., from the Persian Gulf and Gulf of Oman. (Plates VII and VIII.) .. .. .	74, 80
<i>Malluvium</i> , nov. subgen. .. .. .	82
Holocene deposit at Harlton, Cambs .. .. .	85, 86
<i>Martensia Bowkeræ</i> , n.sp. .. .. .	88
<i>Limicolaria Ponsonbyi</i> , n.sp. .. .. .	89
<i>Limicolaria Smithi</i> , n.sp. .. .. .	90
New South Australian Polyplacophora. (Plate IX.).. .. .	91
Anatomy of <i>Dyakia striata</i> , var. (Plate X.) .. .. .	96
New species of <i>Goniostomus</i> , <i>Drymæus</i> , <i>Neocyclotus</i> , and <i>Curvella</i> . (Plate XI.) .. .. .	99
<i>Volutilithes muricina</i> , <i>V. pertusa</i> . (Plate XII.) .. .. .	104
New species of <i>Chloritis</i> . (Plate XIII.) .. .. .	118

	PAGE
<i>Clausilia Sumatrana</i> , Mart. . . . .	127
<i>Clausilia robustior</i> , n.sp. . . . .	128
<i>Pterocyclus aspersus</i> , <i>Planorbis Sagoensis</i> , n.spp. . . . .	129
<i>Segmentina Kennardi</i> , n.sp. . . . .	130
Nudibranchiata from the Cape Verd Islands. (Plate XIV.) . . . .	159
New species of <i>Glessula</i> . (Plate XV.) . . . . .	172
Shells from the "Porcupine" expeditions. (Plate XVI.) . . . .	190
<i>Oliva ispidula</i> , var. <i>longispira</i> , n.var. . . . .	195
<i>Chloritis heteromphalus</i> , Pilsbry . . . . .	196
Anatomy of <i>Burtoa Nilotica</i> . (Plate XVII.) . . . . .	200
<i>Fistulana numia</i> . . . . .	203
<i>Calliostoma Formosensis</i> , n.sp. . . . .	205
<i>Alycæus (Pincerna) liratulula</i> , n.sp. . . . .	206
Mollusca, fossil and recent, from New Zealand. (Plate XVIII.) . .	216
<i>Latirus (Peristernia) Sowerbyi</i> , n.sp. . . . .	217
Anatomy of <i>Tagelus gibbus</i> and <i>T. divisus</i> . (Plate XIX.) . . . .	223
<i>Rhytida Bednalli</i> , <i>Coliobus thrix</i> , n.spp. . . . .	224
New species of <i>Achatina</i> . (Plate XX.) . . . . .	227
New species of <i>Chloritis</i> , etc. (Plate XXI.) . . . . .	235
New species of Mollusca from New Zealand. (Plate XXII.) . . . .	240
<i>Melania Novæ-Hiberniæ</i> , <i>M. Browni</i> , n.spp. . . . .	266
<i>Melania Melvilli</i> , <i>M. Kelantanensis</i> , n.spp. . . . .	267
Arms of Belemnites. (Plate XXIII.) . . . . .	273
Colour-markings in fossil shells. (Plate XXIV.) . . . . .	292
<i>Ischnochiton luteoroseus</i> , n.sp. . . . .	293
<i>Callochiton sulculatus</i> , n.sp. . . . .	295
<i>Chiton Torri</i> , <i>C. clavatus</i> , n.spp. . . . .	296
<i>Onithochiton nodosus</i> , n.sp. . . . .	297
New Mollusca from New Caledonia, etc. (Plate XXV.) . . . . .	299
New species of <i>Drymæus</i> . (Plate XXVI.) . . . . .	305
<i>Vallonia miserrima</i> , n.sp. . . . .	307
<i>Liguus (Hemibulimus) magnificus</i> (Pfr.) . . . . .	314
Acmaeidæ of New Zealand. (Plate XXVII.) . . . . .	326
Nudibranchs from New Zealand and the Falkland Islands. (Plate XXVIII.) . . . . .	361
<i>Planispira (Trachiopsis) acuticostata</i> , n.sp. . . . .	362
<i>Chloritis (Austrochloritis) Hedleyi</i> , n.sp. . . . .	362
<i>Ennea (Diaphora) Möllendorffi</i> . Section . . . . .	364



# MALACOLOGICAL SOCIETY OF LONDON.

## LIST OF MEMBERS.

(Corrected up to March, 1907.)

- 1906 Adams, Francis E., Carysfort, Shrewsbury.  
1898 Aldrich, T. H., No. 1739, P. St. N.W., Washington, D.C., U.S.A.
- 1893 Baldwin, D. D., Hamakuapoko, Maui, Hawaiian Islands.  
1901 Bavay, A., 82, Rue Lauriston, xvi<sup>e</sup>, Paris.  
1902 Becker, Dr. H., Grahamstown, Cape Colony.  
O Beddome, Col. R. H., F.L.S., 75, West Hill, Wandsworth, London, S.W.  
1893 Bednall, W. T., The Museum, Adelaide, South Australia.  
1901 Bentley, R. H., Thanet House, 232, Strand, London, W.C.  
O Bles, E. J., D.Sc., Thornville, Hillhead, Glasgow.  
1898 Bloomer, H. Howard, 35, Paradise Street, Birmingham.  
1893 Bonnet, A., 55, Boulevard St. Michel, Paris.  
1893 Böttger, Prof. Dr. Oskar, M.A.N., C.M.Z.S., 6, Seiler Strasse, Frankfurt-am-Main.  
1906 Breun, Louis A., c/o René de l'Hôpital, 159, High Street, Kensington, London, W.  
1902 Bridgman, F. G., 5, Duchess Street, Portland Place, London, W.  
1893 Brusina, Prof. Spiridion, c/o Professor Langhoffer, Natural History Museum, Zagreb (Agram), Croatia.  
1897 Bullen, Rev. Robert Ashington, F.L.S., Englemoor, Heathfield Road, Woking, Surrey.  
1905 Bülow, C., 86, Zimmerstrasse, Berlin.  
1895 Burne, R. H., B.A., 21, Stanley Crescent, Notting Hill, London, W.  
1893 Burnup, Henry, Box 182, P.O., Maritzburg, Natal.  
O Burrows, H. W., A.R.I.B.A., 28, Lambert Road, Brixton, London, S.W.  
1905 Buschbeck, E., Karlstrasse ii, Berlin, N.W. 6.
- 1893 Cairns, Robert, 159, Queen Street, Hurst, Ashton-under-Lyne.  
1902 Campbell, Archibald, The Collegiate School, Queen's Park, Glasgow.  
1903 Chaplin, J. G., 53, Havelock Street, Port Elizabeth, South Africa.  
1895 Clapp, George H., 325, Water Street, Pittsburgh, Pa., U.S.A.  
1901 Coen, G. S., Calle Castorta, Venice.  
O Collier, E., Glen Esk, Whalley Range, Manchester.  
O Collinge, W. E., M.Sc., 55, Newhall Street, Birmingham.  
1906 Collins, Miss Adah, Earlswood, 35, Highbury New Park, London, N.  
1906 Comber, Edward, The Bombay Natural History Society, Bombay, India.  
O Cooke, Rev. A. H., M.A., Aldenham School, Elstree.  
1906 Cooke, C. Montague, jun., c/o Bishop Museum, Honolulu, Hawaiian Islands.
- 1895 Cooper, Charles, 138, Queen Street, Auckland, New Zealand.  
1893 Cooper, James Eddowes, 68, North Hill, Highgate, London, N.  
1898 Cort, Prof. H. de, Rue d'Holbach, Lille, France.  
O Cossmann, Maurice, 95, Rue de Maubeuge, Paris.  
1906 Cousens, H. S., Tai An, Shantung, N. China.  
1893 Cox, Dr. James C., F.L.S., C.M.Z.S., 87, Pitt Street, Sydney, New South Wales.

- 1895 Cox, Major P. Z., F.Z.S., H.B.M.'s Consul and Political Agent,  
Muscat, Arabia; c/o Messrs. Grindlay, Groom, & Co., 54, Parliament  
Street, London, S.W.
- 1896 Crawford, F. C., 19, Royal Terrace, Edinburgh.
- 1893 Crawford, James, c/o Messrs. J. C. Kemsley & Co., Port Elizabeth,  
South Africa.
- Crick, C. P., 2, Bowes Villas, Warwick Road, New Southgate.
- Crick, G. C., F.G.S., British Museum (Natural History), Cromwell  
Road, London, S.W.
- Da Costa, S. I., 9, Gloucester Square, London, W.
- 1893 Dall, William Healey, Honorary Curator Department of Mollusca,  
U.S. National Museum, Washington, D.C., U.S.A.
- 1893 Dautzenberg, Ph., 209, Rue de l'Université, Paris.
- 1903 Digby, Miss Lettice, Kings Ford, Colchester.
- 1897 Dollfus, Adrien, 35, Rue Pierre Charron, Paris.
- 1893 Dollfus, Gustave, 45, Rue de Chabrol, Paris.
- 1899 Dupont, Evonor, Port Louis, Mauritius.
- 1902 Dupuis, Lieut. F. M. S. B., 80, Rue Wéry, Ixelles, Brussels.
- 1899 Ede, Francis J., A.M.I.C.E., F.G.S., Silchar, Cachar, India.
- 1901 Ehrmann, P., Hartelstrasse 6, III, Leipzig, Germany.
- 1900 Eliot, Sir Charles N. E., K.C.M.G., Endcliffe Holt, Endcliffe  
Terrace, Sheffield.
- 1905 Etheridge, R., Australian Museum, Sydney, N.S.W.
- 1893 Farquhar, John, 3, Rose Terrace, Grahamstown, Cape Colony.
- 1899 Fischer, Henri, 51, Boulevard St. Michel, Paris.
- 1894 Foote, R. Bruce, F.G.S., Ivy Cottage, Yercand, Madras Presidency.
- 1893 Foster, Miss A. C. S., 45, Belsize Square, London, N.W.
- 1903 Freyberg, Cuthbert, 27, Hawker Street, Wellington, New Zealand.
- Fulton, Hugh C., Riverside, Kew Gardens, Surrey.
- 1905 Gabriel, C. J., 293, Victoria Street, Abbotsford, Victoria, Australia.
- 1894 Gatliff, J. H., The Commercial Bank, Carlton, Melbourne, Victoria.
- 1896 Gilson, Prof. Gustave, The University, Louvain, Belgium.
- Godwin-Austen, Lieut.-Col. H. H., F.R.S., Nore, Godalming.
- Gude, G. K., F.Z.S., 114, Adelaide Road, London, N.W.
- 1894 Guerne, Baron Jules de, 6, Rue de Tournon, Paris.
- 1894 Guppy, R. J. Lechmere, Kinersly, Port-of-Spain, Trinidad.
- 1893 Gwatkin, Rev. Prof. H. M., LL.D., 8, Scrope Terrace, Cambridge.
- 1904 Hall, C. M., 33, Goring Road, Bowes Park, London, N.
- 1894 Hart, J. H., Curator, Royal Botanic Gardens, Trinidad.
- 1894 Haynes, T. Henry, The Montebello Islands, Inslow, W. Australia.
- 1893 Hedley, Charles, F.L.S., Australian Museum, Sydney, N. S. Wales.
- 1897 Henderson, J. Brooks, jun., Glenwald, Ballston, Virginia, U.S.A.
- 1897 Herdman, Prof. W. A., F.R.S., The University, Liverpool.
- 1902 Hett, Miss Mary L., 12, Exeter Mansions, Cricklewood, London, N.
- 1893 Hind, Wheelton, M.D., F.G.S., Roxeth House, Stoke-on-Trent.
- 1902 Hirase, Y., Kioto, Japan.
- Hoyle, W. E., D.Sc., M.R.C.S., F.R.S.E., Owens College, Manchester.
- Hudleston, W. H., M.A., F.R.S., 8, Stanhope Gardens, London, S.W.
- 1898 Ihering, Dr. H. von, Museu Paulista, São Paulo, Brazil.
- 1906 Iredale, T. Ellerfeld, Boundary Road, Merivale, Christchurch,  
New Zealand.



- 1899 Jarvis, P. W., Colonial Bank, Kingston, Jamaica.  
 1901 Johansen, A. C., D.Ph., M.Sc., 3, Landskronagade, Copenhagen, Str.  
 1897 Johnson, C. W., Boston Society of Natural History, Berkeley Street,  
 Boston, Mass., U.S.A.  
 1899 Jones, Surgeon K. Hurlstone, R.N., R.N. Hospital, Hong Kong.  
 1893 Jousseau, Dr., 29, Rue de Gerjovie, Paris.  
 1899 Jukes-Browne, A. J., F.G.S., Floriston, Cleveland Road, Torquay.
- O Kennard, A. S., 161, Mackenzie Road, Beckenham, Kent.  
 1902 Kensett, Percy F., Broadmeadow, Coombe Lane, Wimbledon,  
 London, S.W.  
 1894 Kenyon, Mrs. Agnes F., 291, Highett Street, Richmond, Victoria,  
 Australia.  
 1893 Kobelt, Dr. W., Schwanheim (Main), Germany.
- 1902 Laidlaw, F. F., Ivanhoe Hotel, Bloomsbury, London, W.C.  
 1905 Lange, H. O., c/o H. Lehmann & Stage, Løvstræde, Copenhagen.  
 1895 Lawson, Peter, 87, Finlay Street, Fulham, London, S.W.  
 1904 Lebour, Miss M. V., B.Sc., Radcliffe House, Corbridge-on-Tyne,  
 Northumberland.
- O Leighton, T., F.G.S., Lindisfarne, St. Julian's Farm Road, West  
 Norwood, London, S.E.  
 1899 Lightfoot, R., South African Museum, Cape Town, Cape of Good  
 Hope.  
 1895 Linter, Miss J. E., Saville House, Heath Road, Twickenham.  
 1893 Lodder, Miss Mary, c/o A. Dawson, Bank of Australasia, Launceston,  
 Tasmania.  
 1897 Longstaff, Mrs. G. B., Highlands, Putney Heath, London, S.W.  
 1905 Lucas, B. R., 3, Dyar Terrace, Winnington, Northwich.
- 1893 MacAndrew, J. J., F.L.S., Lukesland, Ivy Bridge, S. Devonshire.  
 1901 Manger, W. T., 100, Manor Road, Brockley, London, S.E.  
 1901 Marshall, Arthur Grotjan, Clovelly, Park Road, Wallington, Surrey.  
 1894 Matthews, E. H. V., Post and Telegraph Station, Clare, South  
 Australia.  
 1897 May, Dr. T. H., Bundaberg, Queensland.  
 1897 May, W. L., Forest Hill, Sandford, Tasmania.  
 1901 McBean, John, P.O. Box, 1146, Johannesburg, Transvaal.  
 O Meiklejohn, Dr. W. J. S., F.L.S., 105, Holland Road, Kensington,  
 London, W.  
 O Melvill, J. Cosmo, M.A., F.L.S., Meole Brace Hall, Shrewsbury.  
 1893 Monterosato, Marquis A. de, 2, Via Gregorio Ugdolina, Palermo,  
 Sicily.  
 1899 Mort, H. S., B.Sc., Engineering School, University of Sydney, New  
 South Wales.  
 O Moss, W., F.C.A., 13, Milton Place, Ashton-under-Lyne.  
 1893 Murdoch, R., Wanganui, New Zealand.
- O Newton, R. Bullen, F.G.S., British Museum (Natural History),  
 Cromwell Road, London, S.W.  
 O Norman, Rev. Canon Merle, D.C.L., F.R.S., The Red House,  
 Berkhamsted, Herts.
- O Pace, S., F.Z.S., Marine Station, Millport, N.B.  
 1901 Pannell, Charles, East Street, Haslemere, Surrey.  
 1896 Pavlow, Dr. Alexis, Professor of Geology, The University, Moscow.  
 1903 Peile, Major A. J., The Royal Artillery, Portsmouth.  
 1897 Pilsbry, H. A., Academy of Natural Sciences, Philadelphia, Pa., U.S.A.  
 O Ponsoby, J. H., F.Z.S., 15, Chesham Place, London, S.W.

- O Preston, Hugh B., F.Z.S., 53, West Cromwell Road, London, S.W.  
1893 Pritchard, G. B., 22, Mantell Street, Moonee Ponds, Victoria.
- 1893 Quekett, J. F., F.Z.S., The Museum, Town Hall, Durban, Natal.
- 1899 Ramanan, V. V., M.A., F.Z.S.,  $\frac{1}{2}$  Sami Pillai Street, Triplicane, Madras.
- 1903 Randles, W. B., Technical College, Derby.
- 1901 Reynell, Alexander, 152, Selhurst Road, South Norwood, London, S.E.
- 1900 Ridewood, W. G., D.Sc., 61, Oakley Street, Chelsea, London, S.W.
- 1905 Ritchie, John, jun., 581, Warren Street, Boston, Mass., U.S.A.
- 1897 Rolle, Hermann, 89, Königgratzen Strasse, Berlin, W.S.  
O Rosevear, J. Burman, 109, New Kings Road, Fulham, London, S.W.
- O Scharff, R. F., Ph.D., D.Sc., Tudor House, Dumdrum, Co. Dublin.
- 1894 Schepman, M. M., Rhoon, Rotterdam, Holland.
- 1897 Shopland, Commander E. R., Weeting, Sherringham, Norfolk.
- 1894 Simroth, Dr. Heinrich Rudolf, Oetzsch-Gautzsch, Leipzig.  
O Smith, Edgar A., I.S.O., British Museum (Natural History), Cromwell Road, London, S.W.
- O Soul, J. S., 3, Nightingale Road, Clapton, London, N.E.
- O Sowerby, G. B., F.L.S., Riverside, Kew Gardens, Surrey.
- O Stalley, H. J., Christ's Hospital, West Horsham, Sussex.
- 1902 Stevens, R. H., Bradfield, Berkshire.
- 1900 Stubbs, A. G., The Meads Cottage, Hailey Lane, Hertford.
- 1893 Stump, E. C., Polefield, Blackley, Manchester.
- 1894 Suter, Henry, Eden Terrace, Haslett Street, Auckland, New Zealand.  
O Sykes, Ernest Ruthven, B.A., Fair Oaks, Addlestone, Surrey.
- 1906 Thiele, Dr., Konigl. Zoologisches Museum, Invaliden Strasse, 43, Berlin.  
O Tomlin, J. R. le B., M.A., Estyn, Chester; c/o T. Kensington, Esq., Mathon Lodge, West Malvern.
- O Turton, Lieut.-Col. W. H., D.S.O., Harley House, Clifton Down, Bristol.
- 1894 Verco, Dr. J. C., North Terrace, Adelaide, South Australia.
- 1895 Vignal, Mons. L., 28, Avenue Duquesne, Paris.
- 1894 Walker, Bryant, 205, Moffat Buildings, Detroit, Michigan, U.S.A.
- 1904 Walker, Commander J. J., R.N., Aorangi, Lonsdale Road, Summer-town, Oxford.
- 1905 Watson, Hugh, Bracondale, The Avenue, Cambridge.  
O Watson, Rev. R. Boog, LL.D., F.R.S.E., 11, Strathearn Place, Edinburgh.
- O Webb, W. M., F.L.S., 7, Campbell Road, Hanwell, London, W.
- 1903 Webster, Rev. W. H., B.A., The Hermitage, Waiuku, Auckland, New Zealand.
- 1894 Whidborne, Rev. G. F., M.A., F.G.S., Hammerwood, East Grinstead.
- 1904 Williams, Mrs. Alice L., 593, Jackson Boulevard, Chicago, Ill., U.S.A.  
O Wilmer, Lieut.-Col. L. W., Lothian House, Ryde, Isle of Wight.
- 1897 Woods, Henry, M.A., F.G.S., Sedgwick Museum, Cambridge.  
O Woodward, B. B., F.L.S., 4, Longfield Road, Ealing, London, W.  
O Woodward, Dr. Henry, F.R.S., 129, Beaufort Street, Chelsea, London, S.W.

*All corrections or alterations of address are to be sent to Alex. Reynell, 152, Selhurst Road, S. Norwood, London, S.E.*

# PROCEEDINGS

OF THE

## MALACOLOGICAL SOCIETY OF LONDON.

---

ORDINARY MEETING.

FRIDAY, 10TH NOVEMBER, 1905.

E. R. SYKES, B.A., President, in the Chair.

George Wynn Westcott was elected a member of the Society.

The following communications were read:—

1. "Descriptions of new species of *Drymaeus*, *Amphicyclotus*, and *Neocyclotus*, from South and Central America." By S. I. Da Costa.
2. "Description of a new species of *Achatina* from Mashonaland." By S. I. Da Costa.
3. "On some Land and Fresh-water Mollusca from Sumatra." Part I. By Rev. R. Ashington Bullen, B.A., F.L.S.
4. "Description of a new species of *Oliva*." By F. G. Bridgman.
5. "On the Anatomy of *Ensis macha*, *Solen Fonesii*, and *S. viridis*." By H. H. Bloomer.

Mr. F. G. Bridgman exhibited specimens of *Oliva cuneata*, Marrat, and *Olivella mica*, Duclos, pointing out the difference between these two species and referring to the errors that previous authors had made in the determination of the first.

The Rev. R. Ashington Bullen exhibited scalariform examples of *Helix aspersa*, Müll., and of *Hygromia rufescens*, Pennant; also a melanotic example of *Helicigona arbustorum*, Linn.

Mr. E. R. Sykes exhibited a series of all the described species and varieties (except two) of *Catantulus* from Ceylon, to show the range of specific variation within one island.

---

ORDINARY MEETING.

FRIDAY, 8TH DECEMBER, 1905.

E. R. SYKES, B.A., President, in the Chair.

Charles J. Gabriel, Hugh Watson, B. R. Lucas, Robert Etheridge, and Ernest Buschbeck were elected members of the Society.

The following communications were read:—

1. "A Revision of the Species of Cyclostrematidæ and Liotiidae occurring in the Persian Gulf and North Arabian Sea." By J. Cosmo Melvill, M.A.

2. "Description of *Cyclostrema Prestoni* and *Nassa Tindalli*, n.spp., from Ceylon." By J. Cosmo Melvill, M.A.

3. (i) "On the Dates of Publication of J. D. Wilhelm Hartmann's 'Erd- und Süßwasser-Gasteropoden,' 8vo, St. Gallen, 1840." (ii) "On some 'Feeding-tracks' of Gastropods." (iii) "Cement as a Slug-killer." By B. B. Woodward, F.L.S.

4. "A Pteropod Alias." (a) By C. Hedley. (b) By E. R. Sykes, B.A.

5. "Descriptions of four new species of Marine Shells, probably from Ceylon." By H. B. Preston

6. "Description of a new species of *Limnæa* from North-West Australia." By H. B. Preston.

The Rev. R. Ashington Bullen read a letter from Mr. Swanton describing the exact locality in which the melanotic *Helicigona arbustorum* shown by him at the last meeting was found.

Mr. A. Reynell exhibited specimens of *Opeas* with eggs in the oviduct.

Mr. A. S. Kennard exhibited the shell of a *Testacella Maugei* from a holocene deposit at Porlock Weir. The position of the shell led Mr. Kennard to regard it as native, and not a late importation.

Mr. E. R. Sykes exhibited specimens of *Cryptoplax striatus* (an Australian species) from the east coast of Africa and the Red Sea.

---

#### ORDINARY MEETING.

FRIDAY, JANUARY 12TH, 1906.

E. R. SYKES, B.A., President, in the Chair.

Dr. Henry Woodward and Mr. W. Bendall were appointed auditors. Francis E. Adams, Louis A. Breun, and C. Montague Cooke, jun., were elected members of the Society.

The following communications were read:—

1. "On the Dates of Publication of C. L. F. von Sandberger's 'Die Land- und Süßwasser-Conchylien der Vorwelt,' 4to, Wiesbaden (C. W. Kreidel), 1870-75." By B. B. Woodward, F.L.S.

2. "On new species of *Siphonaria*, *Terebra*, and *Mangilia*, and a remarkable form of *Cypræa cruenta*, from South Africa." By G. B. Sowerby, F.L.S.

3. "Critical remarks on certain forms of *Chloritis*, with descriptions of twelve new species." By G. K. Gude, F.Z.S.

4. "Notes on the Anatomy of South African Aplysiidæ, with descriptions of two new species." By R. H. Burne, B.A.

5. "On *Conus Waterhouseæ*, Brazier, var.," and "On *Voluta papillosa*, Swainson, var." By Mrs. Kenyon.

Mr. S. I. Da Costa exhibited some new species of land shells from South America and the Philippine Islands.

The Rev. R. Ashington Bullen exhibited specimens of *Glycimeris pectunculus* and *Nassa incrassata* from Herm, showing remarkable colour peculiarities.

Mr. E. A. Smith, I.S.O., exhibited pieces of chalk and chlorite schist perforated by *Pholas* and showing, with exceptional clearness, striations caused by the prickles of the shell.

Mrs. Kenyon sent for exhibition:—(i) Some specimens of *Cypræa tigris* showing longitudinal hair-like lines or striæ on the dorsal surface, for which, in the year 1902, she had proposed the varietal name *lineata*. (ii) A young example of the so-called *Voluta Kenyoniana*, Brazier, and a photograph of the type, of which the "present whereabouts is unknown." (iii) A young specimen of the rare *Voluta Roadknightæ*, McCoy, consisting of two normal whorls and a remarkably large globose protoconch. (iv) A coloured drawing of *Conus pulcherrimus*, Brazier, taken from the type in her own collection.

## NOTES.

ON THE DATES OF PUBLICATION OF J. D. WILHELM HARTMANN'S "ERD- UND SÜSSWASSER-GASTEROPODEN," 8vo, St. Gallen, 1840. (*Read 8th December, 1905.*)—Some uncertainty has always been felt concerning the exact dates of publication of the various parts of this important work. Reviews of the first seven parts, however, appeared in *Isis*, which, allowing for the obvious misprint with respect to parts 3 and 4, enables us approximately to fix their dates, while there need be no hesitation about accepting the date of the concluding part of the work as given in Engelmann's "Bibliotheca Historico-Naturalis," p. 446 (1846).

Heft 1, 2 : pp. 1-37, pls. 1-12, 1840. *Isis*, xxxiii, June, 1840, col. 487.

" 3 : pp. 37-60, pls. 13-24, { 1840 }  
" 4 : pp. 61-116, pls. 25-36, { [i.e.1841]. } *Isis*, xxxv, July, 1842, col. 559.

" 5 : pp. 117-148, pls. 37-48, { 1842. *Isis*, xxxvi, Sept., 1843, col. 720.

" 6 : pp. 149-156, pls. 49-60, { 1843. *Isis*, xxxvii, Aug., 1844, col. 634.

" 7 : pp. 157-204, pls. 61-72, 1843. *Isis*, xxxvii, Aug., 1844, col. 634.

" 8 : pp. 205-227, pls. 73-84, [1844].

B. B. WOODWARD.

ON THE DATES OF PUBLICATION OF C. L. F. VON SANDBERGER'S "DIE LAND- UND SÜSSWASSER-CONCHYLIIEN DER VORWELT," 4to, Wiesbaden (C. W. Kreidel), 1870-75. (*Read 12th January, 1906.*)—Owing to the infatuated objection of binders to the preservation of wrappers, the exact dates of publication of the several parts of this work, a matter of the utmost importance to specialists on account of the number of new genera and species involved, have not been ascertainable from an inspection of any of the copies open to us. Nor, with the exception of MM. Dollfus & Ramond, to whose work Mr. R. B. Newton has drawn my attention, have any of the bibliographers given the contents of the parts. MM. Dollfus & Ramond, in their "Bibliographie de la Conchyliologie du Terrain Tertiaire Parisien," 8vo, Paris, 1886, p. 20 (whose statements are

reprinted by Mr. Newton, "Syst. List of the F. E. Edwards Coll. of Brit. Olig. and Eocene Moll.," p. 320, though their source is not mentioned), attribute 12 instead of 11 parts to the work, and are wrong in other minor particulars. Through the kindness, however, of Messrs. Dulau & Co., communication was opened with the original publishers of the work, and the following authoritative details have been obtained which set the matter at rest:—

- Lief. 1-3 : pp. 1-96, pls. i-xii, 1870.  
 „ 4-5 : pp. 97-160, pls. xiii-xx, 1871.  
 „ 6-8 : pp. 161-256, pls. xxi-xxxii, 1872.  
 „ 9-10 : pp. 257-352, pls. xxxiii-xxxvi, 1873.  
 „ 11 : pp. i-viii, 353-1000, 1875.

B. B. WOODWARD.

CEMENT AS A SLUG-KILLER! (*Read 8th December, 1905.*)—The accompanying photograph shows the fate that overtakes the unwary slug that essays a journey over a surface of dry cement. The porous material simply sucks all the moisture out of its body, and unless the animal can effect a good retreat it speedily succumbs. The tragedy here shown took place in the early morning of 13th September last at the back of my house in Ealing, and was kindly photographed for me by my neighbour, Mr. C. C. Roberts. The copious exudation of glistening mucous is clearly



shown, as well as the frantic efforts of the unfortunate mollusc to escape from the sucking action of the cement, by rearing and flinging itself to one side or the other, instead of steadily progressing over the surface. The dead slug is seen at the end of the trail of slime, which was so tenaciously retained by the cement that it was still visible in November.

B. B. WOODWARD.

A PTEROPOD ALIAS. (*Read 8th December, 1905.*)—In a recent memoir on "The Thecosomata and Gymnosomata of the Siboga Expedition," Mr. J. J. Tesch touches on the nomenclature of the genus usually known as *Cavolinia*. In a footnote (p. 34) he states that a name "*Gioënia*," which he is unable to verify, probably has priority over *Cavolinia*, and in Appendix I he adds that he afterwards consulted the book, and finds that "the author (Gioëni) proposes, on p. xxiv and p. xxv, that the animal, which without any doubt must be *Cavolinia tridentata*, shall be called after him." This ambiguous remark suggests that "*Gioënia*" was here legitimately proposed for a Pteropod. But in the "Index Animalium" (vol. i, pp. xxvi, 421) Sherborn definitely states that here "*Gioënia* does not occur." The same useful guide assists us to the discovery that Bruguière defined and figured (*Encycl. Méth., Vers i, p. xii, pl. clxx*) as *Gioënia*, the gizzard of *Scaphander*. If revived, *Gioënia* apparently should oust *Scaphander*. Tesch's citation and Sherborn's omission of *Cavolinia* or *Cavolina* of Abildgaard suggest that the Swedish author did not use binomials, and that his name cannot be maintained. But *Cavolina* of Bruguière (op. cit., pl. lxxxv) is a Nudibranch. What name, then, Humphrey's, Lamarck's, or another's, shall be given to *Anomia tridentata*, Forskål?

C. HEDLEY.

The above note rendered it desirable that some person who had access to the literature should consider the question. Gioëni's work, which appeared in 1783, does not contain any Latin names, and is of no authority in nomenclature. He dealt with three forms: (a) the gizzard of *Scaphander*, afterwards called *Gioënia* by Bruguière; (b) what I take to be the *Anomia tridentata* of Forskål; (c) a true *Anomia*. In 1791 Abildgaard (*Skr. Nat. Selsk., vol. i, pt. 2, p. 175*) proposed the name *Cavolina* for a form which he figured and called *C. natans*, and which I consider to be the *Anomia tridentata* of Forskål. The same year Bruguière proposed the same name (*Ency. Méth., Tabl. Vers, pl. lxxxv*) for two forms which are, according to p. 138 of the same work (published in 1824), *Eolis peregrina*, Lam., and *E. affinis*, Lam. The name was therefore used in one year both for a Pteropod and a Nudibranch. Bearing in mind the impossibility of deciding at the present day as to their relative priority, and also that Bruguière's name only appeared on the plate, I consider that Abildgaard's name should be adopted, as has generally been done. *Gioënia* of Bruguière appeared in 1789 (*Ency. Méth., Vers, vol. i, p. xii*), and related to the gizzard of *Scaphander lignaria* (see Deshayes, *Ency. Méth., Vers, vol. ii, p. 167*). The conclusion, therefore, at which I arrive is that *Cavolina*, Abildgaard, is the correct generic term for the *Anomia tridentata* of Forskål.

E. R. SYKES.

ON THE LOCALITY OF THE MELANOTIC *HELICIGONA ARBUSTORUM* EXHIBITED NOVEMBER 10TH. (*Read 8th December, 1905.*)—It occurs in a hedge-bank on the Corallian between Todber and Marnhull in North Dorset. A ditch always containing water adjoins the hedge-bank, but the latter is not particularly damp. The species is chiefly confined to that part of the hedge which has an undergrowth of ivy. All the specimens are somewhat darker than usual, but absolutely melanotic forms are very rare there. I believe only two or three have been as yet found.

G. W. SWANTON.

ON *CONUS WATERHOUSEÆ*, BRAZIER,<sup>1</sup> VAR. (*Read 12th January, 1906.*)—This variety from the Mauritius differs somewhat in colour from

<sup>1</sup> It was pointed out by Mr. G. B. Sowerby, and the meeting generally concurred, that this so-called species was merely the young state of *C. distans*, Hwass.—ED.

the type originally described from the Solomon Islands (Proc. Linn. Soc. N.S.W., 1895, p. 471). It is of a light-brown colour with white irregular blotches at the middle of the body-whorl, which is chocolate brown at the anterior end. The type, on the contrary, has the white patches distributed all over the body-whorl. The brown spotting between the tubercles on the spire are also much darker in the latter than in the variety.

A. F. KENYON.

ON *VOLUTA PAPILLOSA*, SWAINSON,<sup>1</sup> VAR. (Read 12th January, 1906.)—This variety is solid, ponderous, and differs from the type in being longitudinally costate, excepting on the last half of the body-whorl. Ribs numerous on the upper whorls. The columella swollen in the middle, with three strong plaits and a fourth obscure one below, as in typical examples of the species.

A. F. KENYON.

---

<sup>1</sup> It was agreed at the meeting that this variety was inseparable from the *Voluta Kenyoniana*, Brazier. This costate variety should therefore stand under the name *V. papillosa*, var. *Kenyoniana*. Mrs. Kenyon had proposed a varietal name, which now becomes unnecessary.—ED.



DESCRIPTIONS OF NEW SPECIES OF *DRYMÆUS*, *AMPHICYCLOTUS*,  
AND *NEOCYCLOTUS*, FROM SOUTH AND CENTRAL AMERICA.

By S. I. DA COSTA.

Read 10th November, 1905.

PLATE I.

*DRYMÆUS SYKESI*, n.sp. Pl. I, Fig. 1.

Testa elongato-fusiformis, ampliter umbilicata, solidula, albida, strigis fasciisque fusco-nigricantibus, conspicue fenestrata; spira acuminata; anfractus 7, leviter convexi, ultimus  $\frac{1}{2}$  longitudinis æquans, sub lente minutissime transversim striatus; sutura impressa; apertura oblonga, verticalis, intus albida; peristoma album, late expansum et reflexum, marginibus callo purpureo junctis, columellari valde dilatato, fornicato. Long. 52, diam. 19 mm.; apertura 24 longa, 13 lata.

*Hab.*—Bogotá.

This shell, described from a single specimen, resembles a gigantic *D. cognatus*, Pilsbry, but differs from that species in many other respects than mere size, notably in being much thicker, and from its heavy flaring lip. I have taken the liberty of naming this species after my esteemed friend Mr. E. R. Sykes, the President of the Malacological Society.

*DRYMÆUS NOTABILIS*, n.sp. Pl. I, Fig. 2.

Testa oblongo-ovata, tenuiuscula, compresse anguste umbilicata; pallide fulvida, purpureo-fusco irregulariter strigata, et fasciis tribus fuscis, interruptis ornata; spira attenuata, ad apicem acutiuscula; anfractus 6, parum convexi, oblique creberrime plicato-striati, sub lente transversim minute decussati, ultimus  $\frac{2}{3}$  longitudinis testæ æquans; columella recta, violacea; apertura ampla, ovali-oblonga, intus rufo-violacea; peristoma album, tenue, late expansum, margine columellari breviter reflexo et appresso. Long. 33, diam. 17 mm.; apertura 17 longa, 10 lata.

*Hab.*—Antioquia, Colombia.

As in other species from this region, a wide range of variability is noticeable. The distinction in this shell from others in the *D. felix* group lies in its more ventricose outline, its very narrow perforation, and especially in the large ovate aperture.

*DRYMÆUS NOTATUS*, n.sp. Pl. I, Fig. 3.

Testa elongato-fusiformis, profunde rimata, solidula, nitida, irregulariter oblique subplicata, flavescens, strigis numerosis flexuosis castaneis ornata, zona interrupta macularum subnigrarum notata; spira pyramidata; anfractus 6, parum convexi, ultimus bizonatus

spiram æquans, infra rimam striga nigricante cinctus; sutura impressa; apertura verticalis, oblongo-ovalis, violacea; columella recta, subplicata; peristoma valde expansum, album, marginibus approximatis. Long. 34·5, diam. 16 mm.; apertura 17 longa, 11 lata.

*Hab.*—Antioquia, Colombia.

This shell resembles somewhat *D. cognatus*, Pilsbry. It is, however, much thicker and has a more slender form. The umbilicus is deep in each, but *D. cognatus* lacks the black streak behind the rimation.

#### DRYMÆUS ACUMINATUS, n.sp. Pl. I, Fig. 4.

Testa acuminato-fusiformis, subumbilicata, solidula, alba, distanter purpureo-fusco, longitudinaliter strigata; spira acuminata; anfractus  $7\frac{1}{2}$ , modice convexi, ultimus  $\frac{2}{3}$  longitudinis testæ æquans, oblique fortiter striatus, sub lente transversim minutissime striatus; sutura impressa; apertura oblonga, subflexuosa, intus albida; columella recta, violacea; peristoma subexpansum, et antice effusum, margine dextro arcuato, supra paulo sinuato, columellari subincrassato, breviter reflexo, appresso. Long. 33, diam. 14 mm.; apertura 14 longa, 5 lata.

*Hab.*—Matto Grosso, Brazil.

A rather peculiar shell, unlike any known to the writer, who obtained it at the dispersal of the collection of the late Mr. Miers, with other Brazilian shells.

#### DRYMÆUS BELLUS, n.sp. Pl. I, Fig. 5.

Testa fusiformi-ovata, anguste umbilicata, tenuicula, nitida, alba, strigis paucis obscure fuscis ornata, ad apicem rosacea; anfractus 6, leviter convexi, læves, vel sub lente minute spiraliter striati, ultimus  $\frac{2}{3}$  longitudinis totius æquans; sutura impressa; apertura ampla, ovata, oblique dilatata; columella reflexa, appressa; peristoma album, effusum et expansum, intus vivide violaceo-purpureum. Long. 33, diam. 16 mm.; apertura 18 longa, 12 lata.

*Hab.*—San Martin, Colombia.

This species has many of the characters of the typical form of *D. felix*. In the shape, size, and colour of the aperture it resembles *D. confluens*, Pfr., and *D. violaceus*, Mouss., but lacks the nodule at the base of the columella, which is present in those shells.

#### DRYMÆUS PSEUDO-FUSOIDES, n.sp. Pl. I, Fig. 6.

Testa elongato-oblonga, subperforata, tenuis, subpellucida, lævis, nitida, albida, ad apicem rosea, strigis cærulescenti-fuscis, angustis undatis longitudinaliter ornata; anfractus 6, convexi, ad suturam minute subcrenulati, et anguste marginati; apertura oblonga, albida; labrum tenue, album, leviter expansum; columella subrecta, superne reflexa. Long. 33·5, diam. 12 mm.; apertura 15 longa, 7 lata.

*Hab.*—Bogotá, Colombia.

Only one example of this form of the group *D. fusoides* was obtained, but there is a shell in the British Museum similar in character labelled *B. fusoides*, var. In the opinion of the writer it is specifically quite distinct.

*DRYMÆUS ANGUSTUS*, n.sp. Pl. I, Figs. 7, 8.

Testa elongato-oblonga, perforata, tenuiuscula, lævis, nitida, albida; strigis cærulescenti-fuscis, angustis, longitudinaliter undulatis, ornata, macularum seriebus duabus cincta; anfractus  $6\frac{1}{2}$ , convexiusculi, ultimus spira paulo brevior; sutura marginata; apertura oblonga, basi effusa, intus purpurea; columella subplicata, oblique recedens; peristoma simplex, late expansum, marginibus callo tenui purpureo junctis. Long. 31.5, diam. 10; apertura 14 longa, 6.5 lata.

*Hab.*—Bogotá.

The nearest ally of this form is *D. fusoides*, Orb., a much thinner and broader shell. This unique specimen is not in very fresh condition, the marking being somewhat indistinct. It is incorrect to state that *D. fusoides* is peculiar to Bolivia, the writer having specimens from both Ecuador and Colombia.

*DRYMÆUS PRESTONI*, n.sp. Pl. I, Figs. 9, 10.

Testa elongato-ovata, perforata, tenuiuscula, nitida, albida, strigis nigro-castaneis longitudinaliter picta, anfractus  $6\frac{1}{2}$ , convexiusculi, irregulariter striati, ultimus  $\frac{2}{3}$  testæ æquans; sutura marginata; apertura ovalis, peristoma crassiusculum, vix expansiusculum, roseum; columella breviter dilatata, rosea. Long. 21, diam. 10 mm.; apertura 10 longa, 6 lata.

Var. CANCELATA. Fig. 10.

Testa similis, sed brevior, zonis tribus cinctus.

*Hab.*—Chiriqui, Panama.

This species bears a strong resemblance to *D. irazuensis*, Angas, and is represented by several examples hitherto unnamed in the British Museum. I have much pleasure in naming this pretty shell after my friend Mr. H. B. Preston.

*AMPHICYCLOTUS CHANCHAPOYASENSIS*, n.sp. Pl. I, Figs. 11–13.

Testa ampliter umbilicata, orbiculari-depressa, epidermide decidua ustulato-castanea induta; spira conico-depressa; anfractus  $4\frac{1}{2}$ , undique spiraliter lirati, ultimus lineis incrementi fortiter striatus, ad peripheriam saturate fusco fasciatus; apertura circularis; peristoma simplex; operculum corneum, arctispirale. Diam. maj. 27, min. 21 mm.; alt. 17 mm.

*Hab.*—Chanchapoyas, Peru.

This species somewhat resembles *A. Guayaquilensis*, Sow., from Ecuador, in its spiral sculpture; it is, however, a larger shell. Among several specimens received one example shows a variation in respect of altitude, being much more depressed, all the other features being the same as the type. This would appear to be the only species of the genus hitherto discovered in Peru.

*NEOCYCLOTUS DEPRESSUS*, n.sp. Pl. I, Figs. 14–16.

Testa aperte umbilicata, plane depressa, subdiscoidea, fulvescenti-olivacea, supra peripheriam pallida, ad peripheriam linea fusca cincta;

anfractus 4, ad suturam impressi, oblique filoso-striati; apertura sub-circularis; labrum subexpansum; operculum testaceum, arctispirale. Diam. maj. 27·5, min. 19·5 mm.; alt. 13 mm.

*Hab.*—Peru.

A very depressed species. Two others only are recorded from Peru, viz. *N. Bartletti*, Pfr., and *connivens*, H. Adams, both quite small shells.

#### EXPLANATION OF PLATE I.

- FIG. 1. *Drymæus Sykesi*, n.sp.  
 ,, 2. ,, *notabilis*, n.sp.  
 ,, 3. ,, *notatus*, n.sp.  
 ,, 4. ,, *acuminatus*, n.sp.  
 ,, 5. ,, *bellus*, n.sp.  
 ,, 6. ,, *pseudo-fusoides*, n.sp.  
 FIGS. 7, 8. ,, *angustus*, n.sp.  
 FIG. 9. ,, *Prestoni*, n.sp.  
 ,, 10. ,, var. *cancellata*.  
 FIGS. 11-13. *Amphicyclotus Chanchapoyasensis*, n.sp.  
 ,, 14-16. *Neocyclotus depressus*, n.sp.
-



1.



2.



3.



4.



5.



6.



7.



8.



9.



10.



11.



12.



14.



15.



13.

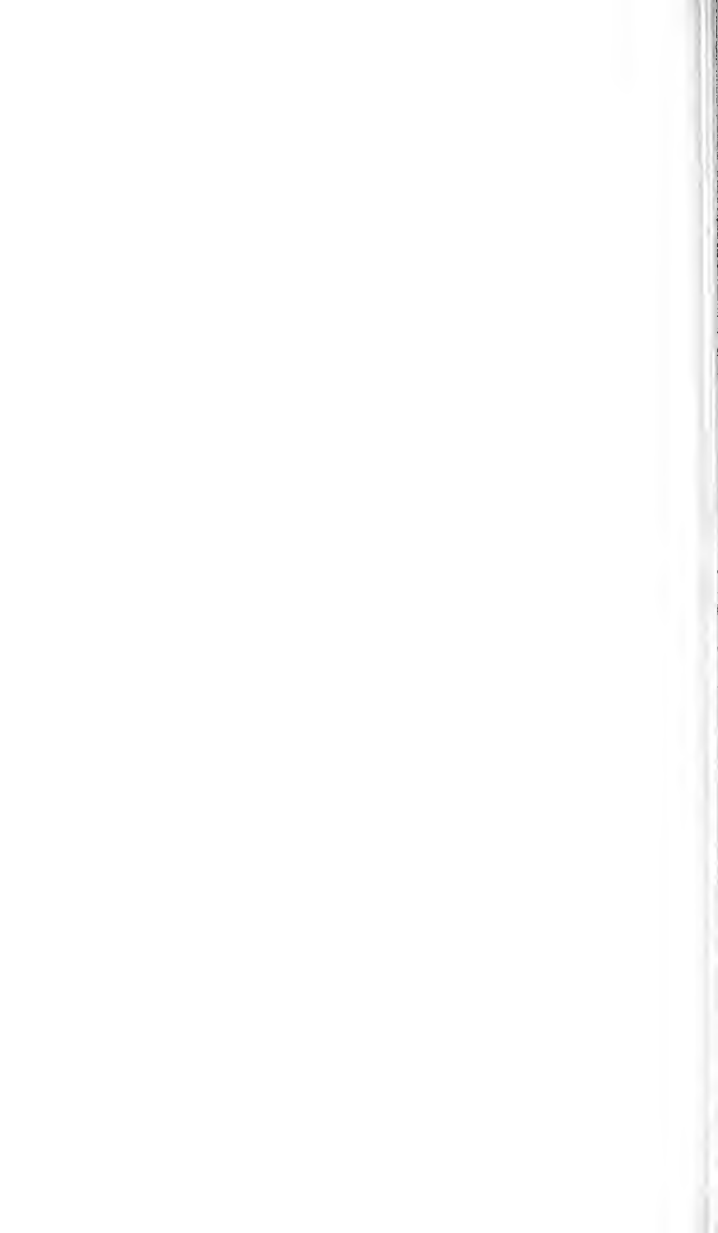


16.

A.H. Searle del. et lith.

Huth, imp.

NEW LAND SHELLS FROM CENTRAL AND SOUTH AMERICA.



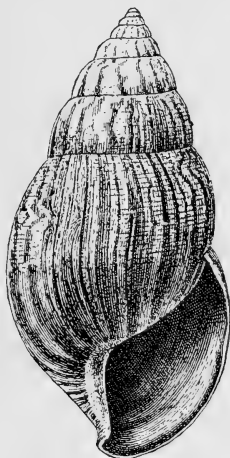
DESCRIPTION OF A NEW SPECIES OF *ACHATINA*  
FROM MASHONALAND.

By S. I. DA COSTA.

Read 10th November, 1905.

*ACHATINA JACOBI*, n.sp.

Testa ovato-subfusiformis, ventricosa, imperforata, tenuis; anfractus 8, longitudinaliter rugoso-striati, priores sub lente minutissime granulati, ultimus lineis impressis paucis reticulatus, stramineus, strigis castaneo-brunneis fulguratis, spiram paulo superans; apex obtusus; sutura subcrenulata; columella recta, leviter torta, oblique truncata; apertura parum obliqua, angulate-ovalis, intus plumbea;



peristoma simplex, acutum, marginibus callo tenui junctis, dextro nigrescenti-marginato. Long. 109, diam. 54 mm.; apertura 56 longa, 26 lata.

*Hab.*—Rusape, Mashonaland.

This would appear to be a common species from the large number of specimens received in all stages of growth. Young examples apparently resemble *A. Studleyi*, Melv. & Pons., figured in the Proceedings of this Society, Vol. II, p. 291. Whether the adults exhibit similar affinities or not, they can hardly be specifically the same, seeing the enormous distance which separates the habitations of the two, viz. Mashonaland and Old Calabar.

ON SOME LAND AND FRESH-WATER MOLLUSCA FROM SUMATRA.  
PART I.

By the Rev. R. ASHINGTON BULLEN, B.A., F.L.S., F.G.S.

Read 10th November, 1905.

PLATE II.

THE shells recorded in this communication have been collected during the Spring and Summer months of 1905 in various localities in mid-Sumatra, and reached me during July and August. A further series will arrive later and be dealt with in a future paper.

The sequence followed in this paper is that adopted by Dr. E. von Martens in Max Weber's "Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien," Band ii (1892), pp. 209-264, and Band iv, Heft 1 (1897), pp. 1-331.

CYCLOPHORUS (CROSSOPOMA) PLANORBULUM, Lamarck.

*Hab.*—Mount Sago.

CYCLOPHORUS (AMPLUS) EXIMIUS, Mousson.

*Hab.*—Mount Sago.  
Dark variety.

Var. ROUYERI, n.var. Pl. II, Figs. 1, 2.

Testa subdepressa turbinata, permodice umbilicata, subsolida, superne spiraliter multum subelevate striata, ad peripheriam subcarinata, infra striis etiam multis spiralibus paullum elevatis, sculpta; periostracum ornamento et subfusco et castaneo stictum, infra fuscatum; anfractus 5, tres priores convexi, apicem satis prominentem formantes, duo sequentes subconvexi; sutura leviter impressa; apertura cæruleo-albida, rotundata, oblique descendens; peristoma angustum, subcrassum, expansum, vix reflexum, cæruleo-albidum, margine columellari late expanso et reflexo, umbilicum plus minus obtegente; operculum corneum, multi-spirale. Diam. max. 50, min. 41 mm.; alt. 40.5 mm.

*Hab.*—Mount Singalong.

These specimens are somewhat like, but smaller than, typical *C. eximius*, the shell being more closely whorled, the columella being regularly widened so as almost to cover the umbilicus; the body-whorl is also more rotund and the spiral ridges are more rounded, and there are more of them on the under-surface of the body-whorl. In one specimen of *C. eximius* from Mount Sago there is a widening of the columella, but it is not symmetrical as in the form under discussion, and is more in the nature of an abnormality than a regular widening. The new shell differs in many essentials from *C. validus*, Sow., and its varieties from the Philippines, and *C. appendiculatus*, Pfr. The above description is put forward as provisional. M. Henri Rouyer has



advised Mr. H. C. Fulton that this shell was being described as *C. eximius*, var. *Ouwensi*, Koll., in Batavia, but the record has not yet come to hand, and as M. Rouyer sent it to me as a species to be identified in July, 1905, I describe it with the above reservation.

CYCLOPHORUS (SALPINGOPHORUS) PLICIFERUS, Martens.

*Hab.*—Mount Singalong.

A very dark specimen, the body-whorl being very much malleated on the upper surface.

MEGALOSTOMA (COPTOCHEILUS) SUMATRANUM, Dohrn.

*Hab.*—Mount Bongson.

PUPINA (EUPUPINA) SUPERBA, Pfeiffer.

*Hab.*—Mount Bongson.

Stunted specimens.

XESTA CORNICEN, n.sp. Pl. II, Figs. 3, 4.

Testa anguste perforata, tenuis, subpellucida, flavide cornea, lineis incrementi tenuibus striisque spiralibus obsoletis sculpta; spira brevis, ad apicem paulum elata; anfractus  $4\frac{1}{2}$ , tres superiores convexiusculi, ultimus ad peripheriam rotunde angulatus, supra angulum et ad suturam canaliculatus; apertura angulatim late lunata; peristoma tenue, margine columellari supra umbilicum breviter reflexo. Diam. max. 23, min. 17.5 mm.; alt. 12 mm.

*Hab.*—Mount Talang.

This specimen is not unlike *X. glutinosa*, Metcalfe, but it trumpets much more, and is a more fragile shell.

TROCHOMORPHA DOHERTYI, Aldrich.

*Hab.*—Mount Sago.

Not in Von Martens' lists.

EULOTA (PLECTOTROPIS) SUMATRANA, Martens.

*Hab.*—Mount Bongson.

STENOGYRA HASTATA, Boettg.

*Hab.*—Mount Merapi.

Not in Von Martens' lists. It is a Javanese species also.

SUBULINA OCTONA (Chemnitz).

*Hab.*—Pajakombo. From banana plantations.

These specimens, like some received from Java, seem to contain ova.

CLAUSILIA (PHÆDUSA) SUMATRANA, Martens, var. VICARIA, Sykes.

*Hab.*—Mount Sago.

CLAUSILIA CORTICINA, Von dem Busch.

*Hab.*—Pajakombo.

More rugose than type.

## LIMNÆA BREVISPIRA, Martens.

*Hab.*—Mount Bongson.

The sender describes these specimens as “de la petite marre.” But the latter word is not in Contanseau’s French Dictionary: ‘marais’ would be understandable; ‘marre’ is perhaps a local French variant.

## LIMNÆA EXCAVATA, MOUSSON.

*Hab.*—Mount Sago.

## LIMNÆA BONGSONENSIS, n.sp. Pl. II, Figs. 5, 6.

Testa producte ovata, tenuis, fusco-cornea; anfractus 4, convexi, lineis incrementi striati; anfractus ultimus elongatus, tumidus, ad suturam non impressus, notis transversis pellucidis pallide corneis pictus; spira brevis, erosa; apertura subpyriformis; columella tortuosa, fusco-castanea, intus nitida, fusco-cornea; labium super regionem columellarem late appressum; peristoma simplex. Long. 21, lat. 12 mm.

*Hab.*—Mount Bongson.

## ISIDORA SUMATRANA (Martens).

*Hab.*—River at Souliki.

Exterior much stained by impure water of habitat. Dr. E. von Martens<sup>1</sup> described this species as having seven whorls, but three specimens (figs. 27–29) are figured with six only. These latter agree with mine, which have a similar number.

## PLANORBIS PROCLIVIS, Martens.

*Hab.*—Mount Singalong.

## AMPULLARIA SUMATRENSIS, Phil.

*Hab.*—From the rice-fields, Pajakombo.

## VIVIPARA SUMATRENSIS, Dkr.

*Hab.*—Pajakombo, and river at Piladang.  
Dark variety.

## MELANIA INDRAGIRICA, Martens.

*Hab.*—River Indragiri, and a variety from the River Kwantan, an affluent of the Indragiri.

## MELANIA (PLOTIA) SCABRA, Müller.

*Hab.*—Brook at Piladang.

## MELANIA (PLOTIA) DATURA, Dohrn.

*Hab.*—Brook at Pajakombo.

## MELANIA DISTINGUENDA, Brot.

*Hab.*—River of Pajakombo.

<sup>1</sup> Zool. Ergeb., Band iv, Heft 1, p. 8, pl. i, figs. 26–29.

## MELANIA PAGODA, Lea.

Var. COSTULATA, Schepman.

*Hab.*—River of Pajakombo.

## MELANIA SAVINIEREI, var., Morlet.

*Melania Savinierei* (Brot MS.), Morlet: J. de Conch., 1884, p. 330, pl. vii, fig. 2.*Hab.*—River of Pajakombo.

## MELANIA CURVICOSTA, Martens.

*Hab.*—River of Mount Merapi.

## Var. PRESTONIANA, n.var. Pl. II, Fig. 8.

Testa typo similis sed minor, lævigata; costæ longitudinales, obsoletæ, striæ et lineæ incrementi plus minus deletæ; color fuscus; anfr. ? , superiores abrupti; reliqui 3-4 convexiusculi; anfractus distalis clausus. Long. ad 25.5, diam. max. 11 mm.

*Hab.*—Mount Merapi.

Smaller than type, ribs obsolete, spire truncated, and distal whorl sealed.

## MELANIA JAVANICA, Von dem Busch, var.

*Hab.*—River Kwantan, affluent of the Indragiri.

## MELANIA LIRATA, Benson.

*Hab.*—River of Mount Bongson.

## MELANIA SUBPLICATA, Schepman.

*Hab.*—River at Souliki.

## MELANIA UNIFASCIATA, MOUSSON.

*Hab.*—River at Souliki.

## MELANIA SYKESI, n.sp. Pl. II, Fig. 7.

Testa pyrgiformis, epidermide fusco-olivacea induta, longitudinaliter costata, costis nodosis ad apicem; sutura impressa; anfractus 9 convexi, ultimus liris quatuor spiralibus basi cinctus; peristoma tenue, aliquantum incrassatum ad columellam non-productam; apertura elongate elliptico-rhomboidalis, simplex, intus pallide-olivacea, pellucida. Long. 21, diam. max. 6 mm.

*Hab.*—Piladong and the Souliki Range.

## UNIO SUMATRENSIS, Lea.

*Hab.*—Rivers Indragiri and Kwantan.

## UNIO PAJAKOMBOENSIS, n.sp. Pl. II, Figs. 9-11.

Testa solida, ovata, tumida, inæquilateralis, antice et postice leviter hians, nitida, flavido-fusco-viridis; valvæ postice decliviter subrotundatæ, concentricè substriatæ; umbones propinqui, erosi; dens anterior cardinis valvæ dextræ longus, erectus, declivis, fere lævis,

interdum cum dente parvo auxiliari parallelo juxta marginem externam sito; dens posterior elongatus, duobus paribus dentes duo posteriores valvæ sinistrae æque elongati; dens anticus interiore pæne obsoletus; cicatrix antica alta, postica minime profunda; ligamentum prominens. Long. 77, alt. 51·5, diam. 37 mm.

*Hab.*—River at Pajakombo.

CORBICULA MOUSSONI, Desh.

*Hab.*—River Kwantan, affluent of the Indragiri, and the Souliki Range.

One *Corbicula* from the River Kwantan is not included in this paper, as its affinities are not at present quite clear.

My best thanks are due to Mr. E. A. Smith for access to the specimens and literature in the British Museum, and to Mr. E. R. Sykes for the loan of a specimen of *Cyclophorus pliciferus* and for useful information.

EXPLANATION OF PLATE II.

- FIGS. 1, 2. *Cyclophorus (Amplus) eximius*, var. *Rouyeri*, n.var.  
 ,, 3, 4. *Xesta cornicen*, n.sp.  
 ,, 5, 6. *Limnæa Bongsonensis*, n.sp.  
 FIG. 7. *Melania Sykesi*, n.sp.  
 ,, 8. *Melania curvicosta*, var. *Prestoniana*, n.var.  
 ,, 9. *Unio Pajakomboensis*, n.sp.  
 ,, 10. Hinge of right valve.  
 ,, 11. Hinge of left valve.



1.

2.



3.



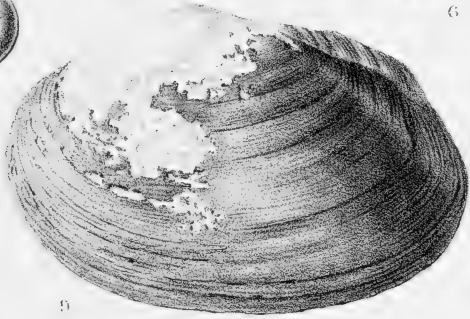
4.



5.



6.



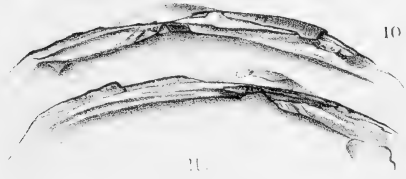
9.



7.



8.



10.

11.

J. Graen del. et lith.

LAND & FRESHWATER SHELLS FROM SUMATRA.



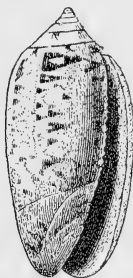
DESCRIPTION OF A NEW SPECIES OF *OLIVA*.

By F. G. BRIDGMAN.

Read 10th November, 1905.

*OLIVA SMITHI*, n.sp.

Shell ovately cylindrical, with a short acuminate spire; whitish, with a reticulation of zigzag lines, some being light brown, others very dark rich brown, interrupted here and there by longitudinal greyish-blue streaks, especially towards the labrum; whorls 7-8, the 3 to 4 apical ones constituting the protoconch, corneous, and somewhat convex, the rest flatly sloping or even faintly concave, more or less blotched with dark brown above, and divided by a deeply channelled suture; the last whorl with curved outlines and with the basal fasciole more or less lineated or blotched with brown; aperture somewhat narrow, dark purplish within, but white at the labrum; columellar side with about fifteen to eighteen transverse plicæ or liræ



upon a defined white callus, which at the anterior end is reflexed over the whorl as in other species of the genus. Length 22, diam. 10 mm.

*Hab.*—Unknown.

Here and there the reticulate markings are interrupted by longitudinal greyish streaks as if indicating periods of arrested growth. The above are the dimensions of the largest specimen seen. Another example equally adult is 18.5 mm. in length and 8.5 mm. wide.

The two specimens which are now in the British Museum, and which may be considered typical, have been in my possession some months, and were thought by me to be *Oliva 'stellata,'* Duclos, until four more specimens were sent me by Mr. Tomlin, of Chester. I then showed them to Mr. Smith, who after carefully comparing them with the figure and description of *O. stellata* given by Duclos in Chenu's work, came to the conclusion, with which I quite agree, that this shell is not Duclos' *O. stellata*, but a new species.

As I am indebted to Mr. Smith for first determining and then for very greatly assisting me in describing it, I have given it the most appropriate name of *Smithi*.

ON THE ANATOMY OF *ENSIS MACHA*, *SOLEN FONESII*,  
AND *S. VIRIDIS*.

By H. H. BLOOMER.

Read 10th November, 1905.

By the kindness of Professor E. Ray Lankester, F.R.S., Director of the British Museum, and Mr. Edgar A. Smith, I.S.O., I have been enabled to examine the following species:—

1. *ENSIS MACHA*, Molina.

*E. macha* resembles *E. ensis*, but is more massively built. It is comparatively shorter, broader, and deeper. The edge of the posterior end of the proximal portion of the siphon is quite straight, while in *E. ensis* it curves a little anteriorly at the centre. The fourth aperture is longer, and situated nearly in the centre of the ventral surface; in *E. ensis* it is more posterior.

The muscular flaps enclosing the pedal aperture are larger and curve more inwardly than in *E. ensis*.

The anterior adductor muscle is not so broad, but has a greater increase in depth towards the posterior end. The distance from the posterior adductor muscle to the end of the proximal portion of the siphon is not so great as in *E. ensis*. In the free portions of the siphon (which are longer than in *E. ensis*) the walls of the two chambers are constricted for some distance. The tentacles bordering the siphonal apertures are not nearly so numerous as in *E. ensis*.

Internally, though the alimentary canal resembles that of *E. ensis*, the fore-part of the stomach is different. The central cavity is situated more anteriorly, the pyloric division is larger, and the œsophageal and the cardiac divisions are smaller. The muscular ridge separating the two last-mentioned divisions, and which appears as a continuation of the muscular papilla, is much more pronounced, while the œsophageal division projects more anteriorly.

2. *SOLEN FONESII*, Dunker.

*Solen Fonesii* resembles *S. vagina*. The following are the points of difference:—

The animal is proportionately shorter and deeper, the length being only four and a half times the depth. The anterior edge of each mantle-lobe is straight, not curved as in *S. vagina*, and runs a little antero-ventrally. The muscular flaps of the pedal aperture are broader and are capable of entirely closing it. Their exterior surface is coloured a brownish black in the specimen examined; a part of the free portion of the siphon has been broken off, but what remains shows the transverse ribbing to be finer and closer, and to be coloured the same as the muscular flaps of the pedal aperture. A narrow band of



this pigment traverses the ventral edge of the mantle-lobes, and a still narrower one passes from the siphon along the greater portion of the dorsal integument.

The anterior adductor muscle is relatively longer and deeper, but not nearly so broad as in *S. vagina*, thus making the anterior part of the animal considerably shorter.

### 3. *SOLEN VIRIDIS*, Say.

*S. viridis* also resembles *S. vagina*, differing from it in being comparatively deeper and more attenuated at the posterior end. The pedal aperture has a greater curve and extends a little more posteriorly on the ventral surface. The centre of the posterior part of the proximal portion of the siphon curves a little anteriorly, and around the posterior edge of it is a narrow brownish-black band.

A REVISION OF THE SPECIES OF CYCLOSTREMATIDÆ AND  
LIOTIIDÆ OCCURRING IN THE PERSIAN GULF AND NORTH  
ARABIAN SEA.

By J. COSMO MELVILL, M.A., F.L.S.

Read 8th December, 1905.

PLATE III.

MORE than four years have now elapsed since a catalogue of those species of *Liotia* and *Cyclostrema* then known to occur in the Persian Gulf and contiguous seas was published,<sup>1</sup> and already the number has been nearly doubled. No apology, therefore, seems necessary for again approaching the subject and offering a revision to date. This additional material has been entirely received from Mr. Frederick W. Townsend, whose indefatigable powers of research, both as regards Mollusca and other branches of zoology as well, e.g. ichthyology, have already in their results eclipsed the efforts of previous investigators in this region. As regards this particular instance, the majority of the species now added, three of which are differentiated as new, came from shell-sand dredged in the Gulf of Oman at a considerable depth, a memorable haul indeed, having already brought to light about one hundred species hitherto unknown to science.

It has been a matter of some surprise that no typical species of *Teinostoma*, A. Ad., has yet occurred. It will be noted the name *Vitrinella*, C. B. Ad., will be in this paper employed subgenerically, and after much deliberation I believe this the correct course to take. Instituted in the year 1850 by Professor C. B. Adams for a series of small, widely umbilicated, often hyaline, mostly smooth, spiral shells from California and other West American shores, *Vitrinella* was much added to by Dr. Philip Carpenter in his Mazatlan Catalogue, and subsequently by Mr. Andrew Garrett in dealing with species from the Pacific Isles.<sup>2</sup> At the best, however, it ranks as an obscure genus, and consists, we believe, in greater part, of an 'olla podrida,' from which several *Cyclostremata* and *Adeorbis* might be extracted. But few are figured, and many have as their types unique dead dredged examples, confessedly imperfect, not easy of access, and therefore, from a scientific point of view, comparatively worthless.

It may not be generally known that the celebrated author of "Peter Simple," "Midshipman Easy," etc., Captain F. Marryat, C.B., F.R.S., was the founder of the genus *Cyclostrema* in the year 1818, his type being the rare *C. cancellatum*,<sup>3</sup> Marryat, from the Philippines.

<sup>1</sup> Proc. Zool. Soc., vol. ii (1901), pp. 345-347.

<sup>2</sup> Proc. Acad. Nat. Sci. Philadelphia, 1873, p. 213, pl. xxi, figs. 13-17.

<sup>3</sup> Captain Marryat considered the genus feminine, his type being given as *C. cancellata*, but if derived from κύκλος and τρήμα, as is probable, it must be of the neuter gender.

In conclusion, I would tender my best acknowledgements to Mr. R. Bullen Newton, F.G.S., for information as to fossil species of the families under discussion; likewise to Mr. Edgar A. Smith, I.S.O., and Mr. Ernest R. Sykes, F.L.S.

### Family CYCLOSTREMATIDÆ.

#### Genus CYCLOSTREMA, Marryat.<sup>1</sup>

##### 1. CYCLOSTREMA ANNELLARIUM, Melvill & Standen.

*Cyclostrema annellarium*, Melvill & Standen: Ann. & Mag. Nat. Hist., vol. xii (1903), p. 292.

*Hab.*—Gulf of Oman, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

Distinguishable by its rounded longitudinal riblets, twenty-four in number on the last whorl, the interstitial surface being microscopically spirally striate.

##### 2. CYCLOSTREMA CARINATUM, H. Adams.

*Cyclostrema carinatum*, H. Adams: Proc. Zool. Soc., 1873, p. 207, pl. xxiii, fig. 8.

*Hab.*—Persian Gulf, lat.  $26^{\circ} 44' N.$ , long.  $52^{\circ} 30' E.$ , on telegraph-cable, 40 fathoms, sand and mud; also Gulf of Oman, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

A solid though small species, many spirally ribbed, with smooth interstices, the ribs being incrassate. Mouth on slightly oblique plane. Not very abundant.

##### 3. CYCLOSTREMA CINGULATUM, Dunker.

*Cyclostrema cingulatum*, Dkr.: Malak. Blätt., vol. vi, p. 225.

„ *Dunkeri*, Tryon: Man. Conch., vol. x, p. 91.

*Hab.*—Persian Gulf; Gulf of Oman, lat.  $26^{\circ} 23' N.$ , long.  $54^{\circ} 55' E.$ , 25 fathoms, sand; also Bombay (Abercrombie, 1892).

A somewhat obscure species, thrice strongly carinate on the periphery, below the suture, and around the umbilicus. Shell shining, white. The name *cingulatum* has been several times employed in this genus. It is a question whether Dunker or Philippi in this have priority.

##### 4. CYCLOSTREMA CINGULIFERUM, A. Adams.

*Cyclostrema cinguliferum*, A. Adams: Proc. Zool. Soc., 1850, p. 43.

*Hab.*—Karachi.

A species with six acute ribs on the last whorl, white, deeply umbilicate, discoidally depressed. Not common.

##### 5. CYCLOSTREMA EBURNEUM, Nevill.

*Cyclostrema eburneum*, G. & H. Nevill: Journ. Asiat. Soc. Bengal, vol. xliv, pt. 2, p. 101, pl. viii, figs. 21, 22.

*Hab.*—Persian Gulf: Bushire, Reshire, Kishm Island. Mekran Coast: Charber, 7 fathoms, sand and mud.

<sup>1</sup> Trans. Linn. Soc., vol. xii (1818), p. 338.

The thickly keeled periphery, narrow umbilicus, and spirally striated interstices, with sculptured base, distinguish this handsome species, which is large for the genus.

Nearly allied to, if not absolutely identical with, the original type of the genus *C. cancellatum*, Marryat, which, however, is an Antillean species.

#### 6. *CYCLOSTREMA EXIGUUM*, Philippi.

*Cyclostrema exiguum*, Philippi: Zeits. für Malak., 1849, p. 25.

*Hab.*—Gulf of Oman, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

One specimen, without much doubt referable to this species, the type having been described from Aden. It is, though small, an elegant form, the body-whorl being ornamented with four keels, which are crossed by close longitudinal riblets, giving a gemmulate appearance.

#### 7. *CYCLOSTREMA GYALUM*, Melvill.

*Cyclostrema gyalum*, Melvill: Proc. Malac. Soc., vol. vi, p. 54, pl. v, fig. 22.

*Hab.*—Gulf of Oman, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

Very small, but most conspicuous for the thrice-keeled body-whorl, the keels large proportionately and very acute, the umbilicus being particularly profound.

#### 8. *CYCLOSTREMA HENJAMENSE*, Melvill & Standen.

*Cyclostrema Henjamense*, Melvill & Standen: Ann. & Mag. Nat. Hist., vol. xii (1903), p. 291, pl. xx, fig. 3.

*Hab.*—Persian Gulf, Henjam Island, 10 fathoms, amongst coarse sand and broken shells.

This species is on the borderland between the genus in which it is placed and *Liotia*; the body-whorl is noticeable for its seven carinæ, closely radiately intersected by slanting riblets, beaded at the points of junction.

#### 9. *CYCLOSTREMA MICANS*, A. Adams.

*Cyclostrema micans*, A. Ad.: Proc. Zool. Soc., 1850, p. 44.

„ *pulchella*, Dunker: Malak. Blätt., vol. vi (1860), p. 225.  
*Liotia pulchella*, Dunker.

*Hab.*—Karachi (F. W. T.); Bombay (A. Abercrombie).

On the borderland between *Liotia* and *Cyclostrema*, the body-whorl possessing three spiral beaded costulæ, the umbilical region being likewise much decorated with two or three other similar rows, the umbilicus itself being small. Near *C. anaglyptum*, A. Ad., or *C. ocrinum*, M. & S.

#### 10. *CYCLOSTREMA NOVEM-CARINATUM*, n.sp. Pl. III, Figs. 3, 3a.

*C. testa parva, profunde umbilicata, depresso-orbiculari, alba, parum nitida, anfractibus 5, quorum 2 apicales vitrei, minutissimi, cæteris ad suturas excavatis, antepenultimo et penultimo binis, ultimo anfractu novem carinis (interdum apud suturas duabus minoribus additis),*

præditis, superficie omni radiatim aretissime striata, apertura circulari, intus alba, peristomate paullum incrassato, fere continuo. Alt. 1.25, diam. 3 mm.

*Hab.*—Gulf of Oman, lat. 24° 58' N., long. 56° 54' E., 156 fathoms.

The whole surface of this little species, which is typically and most frequently furnished with nine spiral carinæ on the body-whorl (of which the sutural and inner umbilicar keels are but weakly developed), is minutely radiately, very closely striate, giving it a shagreened and silky appearance.

Though not quite so abundant as *C. 5-carinatum*, it occurs very frequently in the above dredging, but I have not yet noticed it from other localities.

#### 11. CYCLOSTREMA OCRINIUM, Melvill & Standen.

*Cyclostrema ocrinium*, Melvill & Standen: Proc. Zool. Soc., vol. ii (1901), p. 346, pl. xxii, fig. 1.

*Hab.*—Persian Gulf, lat. 25° 44' N., long. 52° 30' E.; likewise on the telegraph cable at 40 fathoms, mud and sand.

I copy the remarks written by myself at the time of description: "This exquisite and very delicate *Cyclostrema* is slightly comparable with *C. anaglyptum*, A. Ad., from Japan, but is smaller, not so conical, and destitute of spiral ribs. The longitudinal riblets are very close and fine, say, 26 in number on the basal whorl, five-angled, that surrounding the umbilicus at the base being the strongest and most conspicuous. Regular rows of shining gemmæ on the costulæ at the point of the angular projections take the place of spiral liræ; the interstices are plain, vitreous, white; mouth circular, peristome continuous, outer lip crenulate; columellar margin not reflexed over the umbilicus, which is deep and conspicuous."

#### 12. CYCLOSTREMA PROMINULUM, Melvill & Standen.

*Cyclostrema prominulum*, Melvill & Standen: Ann. & Mag. Nat. Hist., vol. xii (1903), p. 292, pl. xx, fig. 6.

*Hab.*—Gulf of Oman, lat. 24° 58' N., long. 56° 54' E., 156 fathoms.

One of the rarer species, of which but two or three specimens have occurred. It is conspicuous for being unusually strongly carinate at the periphery of the body-whorl, the rest of the surface being uniformly multilirate.

#### 13. CYCLOSTREMA QUADRI-CARINATUM, Melvill & Standen.

*Cyclostrema quadri-carinatum*, Melvill & Standen: Proc. Zool. Soc., vol. ii (1901), p. 346, pl. xxii, fig. 2.

*Hab.*—Gulf of Oman, lat. 24° 49' N., long. 55° 56' E., 225 fathoms, sand and mud.

This small shell, four-keeled only on the body-whorl, has not yet been found elsewhere. We have till lately confounded it with the next species now to be described, and to which it bears a superficial resemblance. The remarks made (Ann. & Mag. Nat. Hist., vol. xii, 1903, p. 293) as to the frequency of *C. quadri-carinatum* must therefore be erased.

14. *CYCLOSTREMA QUINQUE-CARINATUM*, n.sp. Pl. III, Figs. 1, 1a.

*C. testa parva, profunde umbilicata, depresso orbiculari, læviuscula, nitida, albo-lactea, vel, rarissime pallide apud carinas stramineo-tincta, anfractibus 5, quorum duo apicales, minuti, vitrei, cæteris spiraliter acuti-carinatis, carinis paullum excavatis, superficie interstitiali omnino lævissima, nitida, supernis unâ, ultimo anfractu quinque carinis prædito; quarum prima infra suturas secunda et tertia apud medium, quarta peripheriali, quinta circa umbilicum, interdum sed rarissime, sexta apud medium umbilicare (var. sex-carinatum), videnda, apertura rotunda, peristomate fere continuo, vix incrassato, simplice. Alt. 1, diam. 2.55 mm.*

*Hab.*—Gulf of Oman, lat. 24° 58' N., long. 56° 54' E., 156 fathoms.

Probably the commonest Gastropod in the above most prolific dredging. It is very uniform in size and sculpture, but occasionally possesses an additional keel or stray spiral lira on the umbilicar region (var. *6-carinatum*).

15. *CYCLOSTREMA SOLARIELLUM*, Melvill. Pl. III, Figs. 5, 5a.

*Cyclostrema solariellum*, Melvill: Mem. Manch. Soc., vol. vii (1893), p. 63, pl. i, fig. 20.

*Hab.*—Persian Gulf: Fao, Bushire. Gulf of Oman, lat. 26° 23' N., long. 54° 55' E., 25 fathoms, mud; with *C. cingulatum*, but much more frequent. Karachi, fine and large (F. W. T.); Bombay (Abercrombie). From the last place only worn examples, from one of which the type was described.

This is a puzzling species, having the aspect of a small *Torinia*. We take the opportunity of refiguring it in two positions, which will render it recognizable at a glance. Allied to *C. Marchei*, Jousseaume, Rev. Zool., 1872, p. 391, pl. xix, fig. 3, from the East Indies, differing in the umbilicar beading and other points.

16. *CYCLOSTREMA SUPREMUM*, Melvill & Standen.

*Cyclostrema supremum*, Melvill & Standen: Ann. & Mag. Nat. Hist., vol. xii (1903), p. 291, pl. xx, fig. 4.

*Hab.*—Persian Gulf, near Fao, and likewise off Bunder Abbas, 5 fathoms, mud bottom.

A very beautiful form, five-whorled, two being apical, the rest cancellated, channelled suturally, the body-whorl being thrice-keeled, with interstices of surface spirally finely striate, about twenty-eight small ribs in all being present. On the base and around the umbilicus the shell is nearly smooth.

Subgenus I: *VITRINELLA*, C. B. Adams.<sup>1</sup>17. *CYCLOSTREMA CHARMOPHRON*,<sup>2</sup> n.sp. Pl. III, Figs. 2, 2a.

*C. testa minutissima, late et profunde umbilicata, tenui, depresso-discoidali, albo hyalina, parum nitida, anfractibus 4, nequaquam angulatis, quorum 2 apicales, vitrei, læves, penultimo et ultimo apud*

<sup>1</sup> Monog. *Vitrinella*, 1850, pp. 1-10 (gen. propr.); Cat. Shells Panama, 1852, p. 184.

<sup>2</sup> χαρμόφρων, 'heart-delighting.'

suturas depressis, deinde ventricosulis, undique sub lente pulcherrime et arctissime cancellatis, cancellis perminutis, apertura rotunda, peristomate tenui. Alt. .75, diam. 1.5 mm.

*Hab.*—Gulf of Oman, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

A most recherché little species, four-whorled, the two last being somewhat roundly depressed suturally; the whorl surface, smooth to the naked eye, is really most delicately shagreened with microscopic cancellations. It is of decidedly rare occurrence.

18. *CYCLOSTREMA PLACENS* (Melvill & Standen). Pl. III, Figs. 6, 6a. *Adeorbis placens*, Melvill & Standen: Proc. Zool. Soc., vol. ii (1901), p. 373, pl. xxii, fig. 15.

*Hab.*—Gulf of Oman, lat.  $24^{\circ} 55' N.$ , long.  $57^{\circ} 35' E.$ , 205 fathoms; also lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

A minute, depressed, umbilicate glassy species, apparently quite smooth, but in the most frequent form, which we therefore take as typical, close microscopical concentric spiral lines occur on the upper portion of the whorls.

Var. *COMPLANATA*, Melvill & Standen (loc. cit., p. 373).

*Hab.*—Reshire, Persian Gulf.

Surface entirely smooth. This occurred but rarely, and may possibly constitute a distinct species. Till fresh material is found, however, it is the prudent course to place it here.

Subgenus II: *LYDIPHNIS*,<sup>1</sup> nov.

Testa profunde umbilicata, discoidalis, alba, tenuis, anfractus 4, quorum apicalis parvus, vitreus, cæteri undique concentricè tenuilirati, ultimus rectus, tribus carinis acutissimis præditus, quorum superior carina extra labrum projecta porrectionem triangularam præbet.

Type: *Cyclostrema euchilopteron*, M. & S.

19. *CYCLOSTREMA EUCHILOPTERON*, M. & St. Pl. III, Figs. 7, 7a.

*Cyclostrema euchilopteron*, Melvill & Standen: Ann. & Mag. Nat. Hist., vol. xii (1903), p. 292, pl. xx, fig. 7.

*Hab.*—Gulf of Oman, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

The squarely-built body-whorl, with three strong keels, most prominently ridged, acutely projecting, and terminating in a triangularly winged extension of the upper part of the outer lip, presents, I think, characters that merit subgeneric distinction. In all probability *C. Verreauxii*, Fischer,<sup>2</sup> from California, would come under the same category, subgenerically.

Subgenus III: *DELPHINOIDEA*, Brown.<sup>3</sup>

20. *CYCLOSTREMA EUMARES*, Melvill. Pl. III, Figs. 4, 4a.

*Cyclostrema eumares*, Melvill: Proc. Malac. Soc., vol. vi (1904), p. 158, pl. x, figs. 1, 1a.

<sup>1</sup> Gr. λυή, δίφω.

<sup>2</sup> Journ. de Conch., vol. vi (1857), p. 285, pl. x, fig. 13 (as *Adeorbis*).

<sup>3</sup> *Delphinoidea*, Brown, 1827: Illustr. Conch. Gt. Brit., pl. li. *Tubiola*, A. Ad.: Proc. Zool. Soc., 1864, p. 71, in parte.

*Hab.*—Gulf of Oman, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

A smooth, umbilicate, globular species, the umbilicar region being excavate, thrice spirally lirated, decussate and crenulate at the points of junction of the longitudinal liræ; beyond these spiral lirations the base is scratched with what may be lines of growth.

Allied to *C. Watsoni*, Tryon (Man. Conch., vol. x, p. 94, pl. xxxii, figs. 81, 82), which was described by Boog Watson as *sulcatum* (Exp. Challenger, vol. xv, pl. viii, fig. 11), but this name had been already appropriated by A. Adams.

#### 21. CYCLOSTREMA EUPOIETUM, Melvill.

*Cyclostrema eupoietum*, Melvill: Proc. Malac. Soc., vol. vi (1904), p. 159, pl. x, fig. 2.

*Hab.*—Gulf of Oman, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms.

A depressedly globular, very small species, closely spirally lirately sulcate, umbilicus partly covered by the lingular peristomatal process. Probably a member of this section, but, the operculum and soft parts being still unknown, also conchologically akin to *Leptothyra*, in the family Turbinidæ.

#### Subgenus IV: DARONIA, A. Adams.<sup>1</sup>

#### 22. CYCLOSTREMA SUBDISJUNCTUM, H. Adams.

*Cyclostrema subdisjunctum*, H. Adams: Proc. Zool. Soc., 1868, p. 293, pl. xxviii, fig. 8.

*Hab.*—Persian Gulf, Gulf of Oman, Maskat; 15 fathoms, muddy sand and loose stones. Always local, the range of distribution is a wide one, embracing Ceylon, to the Andaman Isles, at which last place I have received it from the late Mr. George H. Booley, of Port Blair.

The large size, 10 to 12 millimetres in diameter, obliquely rude contour, wide umbilicus, some spiral ribs, and, above all, the evolute body-whorl, amply distinguish this very curious species.

#### Genus MICROTHYCA, A. Adams.<sup>2</sup>

#### MICROTHYCA CRENELLIFERA (A. Adams).

*Isander crenelliferus*, A. Adams: Ann. & Mag. Nat. Hist., vol. ix (1862), p. 296.

*Cyclostrema (Microtheca) crenellifera*, A. Adams: Sowerby's Thes. Conch., vol. iii, p. 254, pl. 255, figs. 41, 42 (as *Microthyca*).

*Hab.*—Bombay (A. Abercrombie).

Originally described as from Japan, this very interesting form is only known as Indian by one specimen found in shell-sand collected near Bombay. We have but little doubt it is specifically the same, being a shining white little shell, flattened and slightly angular above, with wide spire, and crenulated round the umbilicar region.

<sup>1</sup> Sowerby's Thesaurus Conch., vol. iii (1864), p. 252.

<sup>2</sup> Ann. & Mag. Nat. Hist., vol. xi (1863), p. 264.



It will be observed that this genus was designated by its author *Microthya* on the plate and *Microtheca* in the text, as usually written, but if derived from *μικρός, θήκη*, no doubt the latter is the more correct rendering.

Genus **LEUCORHYNCHIA**, Crosse.<sup>1</sup>

**LEUCORHYNCHIA CROSSEI**, Tryon.

*Leucorhynchia Crossei*, Tryon: *Man. Conch.*, vol. x (1888), p. 106, pl. xxxv, figs. 86a, 86b.

*Hab.*—Gulf of Oman, lat. 24° 58' N., long. 56° 54' E., 156 fathoms.

I cannot separate these specimens from the Singapore species as collected by Mr. Archer, and described by the late G. W. Tryon in 1888. The only difference, indeed, between *L. Crossei* and the typical *L. caledonica*, Crosse, is the absence of a peripheral angle around the body-whorl of the former. The examples, not at all infrequent in shell-sand from the above locality, are all uniformly white, shining, without any striation or marking whatsoever, perfectly smooth, sub-globose, whorls 3-4, with continuous peristome, thickened basally and produced into a lingual callosity that very nearly closes over the umbilicus.

Genus **MÖRCHIA**, A. Adams.<sup>2</sup>

**MÖRCHIA MORELETI**, Fischer.

*Mörchia Moreleti*, Fisch.: *Journ. de Conch.*, 1877, p. 202, pl. x, fig. 1.

*Hab.*—Gulf of Oman, lat. 24° 58' N., long. 56° 54' E., 156 fathoms.

One of the smallest and most wonderful of shells. It is well figured by Fischer, and reproduced equally satisfactorily by Tryon (*Man. Conch.*, vol. x, pl. xxxv, figs. 80-82). Only measuring two millimetres in diameter, it presents a quaint appearance, the shell being depressed, carinated, the keels furnished with a fimbriately crenate edge; below, the form is like a small Ammonite, the whole coil being plainly seen in the unusually wide umbilical region; the aperture is almost reversed, as in *Anostoma*. This very probably may be a distinct species; it is less in diameter by one-third than Fischer's type; but it is perhaps best at present not to differentiate it further.

Family **LIOTIIDÆ**.

Genus **LIOTIA**, Gray.<sup>3</sup>

Only three species of this family and genus have yet been detected in the Persian Gulf region, and all occur very rarely and locally.

1. **LIOTIA CIDARIS** (Reeve).

*Delphinula cidaris*, Reeve: *Conch. Icon.*, vol. i, pl. v, fig. 27; *Proc. Zool. Soc.*, 1843, p. 143.

*Hab.*—Angrias Bank, off coast of Bombay. Collected by Captain W. A. Tindall, of s.s. "Patrick Stewart."

<sup>1</sup> *Journ. de Conch.*, 1867, p. 319.

<sup>2</sup> *Ann. & Mag. Nat. Hist.*, vol. v (1860), p. 301. (Type, *M. obvoluta*, A. Adams.)

<sup>3</sup> *Synopsis Brit. Mus.*, 1840; *Proc. Zool. Soc.*, 1847, p. 145.

## 2. LIOTIA ECHINACANTHA, Melvill &amp; Standen.

*Liotia echinacantha*, Melvill & Standen: Ann. & Mag. Nat. Hist., vol. xii (1903), p. 293, pl. xx, fig. 9.

*Hab.*—Persian Gulf; Gulf of Oman, near Maskat, 10–15 fathoms.

This very beautiful shell, which occurred in some numbers at the above locality, is noticeable for its fluted spines, the nearest ally perhaps being *L. Briareus*, Dall, which I know only by the figure and description,<sup>1</sup> but that seems a species of even more ornate character and sculpture. Both these species, *echinacantha* and *Briareus*, may belong to the subgenus *Arene*, but the present new form, at all events, possesses no scarlet radiating coloration on the whorls.

## 3. LIOTIA ROMALEA, Melvill &amp; Standen.

*Liotia romalea*, Melvill & Standen: Ann. & Mag. Nat. Hist., vol. xii (1903), p. 293, pl. xx, fig. 8.

*Hab.*—Persian Gulf, Sheikh Shuaib Island, 10 fathoms; Maskat, 10–15 fathoms; also Gulf of Oman, lat. 23° 30' N., long. 57° 10' E., 10 fathoms, and lat. 24° 58' N., long. 56° 54' E., 156 fathoms, in shell-sand.

A typical *Liotia*, with obscurely five-angled and thickened peristome, and cancellated whorls, the last whorl thrice spirally keeled.

It remains only to say that *Adeorbis*, of which genus but two exponents have yet been noted from these seas, is now by universal consent removed from the proximity of the Cyclostrematidæ to a place amongst the Tænioglossa, near the Skeneidæ and Litiopidæ.

## EXPLANATION OF PLATE III.

FIGS. 1, 1a.	<i>Cyclostrema 5-carinatum</i> , n.sp.
,, 2, 2a.	,, <i>charmophron</i> , n.sp.
,, 3, 3a.	,, <i>9-carinatum</i> , n.sp.
,, 4, 4a.	,, <i>eumares</i> , Melv.
,, 5, 5a.	,, <i>solariellum</i> , Melv.
,, 6, 6a.	,, <i>plucens</i> , M. & St.
,, 7, 7a.	,, <i>euchilopteron</i> , M. & St.
,, 8, 8a.	,, <i>Prestoni</i> , n.sp.

<sup>1</sup> Bull. Mus. Comp. Zool. Harvard, vol. xviii (1889), p. 388, pl. xxiv, figs. 5, 5a.



1.



1<sup>A</sup>.



2.



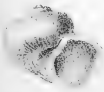
3<sup>A</sup>.



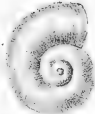
3.



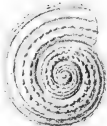
2<sup>A</sup>.



4<sup>A</sup>.



4.



5.



6<sup>A</sup>.



6.



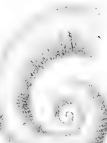
5<sup>A</sup>.



7.



7<sup>A</sup>.



8.



8<sup>A</sup>.

A.H.Searle del. et lith.

A.S.Huth imp.

CYCLOSTREMA FROM THE PERSIAN GULF, ETC.



DESCRIPTIONS OF *CYCLOSTREMA PRESTONI* AND *NASSA TINDALLI*, n.spp., FROM CEYLON.

By J. COSMO MELVILL, M.A., F.L.S.

Read 8th December, 1905.

*CYCLOSTREMA* (*DELPHINOIDEA*) *PRESTONI*, n.sp. Pl. III, Figs. 8, 8a.

*C.* testa depressa, tenui, cornea, late umbilicata, albo-pellucente, lævi, anfractibus 4, apicali parvo, vitreo, cæteris apud suturas impressis, ultimo anfractu conspicue semi-evolvente, apertura rotunda, labro tenuissimo, continuo. Alt. 1.25, diam. 3 mm.

*Hab.*—Ceylon (H. Nevill).

A most interesting form. In the evolution of the body-whorl to some extent comparable with *C.* (*Daronia*) *subdisjunctum*, A. Ad., found in the same seas. The texture, however, is more that of the typical species of the section *Delphinoidea*, Brown, = *Tubiola*, Adams, *in parte*. I do not think, indeed, it can be subgenerically separated from such species as the British *serpuloideum*, Mont., *excavatum*, Watson, from Culebra Island, West Indies (Challenger Exped.), etc.

I am indebted to Mr. Hugh B. Preston for having supplied me with several examples of this species, and for aiding me in its elucidation, and have pleasure in connecting his name with it.

*NASSA* (*HIMA*) *TINDALLI*, n.sp.

*N.* testa ovato-fusiformi, solidula, ochraceo-cinerea, zonis rufobrunneis indistincte spiraliter cineta, anfractibus 8-9, quorum tres apicales vitrei, cinereo-brunnei, lævissimi, tertio spiraliter unicarinato,



cæteris apud suturas gradatulis, longitudinaliter costatis, costis nitidis, gemmulatis, ad ultimum numero 16, omni superficie spiraliter lirato-sulcatis, sulculis aretis, apertura ovata, intus pallide brunnea, vel rarius violascente, labro albo, nitido, extus et intus denticulato,

columella alba, paullum incrassata, dente suturali albo, nitido, conspicuo. Long. 13, lat. 6.5 mm.

*Hab.*—Batticaloa, Ceylon (Captain W. A. Tindall).

The only near ally of this species known to me is *N. Frederici*, Melvill, from Karachi and the Mekran Coast, originally described as *N. Townsendi*,<sup>1</sup> a name subsequently found to have been already used by Dall for a Mexican species. In *N. Frederici* the longitudinal costæ are far more frequent (say 26 on the body-whorl), and likewise thinner in texture. In both species the sutural tooth is conspicuous. The whorls are pale ochreous or ashy-brown, spirally zoned once on the upper ones only, just below the sutures, the body-whorl being additionally centrally banded. The spiral sulci are deeply and clearly cut, the costæ being gemmulate between the points of crossing.

Several examples were collected by Captain Tindall of the s.s. "Patrick Stewart."

---

<sup>1</sup> Mem. Manch. Soc., vol. xli (1897), pt. 3, No. vii, p. 1, pl. vi, fig. 1.

## ON SOME 'FEEDING-TRACKS' OF GASTROPODS.

By B. B. WOODWARD, F.L.S.

*Read 8th December, 1905.*

SOME time since, Mr. W. J. Lewis Abbott, of St. Leonards-on-Sea, sent me a spoilt bromide print of a photograph on which a Gastropod, evidently a slug, had not only crawled, leaving the usual shining trail as it passed, but had fed on the gelatinous surface by the way.

On the black, over-exposed portions of the print, where the animal had browsed, it had eaten right through the surface to the white paper below, thus causing the pattern of the 'feeding-track' to stand out very distinctly (Fig. 1).

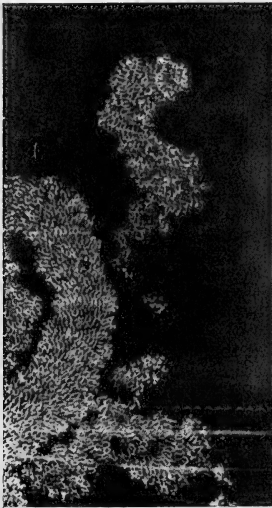


FIG. 1.

This pattern, formed as the animal moved its head from side to side, in an arc, whilst feeding, looks like some picture of a branching Madrepore, each apparent calyx being the result of a single lick. These licks are roughly, but not regularly disposed in curved rows across the line of advance. In shape each lick, of which there were about 12 to 18 in each row, rudely resembles an inverted V.

When highly magnified, a yet more interesting feature becomes apparent, for each lick is resolved into a number of some 16 or

more parallel striæ: the marks left by the individual teeth on the radula (Fig. 2).

I am not aware of any precisely similar case to this having been recorded. Limpet 'licks' and the marks left by *Limnea* when feeding on the algæ on the side of a glass aquarium, are tolerably familiar, but very few observations on the trails of land mollusca have been put on record.

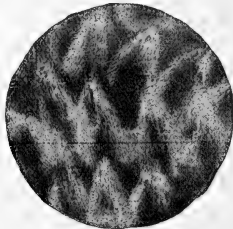


FIG. 2.

In 1846 Ebenezer Emmons, in the "Agriculture of New York," vol. i, described (p. 68) and figured (pl. xiv, fig. 1), under the name of *Nemapodia tenuissima*, what he at first mistook for a fossil in the fine green slate of Salem. Subsequently, however, in the explanation to the plates, he admitted that it was the trail of some living animal, probably of a Gastropod.

Professor E. B. Poulton, in 1885 (*Nature*, vol. xxxiii, p. 176), recorded that snails, probably *Helix aspersa*, had fed off the whitening on his greenhouse glass; but he gave no description or figure of the trails.

In 1893 Mr. Woodworth (*Science*, vol. xxi, p. 157) described the feeding-line of some snails of unascertained species on lichen-covered Carboniferous rocks at Attleboro, Mass. "These bands or trails," which he said closely resembled that figured by Emmons, "were made up of a series of crescentic cross-markings, united alternately, right and left, with the next adjacent in the series, so as to form a continuous, closely pressed, sigmoid line, which in itself constituted the whole of the trail."

Five years later Herr E. Rathay, in the *Zeitschrift für Pflanzenkrankheiten*, Bd. viii (1898), pp. 129-133, described the tracks left by *Helix hortensis* when feeding on the *Pleurococcus vulgaris* growing on the bark of trees, and the figure of the trails given by him, here reproduced (Fig. 3), agrees very closely with Emmons' illustration, and, like it, leaves very much to be desired in the matter of detail.<sup>1</sup>

<sup>1</sup> M. Dollfus gave an abstract of this paper, with a poor reproduction of the figure, in the *Feuille des Jeunes Naturalistes*, tom. xxviii, pp. 211-212.



The key to these trails, however, is to be found in the figure of the feeding-track of *Helix aspersa* given in Taylor's "Monograph of the Land and Freshwater Mollusca of the British Isles," vol. i (1899),

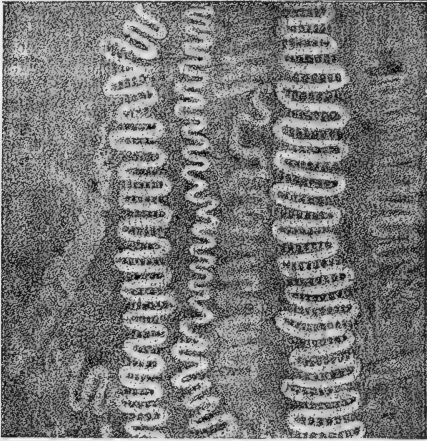


FIG. 3.

p. 260, in which the individual licks are distinct and evidently quite similar to those left by the slug on the photograph. This figure, kindly lent me by Mr. Taylor, is here reproduced (Fig. 4).



FIG. 4.

No further observations on this subject appear to have been made, though it is undoubtedly one of great interest.

DESCRIPTIONS OF FOUR NEW SPECIES OF MARINE SHELLS,  
PROBABLY FROM CEYLON.

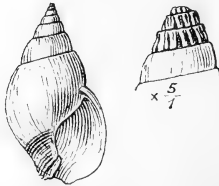
By H. B. PRESTON, F.Z.S.

Read 8th December, 1905.

THE four species about to be described formed part of the collection of the late Mr. Hugh Nevill, and I am strongly of opinion that they were collected in Ceylon, where he resided for many years.

*BULLIA CINEREA*, n.sp.

Shell ovately fusiform; remaining whorls 8, the first two and a half transversely ribbed, the lower whorls smooth, with the exception of the body-whorl, which is spirally grooved at the base; dull ashen grey, with traces of a pale violet band at the periphery; suture



impressed; peristome varicosely thickened and somewhat dilated at the base; columella descending in a curve; aperture ovate, reddish brown within. Alt. 29, diam. maj. 15.75 mm.; aperture, alt. 13, diam. maj. 6 mm.

*Hab.*—Ceylon (?).

*NASSA NEVILLIANA*, n.sp.

Shell ovately fusiform, pale yellowish brown, an indistinct band of darker brown appearing at the suture; remaining whorls 7, trans-



versely ribbed and spirally grooved throughout, giving the shell a beaded appearance, the beading being more noticeable just below

the suture, owing to the spiral grooves being deeper in this region; suture rather deeply impressed; peristome thin and somewhat dilated below; columella straight, a callosity joining it with the lip above; aperture ovate, a row of small denticles appearing inside about 1 millimetre from the edge of the peristome; canal short. Alt. 16·25, diam. maj. 8·75 mm.; aperture, alt. 7, diam. maj. 3 mm.

*Hab.*—Ceylon (?).

This species appears to be allied to *N. eranea*, Melvill & Standen, from the Persian Gulf,<sup>1</sup> but is a rather larger and coarser shell than that species; moreover, *N. eranea* is much smoother, and does not present the beaded appearance so noticeable in the present species.

MARGINELLA SUBFLAVA, n.sp.

Shell pyriform, solid, cream-coloured; spire obtuse, almost immersed; whorls 3; columella bearing 6 or 7 fine plaits; outer lip somewhat



thickened, finely denticulate within. Alt. 6, diam. maj. 4 mm.; aperture, alt. 5·50, diam. maj. 1·75 mm.

*Hab.*—Ceylon (?).

The specimens examined vary somewhat in size.

Allied to *M. dens*, Reeve, but differs from that species in the finer plaits on the columella, in the much finer denticulations of the outer lip, and in the colouring of the shell, *M. dens* being pure white.

MARGINELLA EBURNEA, n.sp.

Shell narrowly conical, solid, shining, pure white; whorls 4–5; suture rather deeply impressed; columella five-plaited; outer lip



flexuous and denticulate within. Alt. 5, diam. maj. 2·25 mm.; aperture, alt. 3, diam. maj. 1·50 mm.

*Hab.*—Ceylon (?).

<sup>1</sup> Proc. Zool. Soc., vol. ii (1901), p. 410, pl. xxiii, fig. 11.

DESCRIPTION OF A NEW SPECIES OF *LIMNÆA* FROM  
NORTH-WEST AUSTRALIA.

By H. B. PRESTON.

Read 8th December, 1905.

*LIMNÆA* (*BULINUS*) *EGREGIA*, n.sp.

Shell sinistral, oblong ovate, somewhat solid, semi-transparent white; whorls 5, rapidly increasing, finely striated with lines of growth, the last whorl rather inflated; suture impressed; umbilicus broad and deep; outer lip simple; columella expanded below over the umbilical



region and extending into a thick callosity, reaching to the junction of the peristome with the whorl above. Alt. 11·75, diam. maj. 6·5 mm.; aperture, alt. 6, diam. maj. 3 mm.

*Hab.*—North-Western Australia.

I was at first inclined to describe the above species as a *Physa*, but Mr. B. B. Woodward having with his usual kindness worked out the radula, and having carefully compared it with that of *Physa* and *Limnæa*, I have now not the slightest doubt that it should be placed in the former genus. This conclusion, I may say, is also in accordance with the views expressed on the Australian so-called Physoid forms in a paper by Mr. A. H. Cooke.<sup>1</sup>

<sup>1</sup> Proc. Zool. Soc., 1889, pp. 136-143.

ON NEW SPECIES OF *SIPHONARIA*, *TEREBRA*, AND *MANGILIA*,  
AND A REMARKABLE FORM OF *CYPRÆA CRUENTA*, FROM  
SOUTH AFRICA.

By G. B. SOWERBY, F.L.S.

Read 12th January, 1906.

AMONG a quantity of small shells recently submitted to me for identification from the Kowie and Pondoland by Dr. H. Becker, of Grahamstown, the following are worthy of attention:—

*SIPHONARIA CYANEOMACULATA*, n.sp.

Testa ovato-oblonga, subdepressa, fusca, albo radiata, maculis parvis numerosis cyaneis picta, ubique confertissime radiatim striata, concentricè rugata; latus dextrum latiusculum, radiatim quadricostatum, costis albidis; sinistrum angustius, contractum, costis majis numerosis;



vertex sinistrorsum inclinatus; pagina interna centralis albida, versus marginem nigro-fusca, albo radiata, ad marginem dentata. Long. 15, lat. 10, alt. 4 mm.

*Hab.*—The Kowie.

The principal character distinguishing this interesting species consists in the numerous bright blue spots upon its surface. The form of the shell is not an uncommon one in the genus. In describing it as having four ribs on the right-hand side, I must remark that there are signs of intermediate ones, which in other specimens may be more fully developed.

*TEREBRA FILMERÆ*, n.sp.

Testa elongata, pallidissime fulvæ; spiræ vix convexiuscula; anfractus  $11\frac{1}{2}$ , apicales læves, tertius planatus, longitudinaliter leviter plicatus, deinde cæteri supra medium obtuse angulati, plicis confertis

lævigatis, ad angulum leviter nodulosis instructi; anfractus ultimus  $\frac{1}{3}$  longitudinis testæ vix æquans, plicis evanidis; apertura parviuscula; columella arcuata, ad basin leviter contorta. Long. 22, maj. diam.  $4\frac{1}{2}$  mm.

*Hab.*—Pondoland.

This species is chiefly distinguished by the angle or obtuse keel above the middle of the whorls, and the numerous plicæ or riblets,



which are rather oblique above the angle and nearly straight below, while upon the angle they form small rounded nodules. I have only seen one specimen, which was collected by Mrs. Filmer, after whom I have pleasure in naming it.

MANGILIA BECKERI, n.sp.

Testa subfusiformis, utrinque acuminata, straminea, postice ad suturam fusco fasciata; spira acute turrata, apice subpapillari; anfractus 7, apicales rotundati, translucens, sequentes rotunde convexi, spiraliter sulcati, longitudinaliter plicati, deinde obtuse angulati, oblique plicati, spiraliter confertissime striati; anfractus ultimus



spiram paulo superans, supra obtuse angulatus, infra angulum convexiusculus, basin versus attenuatus; apertura lævigata, mediocriter lata; labrum acutum, sinu postico latiusculo, profundo. Long. 10, maj. diam.  $3\frac{1}{2}$  mm.

*Hab.*—The Kowie.

This shell is of a form pretty prevalent in the genus, and somewhat similar to *M. Jacksonensis*, Angas, but the sinus is much more pronounced than is usual in the *Mangilia*, and is more like that of a *Drillia*. The shell is of a plain straw colour, excepting towards the apex, where the sutures are banded with dark brown.

CYPRÆA CRUENTA, var. TORTIROSTRIS, var. nov.

This curious little shell has the look of a monstrosity, but it seems to represent a local race, like some of the New Caledonian forms of different species. It is very much smaller than the ordinary *C. cruenta*, of an oblong-ovate form, and the right-hand anterior



extremity is produced into a tortuous beak. The columellar teeth are comparatively few, only 12 or 13, and the labial teeth are absent or undeveloped. The colour of the shell is light pink, with spots of purplish pink at the margins, and the usual freckling of light brown on the back. Long. 12, lat. 7, alt. 5 mm.

*Hab.*—The Kowie.

The three specimens sent to me by Dr. Becker are very much alike, but the one of which the dimensions are here given is the largest.

CRITICAL REMARKS ON CERTAIN FORMS OF *CHLORITIS*, WITH  
DESCRIPTIONS OF TWELVE NEW SPECIES.

By G. K. GUDE, F.Z.S.

Read 12th January, 1906.

PLATES IV AND V.

SEVERAL species of *Chloritis*, having been insufficiently defined, and not properly compared with their allies, are at present little understood; and, as a consequence, some confusion exists in collections containing them. One or two, considered identical with previously described species, have proved to be distinct; while others, thought to be distinct, have been found, on closer examination, to be indistinguishable. In applying myself to these matters, I have been enabled, owing to the kindness of Miss Linter, Mr. J. H. Ponsonby, Mr. E. A. Smith, and Messrs. Sowerby and Fulton, to study an extensive series of shells of this genus; and the collections thus examined, together with the material in my own collection, have been found to contain no less than twelve new species. Finally, the kind co-operation of Mr. Smith has enabled me to illustrate one of Pfeiffer's hitherto unfigured species.

*CHLORITIS UNGULINA*, L.

This, the earliest known species and the type of the genus, varies considerably in colour, in the excavation of the spire, and in size. In a series, placed at my disposal by Messrs. Sowerby and Fulton, the colour ranges from dark chestnut and sienna brown to pale ochreous. Typically, the spire is deeply immersed, each succeeding whorl projecting above its predecessor, except the last quarter of the last whorl, which is suddenly deflected in front and descends as far as the periphery. In some specimens, however, the whorls ascend much more slowly, and consequently the spire is much less immersed, the third quarter of the last whorl being below the level of the penultimate whorl, and the upper half of the last whorl, near the aperture, less sloping from the suture to the periphery, giving the shell a distinct aspect from above; two specimens, which possess the features indicated, measure only 30 and 32 mm. in diameter respectively, and thus they form a connecting link with

Var. *MINOR*, Martens (not Fér.),

which is represented by two specimens from Amboina, measuring 27.5 mm., one dark ochreous, the other blackish brown; the umbilicus is here much less excavated, and the angulation becomes obsolete. Two other specimens measure only 25 mm.

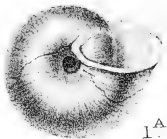
Another specimen, which was submitted by Mr. Fulton in 1898 to the late Professor von Martens, was accompanied by the following remarks from the latter's own hand: "*ungulina*, v. *minor*, of Férussac, Beck, Pfeiffer, and myself, but I should have no objection to-day



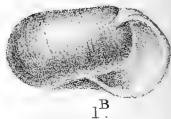




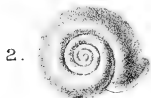
1.



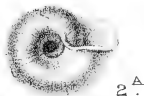
1<sup>A</sup>.



1<sup>B</sup>.



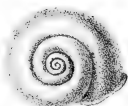
2.



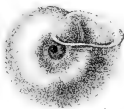
2<sup>A</sup>.



2<sup>B</sup>.



3.



3<sup>A</sup>.



3<sup>B</sup>.



3<sup>C</sup>.



4<sup>C</sup>.



4.



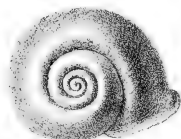
4<sup>A</sup>.



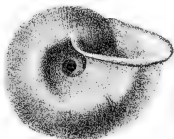
4<sup>B</sup>.



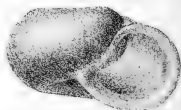
5<sup>C</sup>.



5.



5<sup>A</sup>.



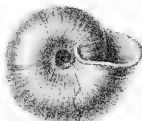
5<sup>B</sup>.



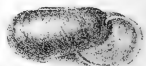
6.



7.



7<sup>A</sup>.



7<sup>B</sup>.



8.



8<sup>A</sup>.



8<sup>B</sup>.



8<sup>C</sup>.



9.

A.H. Searle, del. et lith.

Euth. imp.

SPECIES OF CHLORITIS.

to give it a new name." As the shell is quite distinct from *ungulina*, being much wider in proportion to the axis, having a much less immersed spire, and wider, but not excavated umbilicus, I propose to separate it from that species, and, in according it specific rank, I have pleasure in associating it with the much regretted Professor Eduard von Martens, in appreciation of his many valuable contributions to malacology.

CHLORITIS EDUARDI, n.sp. Pl. IV, Figs. 1-1*b*.

*Chloritis unguilina*, var. *minor*, Férussac: Histoire, pl. lxxvii, fig. 2 (not of Martens).

Shell umbilicate, discoid, light ochreous brown, paler beneath, finely and distinctly striated, a little shining; spire slightly immersed; suture rather deep. Whorls 5, rounded, increasing slowly at first, the last widening suddenly, slightly descending, and suddenly, but very shortly, deflected in front. Aperture crescentic, oblique; peristome slightly thickened and shortly reflected; margins approximate, united by a thin flexuous callus; upper margin slightly ascending at first, then arcuately descending, basal margin regularly curved, forming a slight angle with the columellar margin, which scarcely overhangs the moderate umbilicus. Diam. maj. 26.5, min. 22 mm.; alt. 15 mm.

*Hab.*—Moluccas.

*C. Eduardi* differs from *C. unguilina*, var. *minor*, in being smaller and less high in proportion to its diameter, by the less immersed spire; moreover, the last whorl is scarcely deflected in front, more rounded, not angulated below, and the umbilicus is a little wider, and not excavated. It agrees fairly with the figures in Férussac's work, pl. lxxvii, fig. 2, but that measures only 25 mm., whereas von Martens gives for var. *minor* 30 mm. (Ost-Asien, ii, p. 280).

No habitat appears to have been recorded, but the shell may be assumed to occur in the Moluccas.

CHLORITIS UNGUICULINA, Martens, var. *FUSCA*, n.var.

The shells in the British Museum referred to by the writer in Journ. Malac., vol. x, p. 48, and figured on pl. iii, fig. 4, appear to differ from the type in being much darker and smaller, and seem worthy of varietal rank. A specimen from Buru, in my collection, agrees with the Museum specimens.

CHLORITIS MARTENSI, Pfr. Pl. IV, Figs. 2-2*b*.

*Helix Martensi*, Pfr.: Proc. Zool. Soc., 1861, p. 193.

This hitherto unfigured species is now figured from the type in the British Museum by kind permission of Mr. Smith. A specimen sent to me by Messrs. Sowerby and Fulton, measuring diam. maj. 19, min. 16, alt. 9 mm., agrees with the type. A shell in Mr. Ponsonby's collection is more solid, and measures diam. maj. 20, min. 16.5, alt. 10.5 mm. Pilsbry (Man. Conch., vol. vi, p. 245) gives the diam. min. as 14 mm., this being evidently a printer's error, and should be 16 mm.

## CHLORITIS MOLLISETA, Pfr.

*Helix molliseta*, Pfr.: Proc. Zool. Soc., 1862, p. 271.

Pilsbry unites this species with *C. circumdata*, Fér. (Man. Conch., vol. vi, p. 246). The two, however, appear to me to be distinct, for, apart from its larger size, *C. molliseta* has a narrower umbilicus, and the aperture is relatively higher, the spire more deeply immersed, and the hairs much more crowded.

## CHLORITIS PONSONBYI, n.sp. Pl. IV, Figs. 7-7b.

Shell discoid, thin, yellowish fulvous, with a few transverse, oblique paler streaks, and a slight trace of a paler band above, near the suture, paler below, finely striated, the penultimate whorl with a spiral row of superficial but very distinct interrupted sulci nearest the inner suture, and a few stray ones nearest the outer suture; the former continue indistinctly up the first half of the last whorl. Spire plane, suture impressed. Whorls 5, rounded, the earlier ones increasing regularly and slowly, the last rather suddenly, and slightly dilated towards the mouth, descending slightly and shortly in front. Aperture subovate, oblique; peristome whitish, thin, slightly reflected; margins approaching, regularly curved, columellar margin slightly overhanging the moderate umbilicus, receding a little at first, then ascending forward. Diam. maj. 22, min. 19 mm.; alt. 10.5 mm.

*Hab.*—Moluccas.

Type in Mr. Ponsonby's collection.

The present species is allied to *C. unguicula*, Fér., but is smaller, thinner, and proportionately less high; the whorls are more rounded, the last descends less in front; the aperture is wider and the peristome thinner, and less reflexed. The exact habitat is not known, but, as in the case of *C. Eduardi*, there can be little doubt that it belongs to the Moluccas.

## CHLORITIS FLEXUOSA, Pfr.

*Helix flexuosa*, Pfr.: Proc. Zool. Soc., 1855, p. 112.

*Helix Ceramensis*, Pfr.: Proc. Zool. Soc., 1861, p. 192.

While examining the type of *C. flexuosa*, Pfr., in the British Museum, Mr. Smith called my attention to the resemblance of this shell to *C. Ceramensis*, and, on closer inspection, it was found that both undoubtedly belong to one species, the former being somewhat abnormal through having received some injury to the peristome while alive. The name *flexuosa* (1855) antedating that of *Ceramensis* (1861), the species must be known by the former name, the latter becoming a synonym.

## CHLORITIS MACROSTOMA, n.sp. Pl. V, Figs. 7-7b.

Shell narrowly umbilicated, discoid, somewhat thin, irregularly striated, dark chestnut colour, the penultimate whorl somewhat paler, shining, and showing traces of very fine spiral sculpture under a velvety deciduous cuticle. Spire subplane, suture shallow. Whorls 5, increasing regularly, the last rather suddenly, subcompressed above and below, slightly flattened and obtusely angulated near the suture,

rounded at the periphery; last whorl slightly descending, then suddenly and shortly deflected in front, and a little dilated at the mouth. Aperture rotundate-crescentic, oblique, light purplish livid within, margins approaching, united by a thickish light-purple flexuous callus, which bears, near the upper margin, a crescentic swelling; peristome pale purplish, becoming whitish at the columella; thickened, expanded, and reflected; upper margin shortly ascending at first, then rounded, basal sloping upward, columellar dilated above, ascending forward, and slightly overhanging the narrow pervious umbilicus. Diam. maj. 45, min. 37.5 mm.; alt. 24 mm.; apertura, lat. 26 mm.

*Hab.*—Bangaya, off East Celebes.

Type in the British Museum.

This new species can only be compared with *C. Gruneri*, Pfr., but that species, although considerably smaller, possesses half a whorl more, has a more elevated spire, a much more strongly developed peristome, bears a conspicuous tooth on the callus, and its aperture is more contracted laterally.

I am indebted to Mr. Smith for allowing me to describe and figure this handsome species. Mr. Da Costa possesses a specimen similar to the type from the same locality.

#### CHLORITIS HETEROMPHALUS, Pilsbry.

*Chloritis heteromphalus*, Pilsbry: Man. Conch., vol. vi, pl. li, figs. 60–62 (no description).

Two specimens, labelled *Chloritis* sp., sent to me by Messrs. Sowerby & Fulton, appeared to agree with the above quoted figures of *C. heteromphalus*, a species as yet undescribed, and not included by Pilsbry in his "Guide to the Study of Helices." I therefore submitted one shell to Professor Pilsbry, who states that *C. heteromphalus* agrees well with my shell in most respects, and he has no doubt that they are specifically identical; he adds that the description of his shell was omitted accidentally. As Professor Pilsbry has undertaken to supply a description of the type for these pages, I merely allude to the species *en passant*. The two specimens referred to measure: diam. maj. 29, min. 25, alt. 14 mm., and diam. maj. 30, min. 24.5, alt. 13.5 mm. respectively.

#### CHLORITIS EUSTOMA, Pfr.

*Helix eustoma*, Pfr.: Proc. Zool. Soc., 1856, p. 383.

Considerable confusion appears to exist with regard to *C. eustoma* and *C. erinaceus*. Mr. Smith has expressed the opinion that the two names represent one species (Proc. Zool. Soc., 1885, p. 594), while Dr. Dohrn (Conch. Cab., *Helix*, vol. iv, 1879, p. 572, and 1881, p. 602) considered them distinct. Professor Pilsbry (Man. Conch., vol. vi, 1891, pp. 251, 253) concurs. Dohrn considered *C. erinaceus* closely allied to, if not identical with, *C. discordialis*, Fér., which view is adopted by Pilsbry; the latter species, however, is quite different, having relatively a much larger diameter and a wider aperture, and the hair-scars are much more crowded. A careful comparison of the types of

*C. eustoma* and *C. erinaceus* has convinced me that Mr. Smith's view is the correct one. The statement that in *C. erinaceus* the umbilicus is not broadly funnel-shaped as in *C. eustoma* (Pilsbry, loc. cit.) is not borne out by Pfeiffer's original diagnosis. The shell figured in Novitat. Conch., vol. ii, pl. xlvii, figs. 3, 4, and badly copied in Man. Conch., vol. vi, pl. lii, figs. 88, 89, cannot be the same as the type of *C. erinaceus*, which, it is true, is a little larger and has the spire a trifle more raised than *C. eustoma*, but a long series from various sources, kindly furnished by Mr. Ponsonby, shows the two extremes linked by intermediate forms. *C. erinaceus*, therefore, can only be accorded varietal rank.

The habitat "Marshall Islands" given by Pfeiffer has been called in question by Dohrn and Smith, with some show of reason, and as the species does not appear to have been found there by subsequent collectors, it may be advisable to delete this habitat.

In colour the species ranges from dull or dark ochreous yellow, with white or fuscous peristome, to pale or dark russet, with violaceous or fuscous peristome.

Var. ERINACEUS, Pfr.

Differs from the type by its larger diameter (25.5 mm.) and the slightly more raised spire.

CHLORITIS MOELLENDORFFI, Ancey. Pl. IV, Figs. 4-4c.

*Chloritis Moellendorffi*, Ancey: Proc. Linn. Soc. N. S. Wales, 1897, p. 773, pl. xxxvi, fig. 7.

Four specimens received from Mr. W. Schlüter and labelled "*C. erinaceus*, Tuom Island" appeared to me to agree with Ancey's description of *C. Moellendorffi*, though not with the figure, which appears imperfectly drawn, and on my sending a specimen to M. Ancey he at once pronounced the shell to be his species. To supplement Mr. Ancey's illustration, I add three views of the shell and one of part of the periostracum enlarged. The shell figured measures: diam. maj. 20.5, min. 18 mm.; alt. 14 mm. Another specimen measures 18 × 15 × 13 mm., while a more depressed specimen from Rubiana, New Georgia, in Mr. Ponsonby's collection, measures 18.5 mm. in diameter, alt. 12 mm.

CHLORITIS SUBTILIS, n.sp. Pl. IV, Figs. 3-3c.

Shell umbilicated, thin, fragile, subtranslucent, pale fuscous, the latter part of the last whorl dark rufous, finely striated, and covered with rather crowded, short, stiff, blackish bristles, arranged in quincunx. Spire plane, apex slightly immersed, suture rather deep. Whorls  $4\frac{1}{2}$ , rounded, increasing rather suddenly, the last descending slowly at first, then suddenly and shortly deflected in front, slightly constricted behind the mouth, and compressed round the umbilicus. Aperture roundly lunate, oblique, purplish inside. Peristome thin, shortly expanded and reflected, violaceous purple; margins approaching, upper margin ascending shortly at first, then descending, arcuate, outer and basal arcuate, columella almost straight, dilated above, and slightly

overhanging the moderate, deep umbilicus. Diam. maj. 22, min. 18 mm.; alt. 14 mm.

*Hab.*—German New Guinea.

Type in Mr. Ponsonby's collection.

A thin fragile species somewhat resembling *C. eustoma* in contour, but the umbilicus is much narrower and not funnel-shaped, the last whorl descends more deeply in front, the suture is less deep, and the last whorl is slightly constricted behind the mouth. It also appears to be allied to *C. Simbangensis*, Kobelt (Nachrichtsblatt Deutsch. Malac. Ges., 1898, p. 93), to which I was at first inclined to refer it. I forwarded a specimen to Professor Boettger for comparison with the type of that species, if he had access to it, and he obligingly informed me that the type was contained in the collection of the late Bruno Strubell, part of which passed to Herr Bülow, who, however, cannot find it. From the description, *C. Simbangensis* appears yellowish white, the whorls plane near the suture, subangulated at the periphery, and descending deeply in front, which characters are wanting in the new species.

#### CHLORITIS TENEBRICA, Fulton.

*Chloritis tenebrica*, Fulton: Ann. & Mag. Nat. Hist., vol. ix (1902), p. 316.

The last portion of the penultimate and the whole of the last whorl are obtusely angulated, and flattened near the suture; the last whorl is also obtusely angulated below round the funnel-shaped umbilicus; these features, not mentioned in the original diagnosis, connect the species with *C. eustoma*. From Mr. Ponsonby I have received two specimens labelled "*C. discordialis*, New Ireland; ex Mus. Sydney," which I refer to Mr. Fulton's species; they are pale brown with a pale fuscous peristome, and one of them is slightly more depressed in the spire. Three specimens received from Mr. Fulton, "ex Dr. Cox's collection," and considered by him to pertain to *C. erinaceus*, I also refer to *C. tenebrica*. One is pale fuscous with a dirty whitish lip; it possesses 5 whorls, and measures 27 mm. in diameter, alt. 21 mm. The two others are darker with violaceous peristome; the angulation near the suture is less pronounced; they measure 22 mm. in diam., 15 alt., and 22 mm. diam., 16.5 alt. respectively. For these I propose the varietal name *pallida*.

Two bleached specimens, labelled "*C. tenebrica*, var., New Ireland," also from Mr. Fulton, have the umbilicus narrower and the angulation obsolete, while the last and penultimate whorls are rounded above, not angulated. This form may be called var. *tumida*.

#### CHLORITIS FAUSTA, n.sp. Pl. IV, Figs. 5-5c.

Shell widely umbilicated, depressed conoid, shining under a deciduous velvety cuticle, earlier whorls pale fuscous, becoming reddish brown on the last whorl, faintly striated, covered with slight tubercles arranged in quincunx, which, in fresh specimens, are furnished with short dark bristles. Spire plane, suture deep. Whorls  $4\frac{1}{2}$ , increasing regularly, the last rather suddenly, tumid and subangulated above, rounded at the periphery, obtusely angulated

round the wide, funnel-shaped umbilicus, at first ascending a little above the plane of the spire, then descending gradually and rather deeply in front; the upper side of the last half flattened and sloping towards the periphery. Aperture ovate-lunate, oblique, violaceous purple inside, peristome purplish fuscous, slightly thickened, expanded and reflected; margins approaching, united by a thin callus, upper ascending at first, then descending, arcuate, basal and columellar margins slightly curved, the latter dilated and slightly overhanging the wide umbilicus. Diam. maj. 28·5, min. 22·5 mm.; alt. 17 mm.

*Hab.*—New Mecklenburg.

Type in Miss Linter's collection.

The present species is allied to *C. discordialis*, Fér. (under which name it was sent out), but it differs by the less rounded whorls, the higher axis, wider and funnel-shaped umbilicus, less expanded peristome, relatively higher aperture, and much sparser hairs.

I have seen three specimens besides the type, one in the British Museum, one from Mr. Ponsonby, and one from Messrs. Sowerby & Fulton, the last measuring diam. maj. 26·5, min. 21 mm.; alt. 16 mm.

#### CHLORITIS GAIMARDI, Desh.

*Helix Gaimardi*, Desh. : Guérin, Mag. de Zool., 1831, pl. xxix.

The specific limits between this species and *C. silenus*, Angas, were for some time obscure to me, Angas having omitted to compare his species with its ally. An examination of Mr. Ponsonby's rich series of this group, however, has disclosed the existence of two types of sculpture, one with rows of hair-scars much crowded, the other having these processes much sparser. One of each type was submitted to Dr. H. Fischer with a request that he would compare them with the type of *C. Gaimardi* if it could be found in the Paris Museum, but to my regret he was unsuccessful in his quest. The only specimen found bore the label "*Helix* . . . N<sup>le</sup> Irlande, MM. Lesson et Garnot." Dr. Fischer adds that on the occasion of a visit to the Museum by M. Ancey he filled in the blank with a pencil note, "*Gaimardi*, Desh.;" but it is obvious that this specimen cannot be considered as the type. Fortunately Deshayes gave enlarged figures of the sculpture in the Mag. de Zool., 1831, pl. xxix, and in Férussac's "Histoire," pl. lxxii, fig. 10, and these figures favour the view that his species is characterized by the more distant rows of hair-scars, while the type of *C. silenus* in the Newcastle Museum (which, owing to the kindness of Mr. E. Leonard Gill, the curator, I have been able to inspect) demonstrated the fact that in that species the hair-scars are very densely crowded. Several specimens in Mr. Ponsonby's collection, however, combined the crowded hair-scars of *C. silenus* with the contour of *C. Gaimardi*, and as I consider the sculpture of decided diagnostic value, I have no option but to establish a new species on these latter forms. *C. Gaimardi* may be characterized as smaller (diam. 15 mm.) than *C. silenus*, less conoid, with the last whorl more convex above, less flattened at the side, the aperture with the outer margin more rounded, the basal margin less arcuate, and the hair-scars distant.



## CHLORITIS SILENUS, Angas. Pl. IV, Fig. 6.

*Helix silenus*, Angas: Proc. Zool. Soc., 1873, p. 182, pl. xx, fig. 2.

This species is generally larger than *C. Gaimardi* and has the last whorl compressed above, flattened and sloping towards the periphery; the aperture is more triangular and relatively higher, the outer margin straight, the basal arcuate, and the columellar sloping, while the umbilicus is more obliquely excavated behind the mouth. The hair-scars are very densely crowded. The enlarged sculpture (Pl. IV, Fig. 6) is taken from a specimen from New Ireland received by Mr. Ponsonby from Mr. Garrett. It measures diam. maj. 18, min. 15.5 mm.; alt. 11.5 mm.

## CHLORITIS CONJUNCTA, n.sp. Pl. V, Fig. 5.

Resembles *C. Gaimardi* in contour and size, but has the densely crowded hair-scars of *C. silenus*. It has the spire plane or slightly immersed. Diam. maj. 14.5, min. 13 mm.; alt. 9.5 mm.

*Hab.*—New Ireland.

Type in my collection.

The following specimens are in Mr. Ponsonby's collection: three specimens labelled "*Gaimardi*, ex Dr. Cox, Solomon Islands," diam. 16.5, alt. 10.5 mm., and diam. 15.5, alt. 10 mm.; one specimen "*eustoma*, ex Dr. Cox, Solomon Islands," diam. 16, alt. 9.5 mm.; one specimen "*silenus*, ex Garrett, New Ireland," diam. 15.5, alt. 9.5 mm.; two specimens "*silenus* = ? *Gaimardi*, ex Dr. Cox, New Ireland," diam. 15.5, alt. 9.5 mm., and diam. 14, alt. 9 mm.; one "New Ireland," diam. 13.5, alt. 9 mm.

## CHLORITIS FRATERNA, n.sp. Pl. V, Figs. 6-6c.

Shell moderately umbilicated, depressed conoid, pale ochreous, finely striated, covered rather sparsely with short, stiff, dark bristles, arranged in quincunx. Spire subplane, suture deep, apex not raised. Whorls 4, increasing slowly, rather tumid above, rounded at the periphery, obtusely angulated round the moderate funnel-shaped umbilicus; last whorl slightly dilated at the mouth, slowly descending, not deflected in front. Aperture ovate-lunate, a little oblique, pearly within; margins a little approaching. Peristome dirty whitish, somewhat thickened and expanded, slightly reflected; upper margin arcuate, outer and basal regularly curved, columellar triangularly dilated and slightly overhanging the umbilicus. Diam. maj. 16, min. 14 mm.; alt. 11 mm.

*Hab.*—? New Ireland (ex Sydney Museum).

Type in Mr. Ponsonby's collection.

*Chloritis fraterna* is more elevated in the spire than *C. Gaimardi*, and has a narrower umbilicus; the last whorl is not compressed or sloping above, does not descend so deeply in front, and it has a more rounded aperture. *C. exigua* is more solid, and, although smaller, it possesses half a whorl more, while the hair-scars or pits are much more crowded. Another specimen measures diam. maj. 18, min. 15 mm.; alt. 12 mm. The shells were received by Mr. Ponsonby as *C. silenus*.

## CHLORITIS EXIGUA, n.sp. Pl. IV, Figs. 8-8c.

Shell widely umbilicated, depressed, dark tawny, lightly striated, densely pitted. Spire subplane, suture deep, apex a little raised. Whorls  $4\frac{1}{2}$ , increasing rather slowly, rather tumid above, rounded at the periphery, obtusely angulated round the wide funnel-shaped umbilicus; last whorl shortly deflected in front. Aperture sub-circular, little oblique, dark within; margins a little approaching; peristome rosy fuscous, a little thickened, expanded and reflexed; upper margin ascending a little at first, then sloping down; outer, basal, and columellar arcuate, the latter scarcely dilated. Diam. maj. 12, min. 10.5 mm.; alt. 7.5 mm.

*Hab.*—New Ireland.

Type in my collection.

A specimen which could not be referred to either of the preceding species has lain in my collection for years. It is smaller and darker than any of its allies, has the apex raised, and, compared with *C. conjuncta*, it has a more rounded aperture, and the hair-scars are more crowded.

## CHLORITIS CUMINGI, n.sp. Pl. V, Figs. 1-1a.

Shell widely umbilicated, convex-conoid, solid, lightly striate, reddish-brown. Spire conoid, suture margined, apex obtuse. Whorls 6, convex, increasing regularly, with fine spiral sculpture under a deciduous cuticle, the apical whorl minutely pitted, the last dilated towards the mouth, shortly descending in front, its latter half scored with about six straight, obliquely descending furrows. Aperture obovate, oblique; peristome white, thickened and reflected, margins subparallel, converging near the body-whorl, united by a thin whitish callus; columellar margin ascending at an obtuse angle beyond the umbilical angulation. Diam. maj. 56, min. 45 mm.; alt. 36 mm.

*Hab.*—New Guinea (Mus. Cuming).

Type in the British Museum.

This new species is more elevated in the spire and more angulated than *C. rubra*, Albers. From *C. concisa*, Fér., it differs in the shorter furrows which are confined to the last whorl. I associate with this handsome and striking species the name of the celebrated collector, Hugh Cuming, of whose collection the three shells, on which I base the species, formed part. They were labelled *C. concisa*, Fér., until Mr. Ponsonby pointed out that they could not be referred to that species, and Mr. Smith, with his usual courtesy, now afforded me an opportunity of naming and describing them.

## CHLORITIS BREVIPILA, Pfr. Pl. IV, Fig. 9.

*Helix brevipila*, Pfr.: Proc. Zool. Soc., 1849, p. 130; Conch. Cab., *Helix*, vol. ii (1853), p. 283, pl. cxxiv, figs. 28-30; Mon. Helic. Viv., vol. iii, p. 227; Tryon's Man. Conch., vol. iii, pl. 1, fig. 38.

Several forms have been included under this name by authors, and from the numerous specimens labelled with this name kindly placed at my disposal by Mr. Ponsonby, and from those in my collection,

I am able to separate at least three forms which appear to deserve specific rank. The type of Pfeiffer's species in the British Museum has the spire elevated, not flattened; and the rows of hairs are more distant than in the allied forms. I give an enlarged view of part of the periostracum near the mouth from one of Mr. Ponsonby's specimens. The figures in Cox's Monograph, pl. v, fig. 2, and Reeve's Conch. Icon., fig. 777, are badly drawn, and it is impossible to say what species they represent.

CHLORITIS NOVOCAMBRICA, n.sp. Pl. V, Figs. 2-2c.

Shell narrowly umbilicated, depressed, pale cinnamon brown, finely striated, covered with very crowded, short, stiff bristles, arranged in quincunx. Spire shortly conoid, suture shallow, apex obtuse. Whorls  $4\frac{1}{4}$  to  $4\frac{1}{2}$ , a little flattened above, rounded at the periphery, slightly compressed below, the umbilicus a little obliquely excavated behind the mouth and subangulated; last whorl shortly deflected in front, slightly constricted behind the mouth. Aperture suboval, oblique, margins slightly approaching; peristome white, thin, slightly expanded, margins arcuate, columellar margin dilated above, and half covering the narrow umbilicus. Diam. maj. 13.5, min. 11.5 mm.; alt. 8.5 mm.

Hab.—New South Wales.

Type in Mr. Ponsonby's collection.

Similar in shape to *C. brevipila*, but twice the size, and with the hairs much more crowded.

CHLORITIS DISJUNCTA, n.sp. Pl. V, Figs. 3-3c.

*Chloritis brevipila*, Pilsbry: Man. Conch., vol. vi, pl. lviii, figs. 28-30 (not of Pfeiffer).

Shell moderately umbilicated, depressed, pale corneous, finely striated, covered with pits or hair-scars, arranged in quincunx, in fresh specimens probably provided with short hairs. Spire low conoid, suture impressed, apex obtuse. Whorls 4, rounded above, swollen below, subangulated at the periphery, becoming rounded towards the mouth. Last whorl shortly deflected in front, scarcely constricted behind the mouth. Aperture suboval, oblique; peristome thin, a little expanded; margins convergent, curved, columellar margin dilated, and impinging upon the moderate pervious umbilicus. Diam. 8-9, alt.  $5-5\frac{1}{2}$  mm.

Hab.—Port Stephen, New South Wales.

Type in Mr. Ponsonby's collection.

Allied to the last species, but smaller, with less crowded hair-scars, and wider umbilicus. Compared with *C. brevipila* it is smaller, the spire more elevated, the umbilicus slightly narrower, and not excavated or angulated, and the hair-scars more crowded.

CHLORITIS LAYARDI, n.sp. Pl. V, Figs. 4-4c.

Shell moderately umbilicated, depressed, pale to reddish brown, smooth, with a velvety cuticle, covered with rather distant rows of short, stiff, dark bristles, arranged in quincunx. Spire plane, suture

deep, apex scarcely immersed. Whorls 4, rather tumid, slightly flattened above the periphery near the mouth, subcompressed round the moderate pervious umbilicus, which is slightly obliquely excavated behind the mouth; last whorl slightly descending, then suddenly and deeply deflected, gibbous and constricted behind the peristome. Aperture subcircular, very oblique. Peristome whitish or fulvous, thin, slightly expanded, almost continuous; margins regularly curved, columellar margin triangularly dilated, scarcely impinging on the moderate deep umbilicus. Diam. maj. 10, min. 8.5 mm.; alt. 5.5 mm.

*Hab.*—Islands in Torres Straits.

Type in my collection.

From the late Mr. E. L. Layard I received two specimens (labelled *C. brevipila*), and I have pleasure in associating this pretty little species with the name of this lamented and indefatigable naturalist. In Mr. Ponsonby's collection are three specimens (labelled "*C. brevipila*, New Holland"), which I refer to this species. One of these measures diam. maj. 11, min. 9 mm.; alt. 6 mm. In the same collection are four other specimens from Cape York, Queensland, and one from the Richmond River, New South Wales.

*C. Layardi* is easily distinguished from *C. brevipila* and its allies by the flat spire, almost continuous peristome, and the gibbous crest behind the peristome.

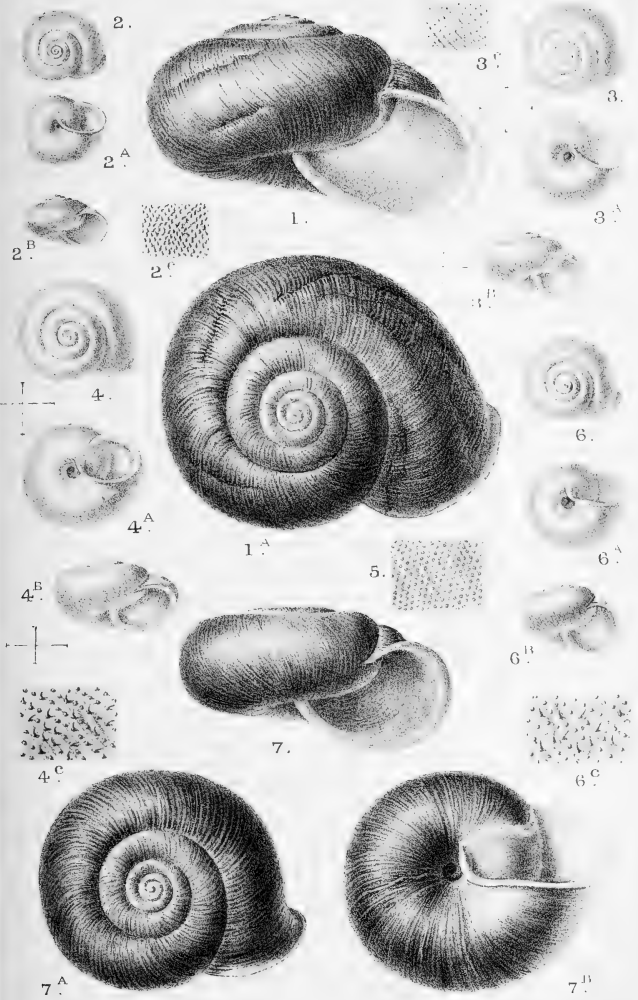
#### EXPLANATION OF PLATES.

##### PLATE IV.

- |                      |   |
|----------------------|---|
| FIGS. 1-1 <i>b</i> . | <i>Chloritis Eduardi</i> , n.sp.                              |
| ,, 2-2 <i>b</i> .    | ,, <i>Martensi</i> , Pir.                                     |
| ,, 3-3 <i>c</i> .    | ,, <i>subtilis</i> , n.sp.                                    |
| ,, 4-4 <i>c</i> .    | ,, <i>Moellendorffi</i> , Ancy.                               |
| ,, 5-5 <i>c</i> .    | ,, <i>fausta</i> , n.sp.                                      |
| FIG. 6.              | ,, <i>silenus</i> , Angas, portion of periostracum enlarged.  |
| FIGS. 7-7 <i>b</i> . | ,, <i>Ponsonbyi</i> , n.sp.                                   |
| ,, 8-8 <i>c</i> .    | ,, <i>exigua</i> , n.sp.                                      |
| FIG. 9.              | ,, <i>brevipila</i> , Pfr., portion of periostracum enlarged. |

##### PLATE V.

- |                      |  |
|----------------------|--|
| FIGS. 1-1 <i>a</i> . | <i>Chloritis Cumingi</i> , n.sp.                               |
| ,, 2-2 <i>c</i> .    | ,, <i>novocambrica</i> , n.sp.                                 |
| ,, 3-3 <i>c</i> .    | ,, <i>disjuncta</i> , n.sp., enlarged two diameters.           |
| ,, 4-4 <i>c</i> .    | ,, <i>Layardi</i> , n.sp., enlarged two diameters.             |
| FIG. 5.              | ,, <i>conjuncta</i> , n.sp., portion of periostracum enlarged. |
| FIGS. 6-6 <i>c</i> . | ,, <i>fraterna</i> , n.sp.                                     |
| ,, 7-7 <i>b</i> .    | ,, <i>macrostoma</i> , n.sp.                                   |



A.H. Searle, del. et lith.

Gibb, sculp.

SPECIES OF CHLORITIS.



NOTES ON THE ANATOMY OF SOUTH AFRICAN APLYSIIDÆ,  
WITH DESCRIPTIONS OF TWO NEW SPECIES.

By R. H. BURNE, B.A.

Read 12th January, 1906.

RATHER more than a year ago, a small collection of Aplysiidæ, collected in South Africa by Mr. Henry Burnup, was entrusted to me, through the kindness of Mr. J. H. Ponsoby, for dissection and description. To both of these gentlemen I wish to express my thanks for the opportunity thus afforded me of adding somewhat to the relatively scanty records of the anatomy of members of this group of molluscs.

The collection comprised eight specimens belonging to four species, two of which are apparently new.

TETHYS OPERTA, n.sp.

The four specimens of this species (three from Isipingo and one from Scottsburg) closely resemble each other except in size, and in their most important external features are so closely similar to *Tethys dactylomela* (Rang) and its varieties (especially var. *aquorea*, Heilprin) that, were it not for the complete closure of the shell-sac, it would be unnecessary to consider them as anything but varieties of *dactylomela*.



FIG. 1.

The least distorted of the four specimens (Fig. 1) had the following measurements:—Total length, 68 mm.; breadth in front of the parapodia, 21 mm.; height in the middle of the visceral sac, 28 mm.; length of posterior extremity of the foot behind the parapodia, 9 mm.; length of the attachment of the parapodia to the body, 28 mm.; greatest depth of the parapodia, 14 mm.; breadth between the anterior ends of the parapodia, 12 mm.; distance from the anterior end of the parapodia to the rhinophores, 22 mm.; distance between the rhinophores and anterior tentacles, 12 mm.; breadth between the rhinophores, 5 mm.

The surface of the animal is slightly crinkled, but otherwise smooth. The parapodia are moderately developed, but do not cover the mantle; posteriorly they are united where they meet the foot, the depth of the union being about 3 mm. The mantle is large; its free right-hand border is turned down for about 4 mm., and posteriorly is suddenly bent to the left to form a short wide siphon 5 mm. in length. The shell-sac is completely closed, but a minute hollow papilla, near its centre, indicates the position where the opening should be.

The rhinophores are short, cylindrical, and blunt. Their apices are hollowed out, the margins of the cavity being irregular. The anterior tentacles are small, and, as usual, are formed by scrolled projections of the buccal lobes. The latter are large and of circular form.

The eyes lie 2.5 mm. in front of, and slightly lateral to, the rhinophores.

The anal orifice lies as usual in the siphon. The genital opening is situated beneath the mantle on a level with the anterior limit of the gill, at a distance of 12 mm. from the anterior ends of the parapodia, and 4 mm. in front of the large single opening of the opaline gland. The genital groove takes the usual course to the penis beneath the right anterior tentacle.

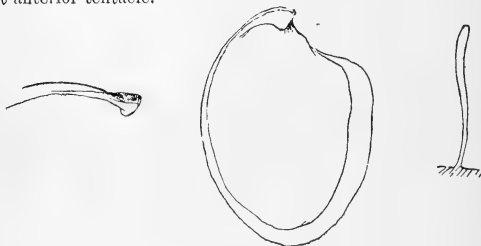


FIG. 2.

FIG. 3.

FIG. 4.

The animal is greenish grey, covered with a network of fine irregular black reticulations, which in places run together to form blotches, or more frequently somewhat vague ring-like markings. These are sharply circumscribed, as a rule, towards the centre, but outwardly fade off into the general reticulation. The rings are scattered chiefly upon the sides of the body and upon the outer surface of the parapodia, the blotches being mainly situated near the margin of the foot, a specially definite one marking the upper surface of its posterior free extremity. The inner surface of the parapodia is marbled with large confluent black blotches. The surface of the mantle is also marbled, but very delicately, the depressed free edge being somewhat specially pigmented. The sole of the foot is yellower than the rest of the body-surface, and is sparingly flecked with small blotches of black or brown.

The shell (Figs. 2, 3) is rather long, narrow, and flat (24 by 16 by 2.5 mm.). It is slightly calcified, showing internally traces of nacre.



The beak is strongly incurved, and upwardly reflexed. The sinus is deeply excavated, and extends barely a third the length of the shell. The colour of the shell is yellowish, owing to the strong periostracum which extends from 1 to 2.5 mm. beyond the anterior border of the calcified part.

Alimentary canal: The jaws, which have an elongated quadrilateral shape, are lateral brush-like developments of a continuous delicate sheet of chitin that encircles the buccal cavity just inside the mouth. They are covered with slender, rod-like, chitinous processes (Fig. 4), about .2 mm. in length, that slightly swell distally, and terminate in a rounded end.

The radula is of the type common to the family, with a formula of 28 : 1 : 28, the outer lateral teeth being, as usual, more or less rudimentary. The median tooth is broad and has three cusps, a median which is irregularly denticulate along its edge, and on either side a smaller smooth cusp. The first lateral has one large smooth cusp; the other teeth, except those quite at the side, have a large internal denticulate cusp, and lateral to it a smaller smooth cusp.

The buccal mass is nearly globular (9 mm. long by 8 mm. broad). The œsophagus measures 9 by 2 mm., and is longitudinally pleated internally. It leads into a voluminous crop measuring roughly 30 by 12 mm., and making one complete spiral twist to the right before opening into the muscular gizzard. This latter region is, as usual, very clearly defined externally by the abrupt anterior and posterior margins of the thick layer of circular muscle fibres of which its walls are composed. Internally it is armed with two or three irregular rows of pyramidal horny teeth of different sizes. The gizzard passes without constriction into the stomach, which in turn gradually narrows to form the intestine. Two large bile ducts and a narrow cœcum open into the intestinal end of the stomach.

The arrangement of the gut-coils, a character that seems to differ in different species, resembles very closely that figured for *T. leporina* in Bronn's Thierreich, Bd. iii, Abth. 2, pl. lxxv, fig. 7. The salivary glands and hepato-pancreas call for no remark.

The opaline gland is of very large size, and is composed of long transparent conical lobules, which measure about 1 mm. in diameter at their outer ends, and gradually narrow towards a common duct that opens by a large aperture, as stated previously.

The nervous system has the form normally present in the genus.

The gill and heart are also of the normal type. The first portion of the aorta is provided with a leaf-like enlargement (*crista aortæ*) closely attached to the anterior wall of the pericardium. The aorta occupies the central line of this enlargement, and on either side is a wing-like expansion.

The reproductive organs are in no way specially remarkable, but it may be mentioned that the hermaphrodite gland, which is buried as usual in the right side of the apex of the visceral mass, is rounded, and the albumen gland is small and sausage-shaped. Otherwise they very closely resemble the published figures of European species such as *T. leporina*.

## TETHYS BURNUPI, n.sp.

Of this species (Fig. 5), which I have taken the liberty to name after Mr. Burnup, there was one specimen only, from Durban. It had the following measurements: total length, 42 mm.; greatest breadth, 15 mm.; distance from the mouth to the anterior end of the parapodia, 11 mm.; length of the parapodia, 30 mm.; greatest depth of parapodia, 9 mm.; distance from anterior end of the parapodia to the rhinophores, 3 mm.; distance between the anterior ends of the parapodia, 6 mm.; breadth of foot, 7 mm.

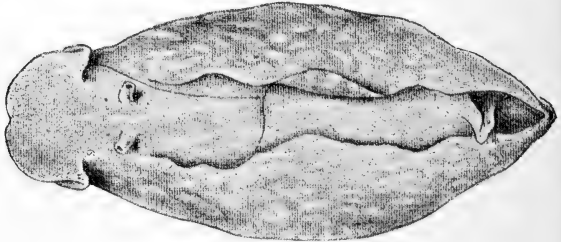


FIG. 5.

The animal has an oval form, with very long but not particularly deep parapodia. The latter unite where they meet the foot at a point only 1 mm. from its extremity.

The mantle is large; its anterior limit nearly coincides with the mid transverse plane of the animal. The shell-sac is completely closed, without any indication of the position where the opening should be. The siphon is small.

The rhinophores, which lie remarkably close in front of the parapodia, are short, cylindrical, and blunt; their apices are excavated, the border of the hollow being irregular. The anterior tentacles, which are formed by foldings of the buccal lobes, are large and flat, and, together with the buccal lobes, project laterally in the horizontal plane.

The genital opening lies on a level with the anterior limit of the mantle, 3 mm. in front of the gill. The opaline gland opens by numerous minute pores. The anus is in the usual position within the siphon.

The genital groove has the normal position and appearance. The eyes lie 1 mm. in front of the rhinophores.

In colour the animal is dusky grey green, flecked with small elongated blotches of whitish green, directed for the most part longitudinally. The inner surface of the parapodia is dusky green, marked near the margin by radially disposed patches of whitish green. The mantle is for the most part transparent, but clouded along its left side and around the siphon with dusky green.

The shell (Figs. 6, 7): Unfortunately the calcareous part was broken to pieces, but the general shape can be recognised from the stout periostracum. It is of elongated oval form, moderately convex, with the beak strongly incurved, and with an upstanding reflected hood. The sinus is short and moderately concave.



FIG. 6.

FIG. 7.

FIG. 8.

The alimentary canal: The jaws lie on either side just within the mouth. They have an irregularly oval form measuring 3 by 2 mm., and are covered by chitinous hair-like rods .08 millim. in length, with a pointed and slightly hooked free extremity (Fig. 8).

The radula has the formula 22 : 1 : 22. The median tooth has a central blunt cusp with denticulate edges, and two pairs of lateral cusps. The lateral teeth have a long denticulate cusp towards the median side, and upon the lateral side two smaller smooth cusps. The teeth are relatively large, being about equal in size to those of *T. operta*, although the animal is much smaller.

The alimentary canal otherwise closely resembles that of *T. operta*, but the intestine is longer with similar though more pronounced coils. The following measurements of the different parts may be noted:—Œsophagus, 7 mm. long by 1.5 mm. diameter; crop, 17 mm. long by 7 mm. diameter; gizzard, 4 mm. long, with two rows of thorn-like chitinous teeth upon its inner surface.

The opaline gland consists of a number of isolated follicles covering an area of the body-wall below, and slightly posterior to, the genital opening. It measures 6 mm. long. by 4 mm. broad, and is more pointed behind than in front.

Reproductive organs: The only remarkable feature about these organs is the absence of the seminal vesicle. The albumen gland also is extremely small.

The gill, mantle-cavity, kidney, pericardium, and heart show no special features worthy of mention. The aortic appendage (*crista aortæ*) is large and leaf-like.

This specimen is of somewhat exceptional interest, for in its general configuration, in the arrangement of the parapodia and mantle, and in the position of the external openings, in fact, in nearly all its most important external characters, it resembles the genus *Paraplysia* of

Gilchrist<sup>1</sup> so closely that I should have unhesitatingly placed it in that genus, had it not differed slightly from it in the leading feature upon which the genus was founded, namely, the position of the rhinophores with regard to the parapodia. In *Paraplysia* the rhinophores lie actually between the anterior ends of the parapodia, whilst in this specimen they are 3 mm. in advance of them. On this account alone it must, I think, be placed in the genus *Tethys*, and having regard to its general similarity in other characters to the genus *Paraplysia*, it becomes a question, as suspected by Gilchrist himself,<sup>2</sup> whether in reality any hard and fast line can be drawn between the genera *Tethys* and *Paraplysia*.

#### TETHYS NIGROCINCTA (Martens).

Of this species there was one specimen from Scottsburg, Natal. It is larger than the type described by Martens, and also differs from it in being of a pale yellow colour instead of light brown.

The specimen had the following measurements: total length, 28 mm.; height, (through the visceral sac) 13 mm., (in front of the parapodia) 6 mm.; distance from the mouth to the anterior limit of the parapodia, 10 mm., the rhinophores being situated midway between these two points. The parapodia are united behind to a depth of 2 mm., and are separated in front by a distance of 6 mm. Their greatest height is 6 mm.

The general form of the body is long and slender, with the visceral sac strongly humped up. The rhinophores and tentacles are slender and ear-like. The sole of the foot is narrow (5 mm.) and very clearly defined. The mantle orifice is peculiarly large (7 by 6 mm.) and somewhat egg-shaped, with the narrower end directed backwards. The siphon is short and wide.

The genital opening lies in front of the anterior edge of the mantle, some 2 mm. in advance of the gill. The opaline gland opens by numerous minute pores.

The colour of the animal is a delicate fulvous yellow, with very faint indications of small lighter spots upon the outer surface of the parapodia and down the centre of the back. The edges of the parapodia, of the mantle orifice, and of the siphon are bordered by an interrupted delicate black line. Black pigment also occurs within the cavities of the rhinophores and tentacles, and upon the anterior and posterior margins of the foot. The eyes, which are plainly visible, lie just in front of the rhinophores.

The shell: The calcareous part of the shell was unfortunately broken. The uninjured beak and the periostracal layer, however, give the following particulars: length, 10 mm.; breadth, 8 mm.; height, 3 mm. The beak is strongly inturred, and is not reflexed. The sinus is slightly concave, and occupies a little more than the posterior third.

<sup>1</sup> Gilchrist, "The genus *Paraplysia*, with description of a new species": Trans. S. Af. Phil. Soc., vol. xi (1902), p. 121.

<sup>2</sup> Gilchrist: loc. cit., p. 124.

Digestive organs: The radula is small, and has the formula 10 : 1 : 10. The individual teeth, though few in number, are relatively large, and are strongly cusped, the cusps being similar in number and arrangement to those of *T. Burnupi*. The jaws are covered with short hooked rods very similar to those of *T. Burnupi*.

The buccal mass, salivary glands, crop, and stomach are quite normal but for a dilatation of the œsophagus, about its middle. This may, however, be an individual peculiarity, or possibly a pathological condition. The intestine is remarkably short and very simply coiled (Fig. 9). The point of the cæcum projects from the hepato-pancreas

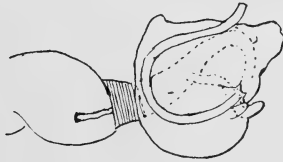


FIG. 9.

further and more abruptly than in the other species examined, although in the usual place, where the intestine begins to run forward upon the left side of the hepato-pancreas.

Organs of circulation: The intra-pericardial part of the aorta has no expansion (*crista aortæ*).

Reproductive organs: These have the usual characters, but (in this specimen) are of large size. The complex of organs that lies between the hermaphrodite duct and the external opening measure 7 mm. in length. The seminal vesicle and spermatheca are also very conspicuous. The albumen gland is nearly circular.

The opaline gland is small (3 by 2 mm.), and consists of an aggregation of separate follicles.

#### TETHYS ELONGATA (Pease).

Of this species there were two specimens from Port Shepstone. They had the following dimensions: total length, 21 mm.; height, (through the visceral sac) 11 mm., (in front of the parapodia) 7 mm.; distance from the mouth to the anterior end of the parapodia, 7 mm., the rhinophores being situated about midway between these two points. The parapodia are united behind, 2 mm. in front of the extremity of the foot, to a depth of 4 mm., and are separated in front by a distance of 6 mm. Their greatest depth is 4 mm.

The rhinophores and tentacles have the same shape as in *T. nigrocincta*. The mantle orifice measures 8 by 6 mm. The siphon is small and broad. The external openings are as in *T. nigrocincta*.

The colour of the animal is dullish olive green, tending to yellowish brown. The concavities of the rhinophores and tentacles are black.

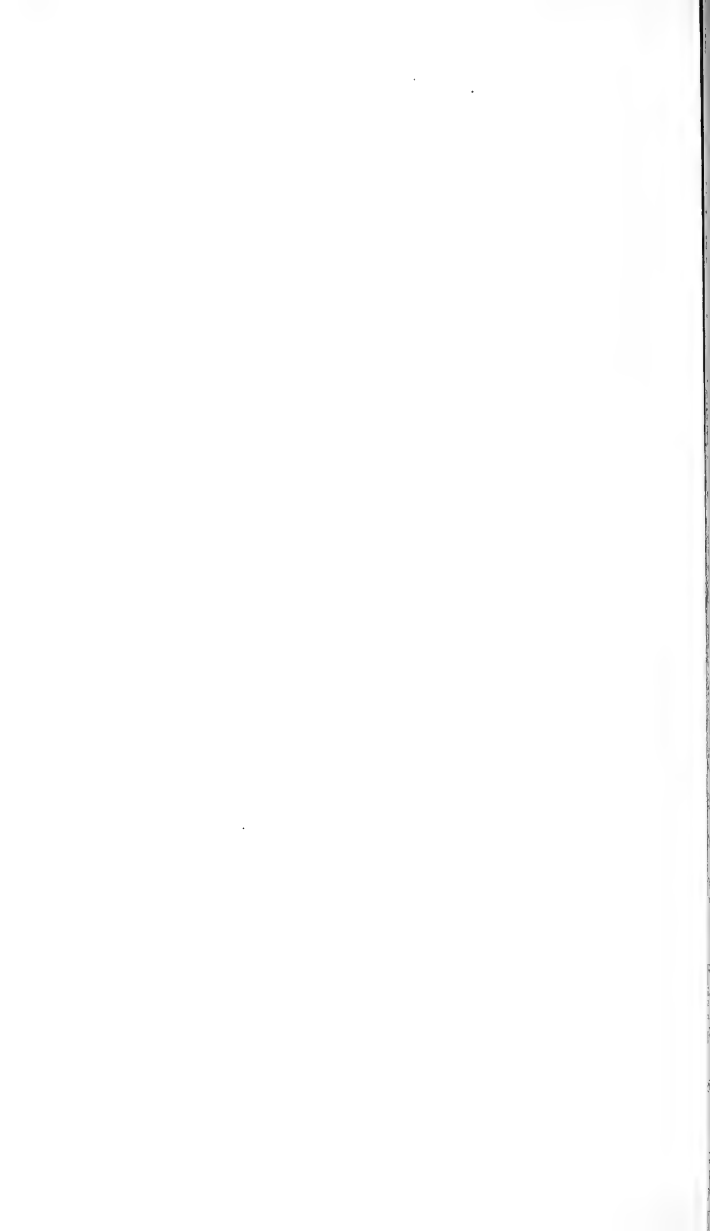
The eyes lie external to the bases of the rhinophores.

The shell, which is remarkably stout, is brownish in colour, and measures 13·5 mm. in length by 9·5 in breadth by 5 in height. The beak is strongly inturned, and is reflexed upward. The periostracum extends considerably beyond the anterior margin of the calcareous part of the shell.

In its internal anatomy this species so closely resembles *T. nigrocincta* that a detailed description is unnecessary, but attention must be drawn to the following special points of resemblance: the arrangement of the gut-coils; the absence of a crista aortæ upon the intra-pericardial part of the aorta; the large size of the reproductive ducts and accessory glands — these are, in fact, even larger than in *T. nigrocincta*, although the animal itself is considerably smaller. The relative size of the several parts differs, however. The albumen gland is larger in *T. elongata*, but the seminal vesicle and spermatheca are smaller. Much importance should not, I suppose, be attached to the size of these organs, for, no doubt, they vary considerably in this respect according to the time of year, as in other animals.

---







MALACOLOGICAL SOCIETY OF LONDON.

INCOME AND EXPENDITURE FOR THE YEAR ENDED 31st DECEMBER, 1905.

DR.	£ s. d.	CR.	£ s. d.
To Balance from last year . . . . .	24 2 2	By Cost of "Proceedings"—	
" Annual Subscriptions—		Printing and Postage . . . . .	£79 17 10
Ordinary Members . . . . .	£36 15 0	Illustrations . . . . .	19 4 11
Corresponding Members . . . . .	19 18 0		99 2 9
" Annual Subscriptions in arrear—	56 13 0	Printing Circulars, etc. . . . .	2 7 6
Ordinary Members . . . . .	£3 13 6	Postage and Cheque Book . . . . .	. . . . .
Corresponding Members . . . . .	4 8 6	Linnean Society—	. . . . .
" Annual Subscriptions in advance—	8 2 0	Electric Lighting . . . . .	£1 1 0
Ordinary Members . . . . .	£1 1 0	Gratuities to Attendants . . . . .	2 10 0
Corresponding Members . . . . .	3 11 0		3 11 0
" Life Members . . . . .	4 12 0	Lantern Operator . . . . .	. . . . .
" Entrance Fees . . . . .	12 12 0	Secretary's Postage . . . . .	. . . . .
" Sale of "Proceedings" . . . . .	4 14 6	Balance in hand . . . . .	. . . . .
" Dividends on £50 Metropolitan 2½% Stock	20 2 3		29 15 10
" Donations for Illustrations . . . . .	1 5 0		
" Advertisement Receipts . . . . .	5 8 3		
	1 10 0		
	£139 1 2		£139 1 2

We have this day examined the accounts of the Treasurer of the Malacological Society of London, and we find the above statement to be correct.

JOHN H. PONSONBY, Hon. Treasurer.  
January 13th, 1906.

HENRY WOODWARD } Auditors.  
WILFRED BENDALL }

## ANNUAL GENERAL MEETING.

FRIDAY, 9TH FEBRUARY, 1906.

B. B. WOODWARD, F.L.S., Vice-President, in the Chair.

Mr. J. E. Cooper and Mr. Louis Breun were appointed scrutineers.

The following report was read:—

“Your Council, in presenting their thirteenth Annual Report, are able to point, with satisfaction, to a considerable body of useful work accomplished during the past year, as shown by the details of the Society's publications given below.

They have, however, to record, with deep regret, the heavy loss that the Society has suffered within the year by the death of two of its former Presidents (Dr. W. T. Blanford and Professor G. B. Howes), and also of Captain F. W. Hutton and Mr. R. Rimmer. The Society is also the poorer for the retirement of five members, but, on the other hand, eight new members have been elected.

The membership of the Society stood as follows on December 31st, 1905:—

Ordinary members	.....	.....	.....	.....	.....	84
Corresponding members	.....	.....	.....	.....	.....	77
						161
				Total	.....	161

At the end of the year 1904 the total membership was 162, and of 1903, 165.

The financial state of the Society is quite satisfactory; all the liabilities of the year have been discharged, and there is a balance in the banking account of £29 15s. 10d., while the sum of £50 still remains invested in Metropolitan 2½ per cent. Stock.

Since the last Annual Meeting three parts of the ‘Proceedings’ have been issued, consisting of 185 pages, illustrated with 8 plates and 63 text-figures, thus completing the sixth volume of the Society's journal.

The Society is greatly indebted to the following gentlemen, who have partly defrayed the actual cost of the numerous illustrations or have provided drawings for reproduction:—R. G. Barnes, H. H. Bloomer, Rev. R. Ashington Bullen, H. C. Burnup, Lieut.-Colonel H. H. Godwin-Austen, G. K. Gude, H. von Ihering, R. B. Newton, H. A. Pilsbry, H. B. Preston, A. Reynell, E. A. Smith, F.S.O., G. B. Sowerby, H. Suter, and E. R. Sykes. It is only with such generous help that the Society is able to issue such a fully-illustrated publication.

Further, the thanks of the Society are specially due to the Council of the Linnean Society, through whose kindness it has been permitted, as in previous years, to hold its meetings in Burlington House."

On the motion of the Rev. R. Ashington Bullen, seconded by Mr. A. S. Kennard, the above was adopted as the Annual Report of the Society.

The following were elected as Officers and Council for the year 1906 :

*President.*—E. R. Sykes, B.A., F.L.S.

*Vice-Presidents.*—Sir C. N. E. Eliot, K.C.M.G. ; Professor W. A. Herdman, F.R.S. ; W. G. Ridewood, D.Sc., F.L.S. ; B. B. Woodward, F.L.S.

*Treasurer.*—J. H. Ponsoyby, F.Z.S.

*Secretary.*—R. H. Burne, B.A., F.Z.S.

*Editor.*—E. A. Smith, I.S.O.

*Six other Members of Council.*—Rev. R. Ashington Bullen, F.L.S. ; S. I. Da Costa ; J. Cosmo Melvill, M.A., F.L.S. ; R. Bullen Newton, F.G.S. ; Alexander Reynell ; H. Woodward, LL.D., F.R.S.

On the motion of Mr. E. A. Smith, I.S.O., seconded by Mr. R. Bullen Newton, a vote of thanks was passed to the Retiring Officer and Members of Council, and to the Auditors and Scrutineers.

---

#### ORDINARY MEETING.

FRIDAY, 9TH FEBRUARY, 1906.

B. B. WOODWARD, F.L.S., Vice-President, in the Chair.

Mr. T. H. Haynes gave a short account (illustrated by lantern slides and specimens) of Pearl Oyster Culture and Pearl Fishing.

After a brief review of the chief pearl fisheries of the Indian Ocean and Malay Archipelago, Mr. Haynes recounted his own experiences in the culture of mother-of-pearl shells in the Montebello Islands, off the north-west coast of Australia, and referred to some of the many difficulties that had to be met—want of water, difficulties of transport, hurricanes, and the ravages of 'vermin' (*Octopus*, Crabs, *Cerithium*, etc.). Operations were started with a small enclosure of loose stones, just above low-water line, in which mother-of-pearl shells were placed with the idea of stocking the surrounding shallows. Subsequently a small lagoon, dry at half-tide, was closed by a dam and cleared of vermin. In this young and old mother-of-pearl shells were placed and flourished, but the young proved to be 'false spat,' and did not develop into true mother-of-pearl shells. The experiments nevertheless showed satisfactorily that by thus planting out shells in secluded and favourable positions, increased growth can be ensured.

Mr. F. Homes exhibited a series of pearl shells in which were remarkable blister pearls, some being of very great size, and in some cases formed within the area of the adductor muscle.

The following specimens were also exhibited:—

By E. A. Smith, I.S.O.: A collection of deep-sea Mollusca from the Indian Ocean. These, which formed part of the dredgings of the "Investigator," included some enormous examples of *Dentalium* and *Solenomya*, and several other most interesting forms.

By the Rev. R. Ashington Bullen: Examples of the Mollusca used as food in Victoria, Australia; specimens of marine shells attached to mammalian Pleistocene bones found in East Crete by Miss Dorothy Bate; and a series of land shells collected near Avignon.

By J. E. Cooper: Some clusters of *Crepidula fornicata* (L.), from the River Crouch, Essex. Mr. Cooper pointed out the great increase in the numbers of this species in Essex waters during the last thirteen years. In the clusters shown the struggle for foothold had evidently been severe, in one case as many as nine specimens being piled one above another. Mr. Cooper also showed some shells of *Vivipara vivipara* (L.), inhabited by hermit crabs. These had been taken in crab-pots at Swanage.

Mr. A. S. Kennard: On behalf of Mr. R. J. Welch, a series of lantern slides illustrating Irish shells and the localities in which the several species are found.

---

ORDINARY MEETING.

FRIDAY, 9TH MARCH, 1906.

B. B. WOODWARD, F.L.S., Vice-President, in the Chair.

The following communications were read:—

1. "Descriptions of thirty-one Gastropoda and one Scaphopod from the Persian Gulf and Gulf of Oman." By J. Cosmo Melvill, M.A., F.L.S.

2. "*Capulus lissus*, Smith, as type of a proposed new subgenus (*Malluvium*) of *Amalthea*, Schumacher." By J. Cosmo Melvill, M.A., F.L.S.

3. "Notes on a Holocene deposit at Harlton, Cambridgeshire." By Rev. R. Ashington Bullen, F.L.S.

4. "On a small collection of Land and Fresh-water Shells from Uganda, with descriptions of a new species of *Martensia* and two new species of *Limicolaria*." By H. B. Preston, F.Z.S.

5. "On new species of Polyplacophora from South Australia." By W. T. Bednall and E. H. V. Matthews.

Mr. E. A. Smith, I.S.O., exhibited some living examples of *Testacella haliotideae*, collected by Mr. H. S. Cousens at Wanstead, Essex.

---

## ORDINARY MEETING.

FRIDAY, 6TH APRIL, 1906.

B. B. WOODWARD, F.L.S., Vice-President, in the Chair.

Mr. H. S. Cousens was elected a member of the Society.

The following communications were read:—

1. "On a species of the Land Molluscan genus *Dyakia* from Siam."

By Lieut.-Col. H. H. Godwin-Austen, F.R.S.

2. "Descriptions of new species of Land Shells from Peru and Colombia and two new species of *Curvella* from the Philippine Islands."

By S. I. Da Costa.

3. "Note on Swainson's genus *Volutilithes*." By R. Bullen Newton, F.G.S.4. "Further remarks on the genus *Chloritis*, with descriptions of eleven new species." By G. K. Gude, F.Z.S.5. "On the occurrence of *Vertigo parcedentata*, Al. Braun, in Holocene deposits in Great Britain." By A. S. Kennard and B. B. Woodward, F.L.S.6. "On the name *Pilsbryella*, von Ihering." By Dr. H. von Ihering.

The following specimens were exhibited:—

By E. A. Smith, I.S.O.: An example of the rare '*Babylonicum*' monstrosity of *Neptunea antiqua*; a remarkably large specimen of the same species nine inches in length; also a reversed example, together with two similar reversed specimens shown on behalf of Mr. B. B. Woodward and Mr. A. Reynell.By B. B. Woodward (on behalf of Dr. Chaster): Specimens of *Jamina triplicata*, Studer, discovered by Dr. Chaster at Brandon, Suffolk, in 1904. For an account of this new addition to the British fauna see Chaster, Journ. of Conch., vol. xi, p. 319.

By F. G. Bridgman: A copy of an old work on Natural History by Filippo Bonanni, dated 1691, entitled "Observationes circa viventia, quæ in rebus non viventibus reperiuntur. . . . His accesserunt aliquot Animalium Testaceorum Icones non antea in lucem editæ."

The second part of this work, pp. 308-335, gives an account of a number of species of shells, illustrated by somewhat rough figures, but sufficiently good in most cases for specific recognition.

## OBITUARY NOTICES.

PLATE VI.<sup>1</sup>

It is with deep regret that we have to record the loss to this Society of another of its past Presidents. It was only in the early part of last year that we had to mourn the death of Professor G. B. HOWES, and now it becomes our sad duty to chronicle that of Dr. W. T. BLANFORD, C.I.E., F.R.S., etc., who passed away on the 23rd June, 1905, aged 72.

Already several memoirs of our distinguished President have appeared in various journals; nevertheless, we feel it our duty to give some idea in these pages of the work which he accomplished, more especially in connection with the branch of science in which this Society is particularly interested.

For twenty-seven years Dr. Blanford was engaged on the Geological Survey of India, and published many valuable reports upon the work achieved during that period. Although, while in India, his official duties were in connection with geology, he still had frequent opportunities of paying attention to the zoology of that country. His memoirs treating upon both the vertebrates and invertebrates are numerous and valuable, and indispensable to the student of the Indian fauna. Perhaps no one has been so qualified to write upon the animal life of India as Dr. Blanford, for he possessed, in an exceptional degree, a great knowledge of the physical characteristics of the country. He had, to a large extent, explored the Indian Peninsula, and thus acquired a great personal acquaintance with the distribution of animal life. The results of this extensive knowledge may be seen in his classic report on "the distribution of vertebrate animals in India, Ceylon, and Burma," published in 1901.

Dr. Blanford wrote many papers on Indian mammals, birds, and reptiles, which appeared in Indian and home journals, and also wrote the account of the mammals and birds in the "Fauna of India," of which he edited the seventeen volumes which have already appeared, and, at the time of his death, he was engaged upon the volumes treating upon the land and fresh-water mollusca.

Some of the earliest work of Dr. Blanford was in connection with Indian malacology, and from the year 1860 onward a series of about forty valuable papers from his own pen, or in conjunction with his brother, H. F. Blanford, appeared in the Journal of the Asiatic Society of Bengal, the Annals and Magazine of Natural History, the Proceedings of the Zoological Society, the Journal de Conchyliologie, and in the Proceedings of this Society. Altogether it is estimated that Dr. Blanford wrote about 400 pages upon Indian Mollusca, besides some account of the fauna of Abyssinia and Persia, a knowledge of which he obtained, from personal observation, whilst accompanying the expeditions under Lord Napier of Magdala, and the Persian Boundary Commission.

---

<sup>1</sup> This portrait, which appeared in the Geological Magazine, 1905, dec. iv, vol. ii, has been very kindly lent, for reproduction here, by Dr. Henry Woodward, F.R.S.



*G. T. Blandford*





Dr. Blanford occupied many honourable positions in the scientific world, and many were the honours conferred upon him. He was twice President of the Asiatic Society of Bengal, President of the Geological Society in 1889-1890, President of the Geological Section of the British Association in 1884, President of the Malacological Society 1899-1900, etc., etc. In 1883 he was the recipient of the Wollaston Gold Medal, the highest mark of distinction at the disposal of the Geological Society; and in 1902 he received from the Royal Society, of which he had been a Fellow for many years, a royal medal in recognition of his memoir on the distribution of animals in India, and of his work in connection with the "Fauna of British India." In 1904 the Companionship of the Order of the Indian Empire was conferred upon him by H.M. the King in recognition of his valuable services in India and of work accomplished in connection with that country since his retirement from the public service. Dr. Alcock writes in the "Records of the Geological Survey of India":—"No notice of Blanford as a zoologist would be complete that failed to emphasize his telling personal influence and his abundant sympathy with all who were in any way interested in the natural history of this country. It seemed to be natural to apply to Blanford, and natural to Blanford to sacrifice his time to help others. No man ever showed a warmer side to the amateur, or was so entirely free from the narrow prejudice of the professional. Of liberal intellect, of just and charitable temper, he was imbued with the true scientific spirit."

With regard to his personality we cannot do better than quote the words of his lifelong friend, Lieut.-Col. H. H. Godwin-Austen, who says:—"All must have felt the charm of his society. Besides being a naturalist he was a keen sportsman—the one often makes the other;—with gun or rod in hand no one enjoyed his day more. It is only in the life spent in camp, with its curious contrasts of pleasure and discomfort, in the hours of walking through the stubbles or standing by the covert-side, that one really gets to know all that there is of good in a friend's nature. William Blanford could enter into such pleasures, and his knowledge of nature had been increased thereby; he will be missed not only as a man of science, but as a friend by many."

A list of Dr. Blanford's writings on Mollusca can be extracted from the catalogue of his scientific papers which appeared in the Geological Magazine, 1905, dec. v, vol. ii, pp. 9-15. We have, however, noticed the following omissions:—

- 1868. On the occurrence of *Diplommatina Huttoni* and *Eneea bicolor* in the West Indies. (Ann. Mag. Nat. Hist., 1868, vol. i, pp. 110-112.)
- 1875. Note on the Molluscan genera *Celostele*, *Benson*, and *Francesia*, Paladilhe, and on some species of Land Shells from Aden. (Journ. Asiatic Soc. Bengal, 1875, vol. xlv, pp. 41-46. Proceedings, 1875, p. 138.)
- 1881. Land, Fresh-water, and Estuarine Mollusca. (British Burma Gazetteer (Rangoon), 1880, vol. i, pp. 698-716.)
- 1899. On *Ariophanta Dalyi*, n. subsp., from Mysore, with a note on *Mariella Dussumieri* (Val.). (Proc. Malac. Soc., vol. iii, pp. 280-283.)
- 1899. Note on the Land Mollusca of Bombay. (Journ. Bombay Nat. Hist. Soc., vol. xii, pp. 326-328.)
- 1901. Note on *Bensonia*, and on an apparently undescribed species, *B. mimela*. (Proc. Malac. Soc., vol. iv, pp. 178-179.)

1901. Note on *Bensonia Mainwaringi* and *Macrochlamys Dalingensis*. (Proc. Malac. Soc., vol. iv, pp. 180-182.)
1901. Notes on *Ariophanta*, *Xestina*, *Nilgiria*, and *Euplecta*, with lists of species. (Proc. Malac. Soc., vol. iv, pp. 241-253.)
1902. On *Rhiostoma Dalyi*, n.sp., and *Sesava megalodon*, n.sp., obtained by the late Mr. W. M. Daly in Siam. (Proc. Malac. Soc., vol. v, pp. 34-35.)
1903. Notes on Mr. Daly's collection of Land and Fresh-water Mollusca from Siam. (Proc. Malac. Soc., vol. v, pp. 274-284.)
1903. Note on the supposed locality "Sulgranees," whence Dr. J. E. Gray's type-specimens of Indian Jurassic Ammonites were said to have been obtained. (Proc. Malac. Soc., vol. v, p. 345.)

CAPTAIN F. W. HUTTON, Corresponding Member of the Society, died on October 27th last year, on board ship, whilst on the way to his home in New Zealand, after a visit to this country.

He was originally intended for the Navy, but subsequently entered the Army, and saw active service during the Crimean War and the Indian Mutiny. A few years later he retired from military service and emigrated to New Zealand, where he soon entered upon a scientific career, at various times holding the posts of Assistant Geologist to the New Zealand Geological Survey, Curator of the Otago Museum, Professor of Natural Science in the Otago University, Professor of Biology and Geology in the University of New Zealand, and Curator of the Christchurch Museum. Captain Hutton was also elected President of the New Zealand Institute, and President of the Australasian Association for the Advancement of Science. He was made Fellow of the Geological Society in 1861, a Corresponding Member of the Zoological Society in 1872, and Fellow of the Royal Society in 1892.

The range of his scientific work, almost exclusively in connection with the country of his adoption, was very wide, embracing many branches of zoology and geology. He did not therefore write so much on Mollusca as he might have done had his time and talents been restricted to that branch of science. However, including his various manuals on the fauna, he published altogether nearly 900 pages on New Zealand Mollusca, both recent and fossil.

Most of his writings appeared in the Transactions of the New Zealand Institute, but he also sent contributions to other Australasian journals, to the Philosophical Magazine, the Annals and Magazine of Natural History, the Geologist, Geological Magazine, Journal of the Geological Society, Proceedings of the Zoological Society, the Ibis, Nature, Journal of Ornithology, Quarterly Journal of Microscopical Science, Monthly Microscopical Journal, Proceedings of the Royal Society of Tasmania, Journal de Conchyliologie, New Zealand Journal of Science. He also wrote a "Class-book of Elementary Geology," 1875; "Darwinism and Lamarkism, Old and New," 1899; "The Lesson of Evolution," 1902; "Nature in New Zealand," 1903; "The Animals of New Zealand," 1904.

It will thus be seen that Captain Hutton was as prolific a writer as his subjects were varied. His writings on New Zealand malacology are indispensable to the student of the fauna of that country, and

reference, in this connection, should be made to his Manual of 1880, and to the "Index Faunæ Novæ Zealandiæ," published as recently as the year 1904. With these two works in hand we have an excellent guide to the study of the Mollusca of that country, for they practically indicate all that has been done upon the subject.

Captain Hutton was personally acquainted with few of the conchologists of this country, but a Corresponding Member of this Society who knew him well wrote, on hearing of his death: "To me it is a terrible blow, for Captain Hutton was the best friend I ever had in New Zealand. With his death, one of the noblest hearts that ever lived has ceased to beat. The loss of a brother could not be more painful to me." This personal appreciation of the man is enough. We need say no more. New Zealand has lost one of its foremost scientists, and many will mourn the loss of a true friend.

RICHARD RIMMER, a member of this Society since 1893, died at his residence, Dalawoodie, Dumfries, on August 19th, 1905, at the age of 79. He was a keen all-round naturalist, but made a special study of the terrestrial and fluviatile mollusca of this country, and in 1880 he published a little book upon that subject, entitled "The Land and Fresh-water Shells of the British Islands." It was quite an unpretentious work, but exhibited a novelty in the manner of the illustrations, being one of the first conchological works to be illustrated by the aid of photography. With the exception of one or two short notes published in the Journal of Conchology, the above work appears to be the extent of Mr. Rimmer's writings on mollusca. Individually, he was regarded by those who best knew him as "one of the most charitable, lovable, social, and kind-hearted men."

---

## NOTES.

---

*CASSIDARIA RUGOSA.* (Read 9th March, 1906.)—I wish to add a note of correction to my paper upon the anatomy of *Cassidaria rugosa* in these Proceedings, Vol. VI, p. 297. Mr. Moore's lecture at the meeting held on the 16th of June last gave me the first intimation that I might be wrong, for, from my description of the nervous system, *Cassidaria* would be a member of his 'hypoathroid' group, instead of, as would be expected from analogy, 'epiathroid.'

To make certain of this point the specimen has been kindly examined by Mr. Burne and re-examined by myself, and we feel sure, in spite of its somewhat fragmentary condition, that the original description was incorrect. The cerebral and pleural ganglia are fused together, and the mass is only partly separable laterally into two lobes. The anterior aorta is attached to the remains of one of the pedal ganglia, and, from its contracted condition, was in the first instance mistaken for a pleuro-visceral connective.

A. REYNELL.

NOTE ON *NEPTUNEA ANTIQUA*. (Read 6th April, 1906.)—The variability of this species in form, size, and sculpture is proverbial. Jeffreys mentions four varieties, and as many as twelve monstrosities. Of the two specimens now exhibited, one is remarkable for its great size, and the other on account of its rarity as an abnormality. The largest recorded dimensions are those given by Jeffreys, who says, "Now and then giants are seen, 7 or 8 inches long," the usual average size being about half that length. The present example is exactly  $8\frac{1}{2}$  inches long, and with the protoconch (which is broken away) must have been nearly 9 inches. The other specimen is an example of the *Monstrum Babylonicum*, which was described and figured by Captain Thomas Brown as *Fusus Babylonicus* in his "Illustrations of the Recent Conchology of Great Britain and Ireland," p. 127, pl. lvii, fig. 19. He did, however, entertain some doubt of its specific distinctness, for he observed, "this shell has much the aspect of *Fusus antiquus*, and is probably only a *lusus* of that species."

He "found it on the strand, opposite Hull." The present specimen came from Billingsgate Market, and has been presented to the British Museum by Mr. E. J. Field.

Sinistral specimens of this species are very rare. Forbes and Hauley mention one as having been procured by Mr. G. B. Sowerby from off the mouth of the Thames, and the British Museum in 1843 purchased a small example said to have been found in Pegwell Bay, Kent.

Sinistral examples have been casually quoted as occurring on the English coast, but I do not find any actual records of individual specimens.

Mr. B. B. Woodward has shown me a specimen in his collection found off Hastings, and Mr. A. Reynell also possesses an example, but he does not know where it was obtained. The Rev. Canon Norman also possesses two specimens.

Mr. F. W. Harmer,<sup>1</sup> in a paper dealing with this species, observes: "Reversed specimens of *Neptunea antiqua* are very occasionally met with on the English coast, but except that they are left-handed, they cannot be distinguished from the right-handed shells among which they occur. The sinistral forms of Vigo Bay (*N. contraria*) are, on the contrary, materially different from the dextral species of British or Arctic seas," an opinion with which I fully concur.

E. A. SMITH.

ON THE NAME *PILSBRYELLA*, VON IHERING. (Read 6th April, 1906.)—A year ago, in the Proceedings of this Society (Vol. VI, p. 199), I proposed the name *Pilsbryella* as a section of *Tomigerus*, the paper being published in March, 1905. It has recently been brought to my notice that Herr Nierstrasz utilized the same term (Chitonen der Siboga Exped., p. 11) for a section of *Lepidopleurus*, his paper being published in January, 1905. I therefore propose to replace *Pilsbryella*, von Ihering, *non* Nierstrasz, by *Cearellu*, nom. nov.

H. VON IHERING.

<sup>1</sup> Proc. Int. Congr. Zool., 1898, pp. 222-225, pl. iii.

DESCRIPTIONS OF THIRTY-ONE GASTROPODA AND ONE  
SCAPHIPOD FROM THE PERSIAN GULF AND GULF OF  
OMAN, DREDGED BY MR. F. W. TOWNSEND, 1902-1904.

By J. COSMO MELVILL, M.A., F.L.S.

*Read 9th March, 1906.*

PLATES VII AND VIII.

THE abyssal forms of molluscan life obtained beyond the 100 fathom limit in the Gulf of Oman seem almost inexhaustible, but the following descriptions well-nigh complete the series received up to the date of writing these lines, excepting indeed so far as the Pelecypoda are concerned. All of these, however, have at last been worked out, and a catalogue is in course of compilation by myself and Mr. R. Standen, and this we hope to publish without much further delay—a delay, I might add, that has been, from various causes, hitherto inevitable.

Of the minute forms of Gastropoda in these seas, many are exceedingly rare and local, others abound in countless numbers. Another haul of the dredge from the prolific stations, lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , at 156 fathoms, would no doubt have brought to light some wonderful species that perhaps now we may never see. Fragments, indeed, exist in the shell-sand of several unknown forms, not, unfortunately, in a condition to be described. One such is, perhaps, of the family Solariidæ, with flattened base, beautifully finely decussate surface, and curious deep and narrow umbilicus, but the upper whorls are entirely broken away. Two or three Pleurotomidæ are in similar unfortunate condition, and a few others besides, the families and genera of which can be but guessed at.

I am informed by Mr. Townsend that the bringing up of this shell-sand was mainly due to an absolute accident, the anchor of the s.s. "Patrick Stewart" having dragged during the night, and stirred up the bottom ooze to an unusual extent.

When the abyssal and benthal life is better known, I should not be surprised if it be found that the 'minutiora' eclipse the larger marine species numerically in the proportionate ratio of 3 : 1, or even in a still greater degree. They are just as beautiful as—indeed, as a rule, more delicately sculptured than—their better known congeners, and, taken as a whole, do not seem to vary from their types to anything like the same extent. When once, therefore, their 'facies' has been grasped, the task of discrimination and differentiation becomes easier than might be thought to be the case by those who have not yet studied them.

When not otherwise stated, the locality for the following will be the one just quoted above, viz., in the Gulf of Oman at 156 fathoms.

I must just add, as on many previous occasions, my great indebtedness to Mr. Edgar A. Smith, I.S.O., of the British Museum (Natural History), to Mr. E. R. Sykes, F.L.S., Mr. G. B. Sowerby, F.L.S., and Mr. R. Standen. Likewise to Messrs. B. R. Lucas, J. Wilfrid Jackson, and the Rev. Lewis Shackelford for having so carefully sorted much of the shell-sand.

*SCALARIA CANEPHORA*,<sup>1</sup> n.sp. Pl. VIII, Fig. 28.

*S. testa minuta, attenuata, gradato-fusiformi, alba, delicata, anfractibus 8, quorum 4 apicales ochracei, plus minus læves, cæteris ad suturas multum impressis, longitudinaliter arcte oblique lamellatis, interstitiis sub lente spiraliter striatulis, ultimo infra medium subangulato, apertura rotunda, peristomate continuo, supra extus angulato. Long. 4, lat. 1.5 mm.*

This rare little Wentletrap, occurring as it did with so many other new forms of its genus, combines certain points of both *S. goniophora* and *theleteria*, M. & S., being similar to the first-named in general form, though its smallness and greater attenuation of whorl at once distinguish it, while to the latter species (*theleteria*) it assimilates in its decussating sculpture, though this characteristic is much finer, proportionately, in our species.

*SCALARIA (CIRSOTREMA) BONA*, n.sp. Pl. VIII, Fig. 29.

*S. testa fusiformi, crassa, albocinerea, rudi, varicosa, anfractibus ad 8, apicali . . . , cæteris apud suturas impressis, arcte rudilamellatis, lamellis obliquis, incrassatis, interstitiis lævibus, ultimo anfractu versus basim spiraliter uniearinata, apertura rotunda, peristomate continuo, percrasso. Long. 14, lat. 6 mm.*

A boldly constructed species, of the same alliance as *S. diadema*, Sowb., but the character of the lamellæ is totally distinct, and the contour more fusiform.

*CROSSEIA ERYMA*,<sup>2</sup> n.sp. Pl. VII, Fig. 1.

*C. testa perminima, profunde sed anguste umbilicata, alba, nitida, fere rotunda, solidula, compacta, anfractibus 5, quorum 2 apicales vitrei, lævissimi, cæteris tumidulis, apud suturas impressis, undique arcissime et delicate spiraliter striatis, ultimo ventricosu-univaricoso, globulari, circa umbilicum concentricè crassicarinato, apertura rotunda, labro incrassato, fere continuo, albo, columella excavata. Long. 2, lat. 1.15 mm.*

A very small but elaborate little species, belonging to a genus which has, so far, had few exponents brought to light. The only species near this shell would seem to be *C. striata*, Boog Watson, from Cape York, N. Australia. The bordered umbilicus is the same in both species, but the spiral striæ appear fine and closer in *C. eryma*, and the base is not so produced.

<sup>1</sup> *κανηφόρος*, 'basket-bearing,' from the fine cancellations.

<sup>2</sup> *ἔρμα*, 'a bulwark,' from the strong umbilical keel.

FOSSARUS (COUTHOUYIA) EUDMETUS,<sup>1</sup> n.sp. Pl. VII, Fig. 2.

F. (*Couthouyia*) testa minima, alba, delicata, vix perforata, ovata, anfractibus 5, quorum apicalis lævis, vitreus, cæteris ad suturas canaliculatis, undique spiraliter et uniformiter crassiliratis, interstitiis squarrose cancellatis et fenestratis, ultimo circa regionem umbilicarem incrassato, fortiter carinulato, apertura ovata, labro extus 6-8 crenulato, columella excavata, apud basim paullum callosa. Long. 2, lat. 1.5 mm.

A very small and delicate species, which I think has nearly, if not quite, attained full growth. It resembles *Couthouyia insignis*, Nevill, but the aperture is smaller and rounder proportionately, and there is hardly any umbilicar perforation, the sculpture being somewhat similar.

## DIALA TRILIRATA, n.sp. Pl. VII, Fig. 3.

D. testa minuta, pyramidata, lævi, nitida, perforata, anfractibus 8, quorum apicales 2 globosi, vitrei, cæteris apud suturas canaliculato-impressis, superne brunneo vel castaneo sparsim maculatis, maculis paucis squarrosulis, ultimo anfractu ad peripheriam acute carinato, carinulis vel liris tribus contiguis prædito, ad basim angulatim prolongato, apertura ovata, labro paullum effuso, columella recta. Long. 2, lat. 1.15 mm.

Characterized by its small size, diamond shape, the body-whorl acutely keeled at the periphery, thrice lirated in all. It is obscurely marked with distant squarish brown or chestnut blotches, just below the sutures, otherwise is smoothish and immaculate. *Diala* is sometimes considered as a genus on its own merits, sometimes as a mere appanage of *Litiopa*, Rang.

## CERITHIOPSIS MATHILDÆFORMIS, n.sp. Pl. VII, Fig. 4.

C. angustissime fusiformi, minuta, albida, vel hic illic brunneo-sparsa, rugosa, anfractibus 9-10, apice mamillato, parvo, lævi, cæteris multum apud suturas impressis, ventricosis, quatuor liris spiralibus rugosis accinetis, undique longitudinaliter obscure costulatis, juncturis costularum lilarumque gemmatis, ultimo anfractu quinque liris prædito, apertura subrotunda, labro tenui, columella fere recta. Long. 3.15, lat 1 mm. (sp. max.).

A very minute, narrow, yet rugged species, with some resemblance to a *Mathilda* in miniature, hence the proposed specific name.

EULIMA NISONIDA,<sup>2</sup> n.sp. Pl. VII, Fig. 6.

E. testa fusiformi, subtrapeziformi, nitida, alba, polita, omnino lævissima, solida, anfractibus 12-13, quorum 2 apicales parvi, globulares, cæteris ad suturas paullulum impressis, fascia lactea interna infra, juxta suturas spiraliter solum videnda, ultimo anfractu apud peripheriam angulato, apertura ovata, labro extus paullum incrassato, columella recta apud basim producta. Long. 6, lat. 2 mm.

<sup>1</sup> εὐδμητος, 'well-fashioned.'

<sup>2</sup> *Nisonida*, from its likeness to a species of *Niso*, Risso.

Angled at the periphery of the body-whorl, this typical *Eulima* much resembles in form *Niso venosa*, Sowb., from the same region, the var. *pura* of this species occurring sparingly in the same shell-sand. But there is no umbilicar perforation present, and the affinity is merely superficial. Two or three examples have, so far, alone occurred. It is of the same alliance as *E. Shoplandi*, Melv., and *E. Gentilomiana*, Issel, but the peripheral angle gives distinctive characters.

*EULIMA RHÆBA*,<sup>1</sup> n.sp. Pl. VII, Fig. 7.

*E.* testa parva, aciculata, ad medium leniter incurva, subpellucida, lacteo-vitrea, perlævi, delicata, anfractibus ad 10, quorum apicales 2-3 nitentes, vitrei, lævissimi, cæteris ad suturas parum impressis, aretis, condensatis, apertura anguste oblonga, labro tenui, simplice, columella obliqua. Long. 3, lat. .75 mm.

One of the smallest of the genus, but not the least interesting, being allied to the European *E. Philippii*, Weink., also known as *distorta*, Phil. non DeFrance, and *incurva*, Renieri. I have closely compared it with this variable species. It occurred but sparingly in shell-sand, and its discovery is due to the energetic sifting of Mr. J. Wilfrid Jackson.

*MUMIOLA EPIBATHRA*,<sup>2</sup> n.sp. Pl. VII, Fig. 5.

*M.* testa minuta, angusta, fusiformi, alba, rimata, delicata, anfractibus 6-7, quorum apicales vitrei, læves, paullum planati, cæteris fortiter gradatis, arete sed indistincte longitudinaliter costulatis, spiralter aretissime striatis, apertura ovato-rotunda, labro paullum effuso, columella fere recta. Long. 3, lat. 1 mm.

A puzzling form, occurring extremely rarely in shell-sand. I am not sure as to its proper location, but in several ways *Mumiola* seems best suited to it. The peculiarly flattened apex is curious; the mouth, too, is small, proportionately speaking.

*MUCRONALIA BIZONULA*, n.sp. Pl. VIII, Fig. 31.

*M.* testa minuta, attenuata, fusiformi, lævissima, polita, tenui, subvitrea, anfractibus 8, quorum 4 mamillati, caudati, irregulares, vitrei, ochrotineti, cæteris ad suturas vix impressis, lævibus, spiralter zona brunnea cingulatis, ultimo bicingulato, peristomate tenui, ad suturam paullulum sinuato et effuso, ad basim producto, columella obliqua. Long. 3, lat. 1 mm.

A very minute, attenuately fusiform species, the upper whorls spirally once rufous or brown-banded, bizoned on the body-whorl, after the fashion of certain *Liostracæ*. A very few specimens have, so far, been found. Indeed, the three *Mucronaliæ* that occur together in the dredging at 156 fathoms are all of decidedly rare occurrence.

<sup>1</sup> ῥαιβός, 'bent, incurved.'

<sup>2</sup> ἐπιβάθρα, 'a scaling ladder,' from the gradate whorls.



MUCRONALIA LEPIDA,<sup>1</sup> n.sp. Pl. VII, Fig. 8.

*M. testa parva, ovato-fusiformi, vitrea, delicata, lactea, polita, lævigata, anfractibus 8-9, quorum 3-4 apicales parvi, mamillati, apice ipso heterostropho, cæteris ad suturas vix impressis, rapide accrescentibus, anfractu ultimo tertiam totius longitudinis partem præbente, apertura ovata, labro paullum incrassato, columella crassa, simplice. Long. 3, lat. 1 mm.*

A neatly-formed *Mucronalia*, of thicker and more compact substance than its ally, *M. oxytenes*, Melv., from the same locality.

SYRNOLA APERANTA,<sup>2</sup> n.sp. Pl. VII, Fig. 9.

*S. testa attenuato-fusiformi, alba, nitida, polita, solidiuscula, anfractibus ad 10-11, quorum apicales 2 parvi, quam maxime heterostropho, vitreo-globulares, cæteris apud suturas multum canaliculato-impressis, et paullum gradatis, quatuor ultimis anfractibus rectis, uniformibus, ultimo paullum producto, apertura ovato-rotunda, labro haud effuso, ad basim producto, margine columellari recto, fortiter uniplicato. Long. 6, lat. 1.25 mm.*

This species might easily be confounded with *Eulimella carmanica*, M. & S., which occurs with it in equal plenty. It is, however, of a more gracefully attenuate contour, with aperture smaller proportionately. The columella, too, is strongly once-plicate, in the *Eulimella* it is simple.

SYRNOLA CLAVELLOSA,<sup>3</sup> n.sp. Pl. VII, Fig. 10.

*S. testa parva, alba, nitida, polita, angusto-fusiformi, solidula, anfractibus 9-10, quorum 2-3 apicales magnopere heterostropho, conspicui, bulboso-globulares, cæteris apud suturas canaliculato-impressis, lineis internis 4-5 spiraliter præditis, apertura ovata, labro paullum producto, margine columellari fortiter uniplicata. Long. 4.5, lat. 1 mm.*

A very narrowly fusiform species, the heterostrophe apical whorls unusually swollen, globular, club-like, and conspicuous in proportion to the size of the shell. The internal spiral lines, showing opaquely through the surface, are four or five in number, broadest just below the sutures. Very faint spiral chestnut banding appears in some specimens. It is one of the smallest *Syrnola*, and not, I think, very comparable with other forms of the genus.

## TURBONILLA (PYRGOSTYLIS) DELIA, n.sp. Pl. VIII, Fig. 30.

*T. testa breviter fusiformi, minuta, albo-straminea, anfractibus 8, quorum 2 apicales globulosi, vitrei, sublæves, cæteris ad suturas multum impressis, tumidulis, arcte lævicostatis, interstitiis lævissimis, apertura ovali, peristomate subeffuso, continuo, columella obscure plicata. Long. 3, lat. 1 mm.*

*Hab.*—Persian Gulf, Bushire, 6-10 fathoms.

Conspicuous for its ventricose whorls, yellowish colour, and shortened spire.

<sup>1</sup> *Lepidus*, 'neat, pleasing.'

<sup>2</sup> ἀπέραντος, 'countless,' from its frequency.

<sup>3</sup> *Clavellosa*, dim. of *clavus*, 'a club,' from the form.

## TURBONILLA HERMIA, n.sp. Pl. VII, Fig. 11.

*T. testa compresso-fusiformi, alba, nitida, anfractibus 9-11, quorum 2 apicales omnino heterostrophi, globulares, vitrei, cæteris ad suturas impressis, lævibus, paullulum ventricosulis, undique longitudinaliter lævicostatis, costis arcatis, nitidis, numero ultimum apud anfractum circiter 18, interstitiis sub lente delicatissime spiraliter striatis, apertura ovata, labro tenui, fere recto, columella obscure uniplicata. Long. 4.5, lat. 1.25 mm., sp. maj.; long. 4, lat. 1 mm., sp. min.*

Hitherto confounded with *T. terebrina*, Melv., which, first discovered by Mr. Abercrombie at Bombay, has been found to occur in the Gulf of Oman also, this new species, one of the most distinct of the many affecting this region, may be recognized by its compressedly fusiform build and 9-11 whorls, the lower ones mostly somewhat pinched in towards the centre, causing a slightly sinuous contour. The fine spiral striations may serve to distinguish it at once from the perfectly smooth *T. terebrina*. The columella is very obscurely once plicate, showing a possible transition to, and link with, *Pyrgulina*. The study of the *Turbonillæ*, in these seas, as elsewhere, presents numberless difficulties, especially as regards the *basilica-sororia* section, which abound in every dredging, and vary to a considerable extent. The form of the heterostrophe apex may serve as an index to specific character, but it is most likely that the ♂ and ♀ present shell-modifications difficult—indeed, with our present state of knowledge almost impossible—to grasp.

## ODOSTOMIA (PYRGULINA) HERVIERIOIDES, n.sp. Pl. VII, Fig. 12.

*O. (Pyrgulina) testa angusta, minima, alba, cylindræa, nitida, anfractibus 6½, quorum 1½ apicales vitrei, heterostrophi, globulosi, cæteris fere rectis, apud suturas paullum impressis, undique longitudinaliter costulatis, costulis rectis, crassis, numero ad 16 ultimum apud anfractum, interstitiis lævibus, apertura ovata, peristomate continuo, extus fere recto, columella uniplicata. Long. 3, lat. 1 mm.*

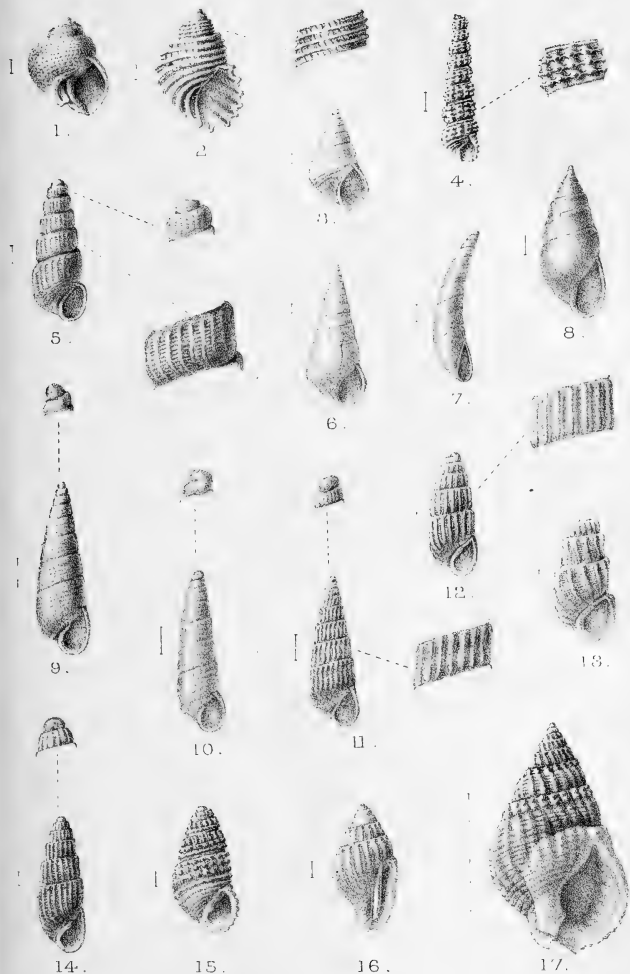
Minute, white, the straight longitudinal riblets being thick and large, proportionately speaking, with the interstices quite smooth. In miniature, much resembling superficially *Herviera isidella*,<sup>1</sup> M. & St., from the New Caledonian region, or *Elusa livida*, Sowb.,<sup>2</sup> from the Philippine Islands, which is, I consider, synonymous with *H. isidella*. Indeed, these may all some day be relegated to the same genus.

## ODOSTOMIA (PYRGULINA) TENERRIMA, n.sp. Pl. VII, Fig. 13.

*O. (Pyrgulina) testa minutissima, alba, fusiformi, delicata, anfractibus 4-5, quorum 1-2 apicales planato-globosi, vitrei, cæteris gradatulis, longitudinaliter costatis, costis prominulis, superne angulatis, interstitiis lævibus, apertura ovata labro fere recto, ad suturam angulato, columella paullum excavata, obscure uniplicata. Long. 1.75, lat. 0.5 mm.*

<sup>1</sup> Journ. of Conch., vol. ix (1899), p. 186, fig.

<sup>2</sup> Proc. Malac. Soc., vol. iv (1901), p. 210, pl. xxii, fig. 8.



A. H. Searle, del et lith.

Huth, imp

NEW SPECIES OF GASTROPODA, &c, FROM THE PERSIAN GULF, AND GULF OF OMAN.



The minutest mollusk yet discovered in the Persian Gulf region, but, nevertheless, beautiful in form, being four to five-whorled, scalato-gradate, longitudinally ribbed, ribs numbering about 12 on the body-whorl, the interstices being smooth. The lip is angled above, nearly straight otherwise, columella slightly excavate. But three or four examples have so far occurred, but so tiny an organism can easily be overlooked.

ODOSTOMIA (PYRGULINA) THELXINOA,<sup>1</sup> n.sp. Pl. VII, Fig. 14.

O. (*Pyrgulina*) testa perminuta, angusta, gradatula, cylindrica, alba, nitida, anfractibus 6-7, quorum duo apicales heterostrophi, vitrei, globulosi, cæteris apud suturas multum impressis, undique longitudinaliter costulatis, costulis fere rectis, delicatis, interstitiis sub lente spiraliter arcte striatis, apertura oblique ovata, labro paullum effuso, continuo, columella uniplicata. Long. 2, lat. .75 mm.

This and the preceding *Pyrgulina* occurred almost equally rarely. Their extremely small size, and, in the case of *P. thelxinoæ*, its neatly turreted or gradate whorls, will serve to distinguish them from their allies.

ODOSTOMIA (MIRALDA) IMA,<sup>2</sup> n.sp. Pl. VII, Fig. 15.

M. testa ovato-fusiformi, compressa, solidula, albida, anfractibus 6, quorum 2 apicales læves, heterostrophi, cæteris apud suturas bene impressis, subcanaliculatis, superne apud medium anfractuum costatis, trinis gemmularum ordinibus decoratis, costulis infra evanidis, sed, penultimo et antepenultimo anfractibus una, ultimo multis ad basium liris fortibus spiraliter accinctis, interstitiis sulculosis, apertura ovata, labro extus crasso, paullum effuso, columella uniplicata. Long. 2.5, lat. 1.

A charming little species, nearly allied to *M. diadema*, A. Ad., from Japan, and which has been also reported from Indian seas. It is more compact, and stouter proportionately than either this or the allied *M. gemma*, A. Ad., the disposition of gemmuled riblets on the upper portion of the whorls, and spiral liræ on the lower, being identical. I would also take this opportunity of stating that two allied species from the Persian Gulf, described in 1903 by Mr. Standen and myself as *Actæopyramis latitia* and *brevicula*,<sup>3</sup> would be better located in the genus *Miralda*.

COLUMBELLA (SEMINELLA) COMISTEA,<sup>4</sup> n.sp. Pl. VII, Fig. 16.

C. testa minuta, obesa, utrinque attenuata, solida, lævi, pallide straminea, anfractibus 6, quorum 3 apicales vitrei, læves, cæteris undique longitudinaliter costulatis, aliter lævissimis, ultimo pyriformi, ad basim maxime attenuato, et spiraliter lirato-sulcata, costulis dorsaliter inferne evanidis, apertura angustissima, labro incrassato, nitido, arcuato, columella sinuata, ad basim attenuata, producta. Long. 3, lat. 1 mm., sp. maj.

<sup>1</sup> *θελξίνοος*, 'charming.'

<sup>2</sup> *Imus*, in sense of 'abyssal.'

<sup>3</sup> Ann. & Mag. Nat. Hist., vol. xii (1903), p. 305, pl. xxii, figs. 3, 4.

<sup>4</sup> *κομιστέος*, 'brought forward.'

Many examples were obtained of this small *Columbella*, of the same alliance as *C. selasphora*, *phaula*, M. & S., *atornella*, *Duclos*, etc., but differing in greater smoothness, even minuter size, pyriform shape, much attenuated at either extremity, and exceedingly narrow orifice. It is perhaps nearest to *C. troglodytes*, *Souv.*, but that species is slightly larger, say long. 4, and not quite so narrowed at either extremity.

*NASSA* (*ALECTRYON*) *JACTABUNDA*,<sup>1</sup> n.sp. Pl. VII, Fig. 17.

*N. testa* obeso-pyramidalis, paullum inflata, pallide straminea, versus apicem rapide attenuata, anfractibus 9, quorum 2 apicales læves, tertio sub lente lævi, unicarinato, cæteris ad suturas paullum gradatis, arcte longitudinaliter costulatis, costis interdum irregularibus, numero costarum ultimum ad anfractum circa 19, spiraliter undique arcissime liratis, lirarum ordinibus duobus superne, infra suturas, magnis, tumidis, ad costas gemmulatis, interdum hic illic paucimaculatis, maculis brunneo-cinereis, apertura ovata, alba, labro effuso, albo, crassiusculo, nitido, intus perindistincte denticulato, columella nitida, alba, excavata, ad basim truncatula, canali brevi. Long. 18, lat. 10 mm.

*Hab.*—Persian Gulf.

To *N. idyllia*, M. & S.,<sup>2</sup> from the Gulf of Oman, this bears a certain resemblance, but is more than half as large again, and a less delicately sculptured species, with spire more acute and lip less thickened. I am indebted to Mr. G. B. Sowerby, not only for the specimens, but for his critical opinion on its merits as a species.

*MARGINELLA* (*VOLVARIA*) *AMYDROZONA*,<sup>3</sup> n.sp. Pl. VIII, Fig. 18.

*M. testa* cylindrica, attenuata, nitidissima, polita, subdiaphana, pallide stramineo-fusca, vel, rarius, albo-viridescente, spira omnino callose immersa, ultimo anfractu supra medium indistinctissime spiraliter unizonato, zona castanea, apertura angusta, intus straminea, labro fere recto, ad medium inflexo, columella triplicata. Long. 8, lat. 2.5 mm.

*Hab.*—Persian Gulf, Gulf of Oman, Maskat, 15 fathoms (1901–2).

A narrow, cylindrical, bulloid species of *Volvaria*, shining, pale, either straw-coloured, fulvous, or, more rarely, greenish white. The outer lip and columella are callously reflected to such a degree over the spire that total immersion is the result, otherwise the lip is straight, somewhat inflected over the aperture towards the centre, receding again when nearing the base, the columella being white, shining, thrice plaited. There is a very obscure rufous or chestnut zone slightly above the centre of the body-whorl, extending spirally around it.

*MARGINELLA* (*VOLVARIA*) *EUMORPHA*,<sup>4</sup> n.sp. Pl. VIII, Fig. 19.

*M. testa* nitidissima, lævigata, polita, oblongo-cylindrica, albida vel pallide stramineo-brunnea, subpellucida anfractibus 5, quorum apicales

<sup>1</sup> *Jactabundus*, 'storm-tossed,' from the wave-like coste.

<sup>2</sup> *Proc. Zool. Soc.*, 1901, vol. ii, pp. 410, 411, pl. xxiii, fig. 12.

<sup>3</sup> ἀμυδρός, ζώνη, from the indistinct central band.

<sup>4</sup> εὐμορφος, 'beautifully formed.'

conici, apice ipso magno, omnino lævissimis, ultimo spiraleriter obscure trizonato, zonis rufulis, apertura oblonga, labro incrassato, nitido, simplice, columella obliqua, 4-plicata. Long. 9, lat. 4 mm.

*Hab.*—Persian Gulf, Gulf of Oman, Maskat, 15 fathoms (1902).

Allied to *M.* (*Volvaria*) *secalina*, Phil., a Mediterranean species, of which *M. nitida*, Hinds, wrongly included in the subgenus *Cryptospira*, Hinds, by Tryon (*Man. Conch.*, vol. v, p. 34), is perhaps a variety. *M. arena*, Valenc., from the Antilles; *teniata*, Sowb., from the Cape de Verd Islands; and *Verdensis*, E. A. Sm., are likewise near allies; indeed, Mr. Standen and I included this species under the latter name in our general catalogue of Persian Gulf species, and it must now be eliminated, and the name *eumorpha* substituted. *M. gracilis*, C. B. Ad., another West Indian shell, is akin, but our species is not so attenuate.

I am much indebted to Mr. G. B. Sowerby for first having called my attention to these two *Volvaria*, and especially for his having carefully compared them with existing types and specimens in our national collection.

? DRILLIA THISBE, n.sp. Pl. VIII, Fig. 20.

*D.* testa parva, fusiformi, alba, solida, anfractibus 6, quorum 3 apicales vitrei, perlæves, cæteris undique spiraleriter densiliratis, liris crassis, interstitiis sub lente obscure longitudinaliter striatulis, apertura ovato-oblonga, labro paullum effuso, columella fere recta, simplice. Long. 6, lat. 1.75 mm.

Only a few examples occurred of this white, fusiform little species, very likely not full-grown. The close spiral liræ conspicuously covering the whole surface, and the absence of sutural impression, are the chief characteristics. It resembles no other Persian Gulf or Arabian Sea species, excepting, perhaps, *D. circumvertens*, M. & St., and in a lesser degree *D. audax*, from the same locality. It has been suggested that it may be the juvenile form of a Buccinoid species, but I am inclined to hold to its being a member of the Pleurotomidæ.

MANGILIA BIPPLICATA, n.sp. Pl. VIII, Fig. 21.

*M.* testa parva, alba vel albo-straminea, ovato-fusiformi, solidula, anfractibus 7-8, quorum 2-3 apicales lævissimi, straminei, nitidi, vitrei, cæteris ad medium angulatis, et carina inferiore infra medium. juxta suturas, undique longitudinaliter crassicostatis, costis ultimi anfractus numero ad 9, spiraleriter liratis, liris paucis, crassiusculis, ultimo ad basim multilirato, apertura ovata, sinu perlato, labro paullum incrassato, intus tridenticulato, columella conspicue biplicata, canali paullum producto. Long. 7, lat. 2 mm., sp. maj.; long. 4, lat. 1 mm., sp. min.

Varying much in size, as is seen by the dimensions given above, this small *Mangilia* belongs to the same alliance as *spurca*, Hinds, *soror*, Smith, inhabiting the same seas. Such as these, however, are giants compared with even the largest example of this pigmy form.

DAPHNELLA SABRINA, n.sp. Pl. VIII, Fig. 22.

*D.* testa ovato-fusiformi, delicata, alba, pulcherrime cancellata, anfractibus 8, quorum 3-4 apicales ochracei, arcte et minutissime decussati, cæteris apud suturas impressis, antepenultimo spiraleriter

bi-, penultimo tri-, ultimo anfractu quinque-carinato, undique longitudinaliter arcissime et oblique liratis, interstitiis quadratis, lævibus, apertura lata, ovata, canali paullum producto, labro tenui, effuso, columella fere recta, sinu lato, haud profundo. Long. 5, lat. 3 mm., sp. maj.

A peculiarly select and highly sculptured *Daphnella*, unlike any other form hitherto recorded from these seas. Some similitude with *D. (Taranis) Mörchi*, Malm,<sup>1</sup> from Northern European seas and Gulf of Mexico, may be traced. Nearly all the specimens are imperfect, and greater size is probably ultimately attained than is afforded in the present material.

*DAPHNELLA (PLEUROTOMELLA) ALCESTIS*, n.sp. Pl. VIII, Fig. 23.

*D. testa* ovato-fusiformi, delicatissima, parva, alba, vel pallide straminea, anfractibus 6-7, quorum apicales 3-4 pulcherrime decussato-cancellati, ochracei, cæteris ad suturas bene impressis, ventricosi, undique longitudinaliter crassicostatis, costis obliquis, spiraliter tenuiliratis, liris paucis, ad juncturas costarum gemmiferis, ultimo anfractu apud basim producto, apertura fusoidæ, oblonga, labro tenui, canali lato. Long. 6, lat. 1.5 mm.

A delicate fusoid *Daphnella*, not perhaps quite adult, but the six or eight examples that occurred were all much of the same size. It seems almost exactly intermediate, as regards texture, between *D. Lucasii* and *Clathurella amphiblestrum*, Melv., from the same locality, being in form like the former, from which it chiefly differs in the presence of longitudinal ribs and different quality of spiral sculpture, from the latter in general form, and, especially, more extended canal. It is more than probable that *Cl. amphiblestrum*, as well as *Mangilia ephora*, Melv., should be classed among the *Daphnellæ* as of the subgenus *Pleurotomella*. Verrill. The eight allied species as yet differentiated from the Persian Gulf region might be placed thus:—

*Pleurotomella itama*, n.sp.

*Pl. Lucasii*, Melv.: Proc. Malac. Soc., vol. vi, p. 167, pl. x, fig. 25 (1904).

*Pl. Alcestis*, n.sp.

*Pl. amphiblestrum*, Melv. (*Clathurella*): Proc. Malac. Soc., vol. vi, p. 58, pl. v, fig. 7 (1904).

*Pl. Nereidum*, M. & St.: Ann. & Mag. Nat. Hist., vol. xii, p. 315, pl. xxiii, fig. 2 (1903).

*Pl. Amphitrites*, M. & St.: l.c., p. 316, pl. xxiii, fig. 3 (1903).

*Pl. Eulimenes*, Melv.: Journ. of Malac., vol. xi, p. 84, pl. viii, fig. 15 (1904).

*Pl. ephora*, Melv. (*Mangilia*): Proc. Malac. Soc., vol. vi, p. 58, pl. v, fig. 5 (1904).

*DAPHNELLA (PLEUROTOMELLA) ITAMA*,<sup>2</sup> n.sp. Pl. VIII, Fig. 24.

*D. testa* parva, fusiformi, pallide straminea vel brunnea, asperata, anfractibus 7-8, quorum 3-4 apicales ochracei, ventricosi, pulcherrime

<sup>1</sup> Cf. Sars, Moll. Norveg., pl. xvii, fig. 8.

<sup>2</sup> *ιταμός*, 'bold.'



reticulati et decussati, cæteris ad suturas impressis, ad medium angulatis, longitudinaliter crassicostatis, costis paucis, ultimi anfractus ad 8, spiraliter undique arcte liratis, liris filosis, apertura ovata, labro paullum effuso, canali paullum producto, columella simplicæ. Long. 6, lat. 2 mm.

With the superficial appearance of a *Clathurella*, this little Pleurotomid, from its three to four ventricose-whorled, beautifully cancellate protoconch, seems well included in *Pleurotomella*, Verrill. It is allied to such a species as *Pl. Packardi*, Verrill & Smith, the form *Verrilli* of which is figured<sup>1</sup> by Dr. Dall. Not of very frequent occurrence, and I hardly think the specimens obtained adult. The longitudinal ribs are remarkably incrassate, and are crossed by the spiral liræ, which give a roughened appearance to the whole surface.

*CYLICHNA COLLYRA*,<sup>2</sup> n.sp. Pl. VIII, Fig. 25.

*C. testa parva, umbilicata, cylindrica, alba, nitida, sub lente delicatissime spiraliter striata, lateribus rectis, compressiusculis, apertura angustissima, ad basim latiore, labro tenui, columella uniplicata. Long. 3, lat. 1 mm.*

Much like *C. cylindræcea*, Pennant, in miniature, this being also found in the Arabian Sea and Gulf of Oman; I think it, however, distinct. A large number of examples occurred, all of the same size, and with no intermediates.

N.B.—The opportunity may be here a good one to state that *Cylichna Bushirensis*, M. & St., described in 1901, is undoubtedly a *Scaphander*, and will stand thus:—

SCAPHANDER BUSHIRENSIS, M. & St.

*Cylichna Bushirensis*, M. & St.: Proc. Zool. Soc. Lond., 1901, vol. ii, pp. 454, 455, pl. xxiv, fig. 21.

*Hab.*—Persian Gulf, Bushire and near Fao; Gulf of Oman, Maskat, 15 fathoms, also at 208 and 156 fathoms.

*VOLVULA COMPACTA*, n.sp. Pl. VIII, Fig. 26.

*V. testa parva, ovata, compacta, alba, lævigata, postice obtuse producta, antice rotundata, sub lente spiraliter arcte et tenuissime striata, apertura angusta, antice dilatata, labro fere recto, columella apud basim crassiuscula, uniplicata. Long. 2.5, lat. 1.25 mm.*

A somewhat solid, compact little shell, the posterior labial extension obtuse and abbreviate, while the outer lip is slightly thickened and rounded at the base, the columella being once-plaited. Surface white, shining, the whole surface exceedingly finely and microscopically striate. No species known to me shows so oval an outline. It was abundant in shell-sand, with another species, which I cannot separate from the common British and Mediterranean *V. acuminata*, Brug., which, under various names, seems ubiquitous throughout the Northern Hemisphere, both of the Old and New World.

<sup>1</sup> Bull. Mus. Comp. Zool. Harvard Coll., xxix, pt. 2, p. 119, pl. xiv, fig. 4.

<sup>2</sup> κολλύρα, 'a roll.'

PARASTROPHIA FILUM,<sup>1</sup> n.sp. Pl. VIII, Fig. 27.

*P. testa* minuta, fere recta, versus apicem incurvo-sinuata, alba, lactea, levigata, sub lente indefinite et obscurissime spiraliter arcti-striata, regione apicali caudata, attenuata, apice ipso globulari, retuso, parvo, apertura rotunda, haud incrassato, tenui. Long. 3, lat. .075 mm.

Of very infrequent occurrence, but most likely overlooked, owing, not only to its microscopical dimensions, but also to its verisimilitude to a small *Creseis* or other Pteropod, multitudes of which occur in the same shell-sand.

*P. Challengeri*, de Folin,<sup>2</sup> is of quite different form, as is *P. Asturiana*,<sup>3</sup> also of de Folin, the new species being more attenuate, with apex smaller proportionately, and the concentric spiral striation very nearly obsolete, though its presence is observable with aid of a very powerful lens, at all events centrally. There is one acutely defined annulus at the distance of, say, half a millimetre from the apex; with this exception the whole surface is smooth, the mouth being hardly oblique.

CADULUS CAMPYLUS,<sup>4</sup> n.sp. Pl. VIII, Fig. 32.

*C. testa* perparva, apud medium crassiore, arcuata, utrinque attenuata, ad apicem posteriorem magnopere angusta, apertura rotunda, margine paullum obliquo, tenui. Long. 3, diam. oris .05, apicales .025 mm.

A very small, white, and shining *Cadulus*, particularly narrowed posteriorly, while thickened and elbowed out towards the centre. The aperture is round, with slightly oblique margin.

## EXPLANATION OF PLATES.

## PLATE VII.

Fig.

1. *Crossocia cryma*, n.sp.
2. *Fossarus (Couthouyia) eudmetus*, n.sp.
3. *Diala trilirata*, n.sp.
4. *Cerithiopsis mathildæformis*, n.sp.
5. *Mucniola epibathra*, n.sp.
6. *Eulima nisonida*, n.sp.
7. *E. rhæba*, n.sp.
8. *Mucronalia lepida*, n.sp.
9. *Syrnoia aperanta*, n.sp.

Fig.

10. *S. clavellosa*, n.sp.
11. *Turbonilla Hermia*, n.sp.
12. *Odostomia (Pyrgulina) hervierioides*, n.sp.
13. *O. (P.) tenerrima*, n.sp.
14. *O. (P.) thelxinoa*, n.sp.
15. *O. (Miralda) ima*, n.sp.
16. *Columbella (Seminella) comisteia*, n.sp.
17. *Nassa (Alectryon) jactabunda*, n.sp.

## PLATE VIII.

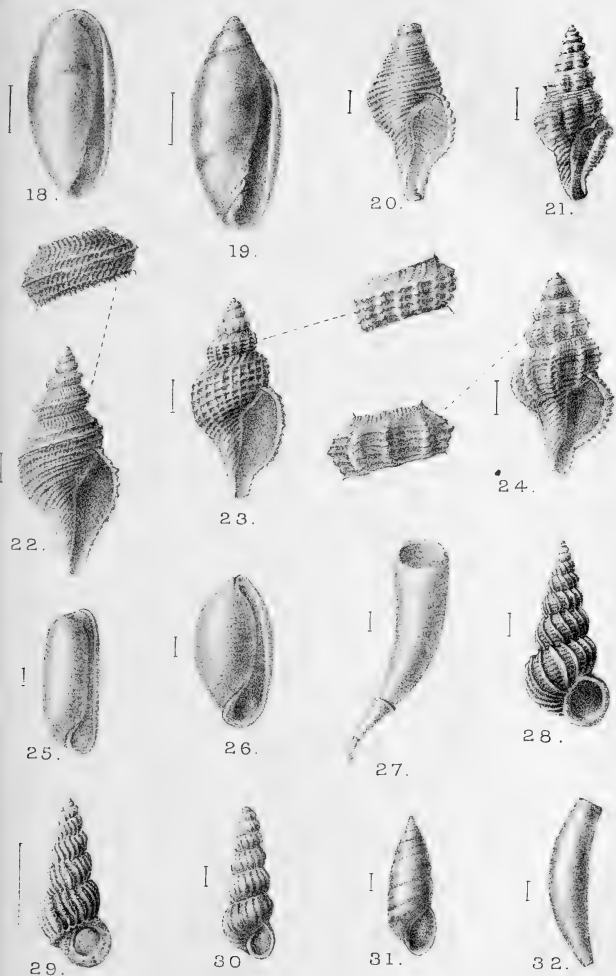
- |   |   |
|---|---|
| 18. <i>Marginella (Volvaria) amydrozona</i> , n.sp. | 26. <i>Volvula compacta</i> , n.sp.               |
| 19. <i>M. (V.) eumorpha</i> , n.sp.                 | 27. <i>Parastrophia filum</i> , n.sp.             |
| 20. <i>Drillia Thisbe</i> , n.sp.                   | 28. <i>Scalaria canephora</i> , n.sp.             |
| 21. <i>Mangilia biplicata</i> , n.sp.               | 29. <i>S. (Cirsotrema) bona</i> , n.sp.           |
| 22. <i>Daphnella Sabrina</i> , n.sp.                | 30. <i>Turbonilla (Pyrgostylis) Delia</i> , n.sp. |
| 23. <i>D. (Pleurotomella) Alcestis</i> , n.sp.      | 31. <i>Mucronalia bizonula</i> , n.sp.            |
| 24. <i>D. (P.) itama</i> , n.sp.                    | 32. <i>Cadulus campylus</i> , n.sp.               |
| 25. <i>Cylichna collyra</i> , n.sp.                 |   |

<sup>1</sup> *Filum*, 'a thread,' from the appearance.

<sup>2</sup> Rep. "Challenger" Exped., vol. xv, Zool., p. 681.

<sup>3</sup> Les Fonds de la Mer, vol. i, pp. 172, 218, pl. xxix, fig. 7.

<sup>4</sup> *καμπυλός*, 'bent.'



A.H. Searle, del et lith.

Huth. imp.

NEW SPECIES OF GASTROPODA, &c, FROM  
THE PERSIAN GULF, AND GULF OF OMAN.



*CAPULUS LISSUS*, SMITH, AS TYPE OF A PROPOSED NEW  
SUBGENUS (*MALLUVIUM*) OF *AMALTHEA*, SCHUMACHER.

By JAMES COSMO MELVILL, M.A., F.L.S.

Read 9th March, 1906.

IN 1894 Mr. Edgar Smith described<sup>1</sup> an abyssal mollusc, from the Bay of Bengal, dredged during the cruise of H.M. Indian Marine Survey steamer "Investigator," Commander C. F. Oldham, R.N., at a depth of 90-102 fathoms. To this he gave the name of *Capulus lissus*.

Since that date Mr. F. W. Townsend has procured, from various stations in the Persian Gulf and Gulf of Oman, to be enumerated subsequently, more voluminous material, including live examples *in situ*, and exhibiting considerable variety. I know, therefore, that the author will allow me to further extend his original description to suit the larger specimens now before me, and also to propound reasons for considering this species as rather appertaining to *Amalthea*, Schum. (= *Hipponyx*, DeFrance).

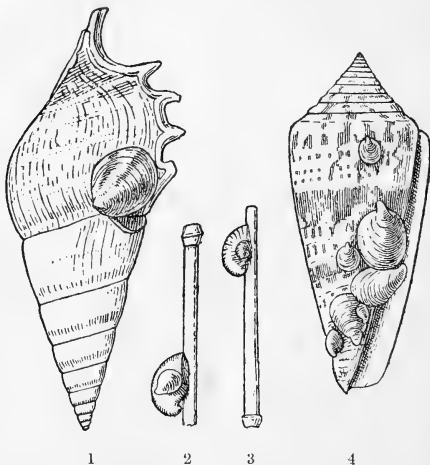
Mr. Smith rightly lays stress upon the complete absence of radiating sculpture. In all the species of either genus (*Amalthea* or *Capulus*) known to me, this sculpture is present, and accordingly, to whichever of these this mollusc belongs, that fact in either case attains equal predominance.

Mr. Townsend dredged *C. lissus* either dead, in shell-sand, mostly small imperfect examples, at a considerable depth, or alive, on *Rostellaria delicatula*, Nevill (Fig. 1), and especially *Conus planiliratus*, Sowb. (Fig. 4). On this latter it was gregarious, forming colonies of life; and usually a small example is found to have attached itself to the dorsal surface of, very probably, its parent. But the most interesting discovery was that of a few examples obtained at 122 fathoms in the Gulf of Oman in 1903, when the larger ones were found adhering to the spines of a *Cidaris* (Figs. 2, 3), invariably attended by a small, but normally shaped, offspring, attached dorsally, while they themselves had assumed a narrow oblong form, having become adapted to the attenuate spine they had affected. Contracted as they thus were, it was nevertheless necessary, as they still overlapped considerably at the base, to deposit shelly matter, formed out on both sides, thus creating a basal plate, of considerable solidity and thickness. This is a characteristic of the genus *Amalthea*, Schum., rather than of *Capulus*, Montfort, as the foot of the latter genus does not ever secrete a shelly base.

<sup>1</sup> Ann. & Mag. Nat. Hist., vol. xiv (1894), p. 166.

It at once occurred to me that I had recently somewhere noticed figures much resembling these, and a brief search soon revealed the fact that during the "Blake" Expedition a very near ally of *C. lissus* was obtained, which was described by Dr. Dall under the name of *Amalthea benthophila*,<sup>1</sup> and towards the close of this paper I propose to touch upon this species also in fuller detail.

There can be but little moral doubt but that this Western species is a New World exponent of the Oriental *C. lissus*, and is congeneric with it; and I am inclined to go even further than this, and to propose that



the unusual smoothness of surface and want of radiating sculpture are worthy of subgeneric distinction, as follows:—

#### AMALTHEA, Schum.

*Amalthea*, Schumacher, Essai, pp. 56, 181, pl. xxi, fig. 4 (1817).

*Hipponyx*, DeFrance, Bulletin Soc. Philom., p. 9 (1819).

#### MALLUVIUM,<sup>2</sup> nov. subgen.

Ab *Amalthea* typica differt superficie omnino lævigata, interdum alba, interdum longitudinaliter bi- vel tri-radiato colorata, radiis cinnamomeis vel castaneis, apertura ovata vel circulari, intus albida, margine tenui, lamina basali tenui, vel, interdum, solida.

Type: *Capulus lissus*, E. A. Smith.

<sup>1</sup> Bull. Mus. Comp. Zool. Harvard Coll., xviii, No. 29; pt. 2, p. 289, pl. xiv, figs. 1a-b.

<sup>2</sup> *Malluvium*, a basin.

## 1. AMALTHEA LISSA (E. A. Smith).

*Capulus lissus*, E. A. Smith, Ann. & Mag. Nat. Hist., vol. xiv (1894), p. 166, pl. iv, figs. 4-6.

The following is the author's original description:—

"Testa pileiformis, apice postice valde recurvato, sordide alba vel dilutissime rufescens, lineis incrementi striata, *haud radiatim sculpta*, anfractus 3, apicales duo (nucleus) globosi, læves; apex pone sed supra marginem aperturæ convolutus; apertura irregulariter rotunde ovata, pallide fuscescens; peristoma tenue, margine infra apicem incrassato.

"Diam. maj. 11 millim., min. 8, alt.  $5\frac{1}{2}$ ; apertura  $8\frac{1}{2}$  longa, 7 lata.

"*Hab.*—Bay of Bengal, 90-102 fathoms.

"The chief characteristic of this species is the absence of radiating sculpture, a feature common to most species of the genus *Capulus*."—E. A. S.

To this description it only remains to add that the larger and well-grown examples dredged by Mr. Townsend exhibit in nearly every case longitudinal cinnamon or pale rufous rays, thus ornamenting the shining white surface, which is hardly ever covered with any, even slight, vestiges of the very fugitive pale-brown epidermis. And, as before mentioned, the shelly basal plate has been, for the first time, detected.

Additional localities for this species are as follows:—Persian Gulf; Gulf of Oman; lat.  $24^{\circ} 6' N.$ , long.  $57^{\circ} 30' E.$ , 206 fathoms, on *Gorgonia*, *Rostellaria*, and *Conus planiliratus*, Sowb.; lat.  $25^{\circ} 54' N.$ , long.  $60^{\circ} 20' E.$ , 60 fathoms, on *Conus* mostly; lat.  $24^{\circ} 58' N.$ , long.  $56^{\circ} 54' E.$ , 156 fathoms, dead, and small, colourless, in shell-sand; also lat.  $24^{\circ} 75' N.$ , long.  $56^{\circ} 75' E.$ , 122 fathoms, on spines of *Echini*.

## 2. AMALTHEA BENTHOPHILA, Dall.

*Amalthea benthophila*, Dall, Bull. Mus. Comp. Zool. Harvard Coll., vol. xviii, No. xxix, pt. 2, p. 289, pl. xiv, figs. 1a-b.

*Hab.*—India occidentalis. "Off Sand Key, 50 fathoms. St. Kitts, 245 fathoms. Near Nevis, 373 fathoms. Guadeloupe, 175 fathoms, on spines of *Echini*. Martinique, 170 fathoms, also on *Echinus* spines. St. Vincent, 146 fathoms, on shells. Bottom temperatures  $45^{\circ}$  to  $55^{\circ} F.$ "

The following is Dr. Dall's description:—

"Shell stout, white, smooth, with a smooth straw-coloured epidermis, and a coil of about two whorls. Apex elevated, nucleus glassy, rather large, of about one whorl; surface smooth, often polished, showing only irregularities due to growth, and a few microscopic spiral scratches, aperture subcircular, interior white, glossy, basal plate sometimes quite thin, as when the mollusc is seated on a flat stone, or on another *Amalthea*, or quite thick, as when it rests on a *Cidaris* spine. It is marked with two diverging impressions, corresponding to the position of the adductors. Lat. aperture 8.0, long. ditto 8.0, alt. 6.0 mm.

"This species, by its smooth surface, is easily distinguished from any other. The irregularities of the *Echinus* spines are not reproduced

on the surface of the shell, as its pedestal, secreted by the foot, covers all such irregularities. I cannot help doubting if there is any such connection between the base and the adductors as exists between the latter and the shell. The irregularities of the specimens living on a smooth surface indicate that they are not absolutely fixed to one spot, at least not more than *Gadinia* or *Crepidula* when young. If the adductors were organically attached to the base it would be death to the animal to move."

I think it has been well worth while giving the above descriptive remarks *in extenso* for the sake of comparison, if for no other cause. Most probably these two species are descended from a common ancestor, there being so many close points of similitude; but, while so nearly allied to each other, they are abundantly distinct from the typical section of the genus.

---



## NOTES ON A HOLOCENE DEPOSIT AT HARLTON, CAMBS.

By the Rev. R. ASHINGTON BULLEN, B.A., F.L.S., F.G.S.

*Read 9th March, 1906.*

THE mollusca noticed in this brief communication were found by the veteran geologist the Rev. Osmond Fisher, F.G.S., and Mr. T. R. H. Garrett, of Jesus College, Cambridge, in the parish of which the former is Rector.

In the same parish occurred the Holocene deposit of Romano-British date, near Butler's Spinney, previously (1903) described by



me before this Society.<sup>1</sup> This deposit yielded *H. arbustorum*, Linn., in great abundance, and is the solitary recorded locality (up to the present time) for the occurrence in Cambridgeshire of *Limax arborum*,<sup>2</sup> Bouch. Chant. Mr. Brindley states that it has not occurred alive in Cambridgeshire in recent times, although it is found in the adjoining county, Northamptonshire.

The place in which the later discovery occurred, now described in this paper, is about a half-mile from the above-mentioned deposit, and

<sup>1</sup> Proc. Malac. Soc., vol. v, p. 318.

<sup>2</sup> Marr & Shipley: Nat. Hist. of Cambridgeshire, 1904, p. 134.

Mr. Fisher describes it as follows:—"My notes on the shell-deposit in Harlton clunch-pit are very scanty. I send all that are relevant. The deposit is a thin layer of sandy marl beneath the surface-soil. It is not stratified, and is less than a foot thick. It appears to be a wash, chiefly from the Boulder Clay that caps the hill. I have had some of the stuff brought home, and washed it. It contains bits of flint and chalk, brown clay, and fine sand, and a bit of pyrites. It rests upon a disintegrated surface of clunch."

The height is about 150 feet O.D. It would thus be at a level of about 60 feet higher than the deposit formerly described. From a note made by Mr. Garrett at the time, it appears that above the marly band in which the shells occurred there was from two to three feet of surface soil.



*a*, rainwash ; *b*, brown sandy clay with shells ; *c*, disintegrated clunch ; *d*, talus.

The brown sandy clay with shells rests immediately on the weathered surface of disintegrated clunch.

(N.B.—There is only a small planed off fragment in the south-east corner, as though the deposit in the southern (and higher) part had suffered denudation.)

I have visited this pit four times, twice under Mr. Fisher's guidance.

List of species found:—Non-marine: *Arion ater*<sup>1</sup> (Linn.) [6 granules, one very large]; *Helicella itala* (Linn.); *Hygromia hispida* (Linn.); *Vallonia pulchella* (Müll.); *Pomatias elegans* (Linn.); *Jaminia muscorum*<sup>1</sup> (Linn.). Marine: *Ostrea edulis*, Linn.; *Mytilus edulis*, Linn.

The valve of *Ostrea* is much eroded, but the fragment of *Mytilus* is quite bright, and the nacre sub-iridescent. As Harlton is an inland village and parish, the occurrence of marine species in such a deposit is decidedly of interest.

Although there is no index forthcoming as to the age of this deposit,

<sup>1</sup> Procured at a recent visit (April 7th, 1906).

judging from the section given above, and its position on a higher level, it may possibly antedate the other Romano-British deposit near Butler's Spinney.<sup>1</sup>

I have the pleasure of thanking Mr. Fisher for so kindly transcribing his notes and lending his specimens for exhibition.

Note: The dark layer, marked by crosses (p. 85), is the loamy layer with land shells in which *Ostrea* and *Mytilus* occurred. The boy's height is 5 feet.

---

<sup>1</sup> Mr. A. Santer Kennard, F.G.S., thinks, however, that the presence of *Ostrea edulis* places it at Roman or post-Roman date. It may be so, but the denudation and planing off of the deposit on the south side seems to demand a longer period than he allows.

---

ON A SMALL COLLECTION OF LAND AND FRESH-WATER SHELLS FROM UGANDA, WITH DESCRIPTIONS OF A NEW SPECIES OF *MARTENSIA* AND TWO NEW SPECIES OF *LIMICOLARIA*.

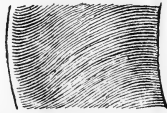
By H. B. PRESTON, F.Z.S.

Read 9th March, 1906.

THE specimens which form the subject of the present paper were placed in my hands for identification by Mr. J. H. Ponsonby, and include the following genera: *Martensia*, *Achatina*, *Limicolaria*, *Succinea*, and *Ampullaria*. As might easily be expected in a collection from Central Africa, the *Limicolarie* largely predominate; many of these appear to be varietal forms of already known species, though there are two which I am unable to identify, and these I now venture to describe in the present paper.

*MARTENSIA BOWKERÆ*, n.sp.

Shell thin, depressed, perforate, keeled at the periphery, dull brownish grey, ornamented at the sutures and periphery with a chocolate-coloured band; whorls 5-6, sculptured with very fine



transverse striae and coarser lines of growth; base of shell somewhat polished and sculptured with fine wavy spiral striae; sutures impressed; aperture obliquely lunate; peristome simple; columella descending obliquely, and somewhat reflexed over the rather narrow umbilicus. Diam. maj. 17.5, alt. 8.75 mm.; aperture, diam. 8, alt. 7 mm.

*Hab.*—Uganda district.

This species may be compared with *M. permanens*,<sup>1</sup> Smith, also from

<sup>1</sup> Journ. Malac., 1901, vol. viii, p. 94, figs. 2, 3.

Uganda, which appears to be its nearest ally; it is, however, more depressed than that species; moreover, it is of a darker colour, the sculpture both on the spire and on the base is much finer, and the umbilicus is much narrower.

*ACHATINA (BURTOA) NILOTICA*, Pfr.

Two specimens, one adult and in fine condition, the other young.

*LIMICOLARIA DIMIDIATA*, Martens.

A number of specimens exhibiting great diversity of coloration, two of them being of an almost uniform pale-yellow tint.

*LIMICOLARIA MARTENSIANA*, Smith.

Two specimens.

*LIMICOLARIA PONSONBYI*, n.sp.

Shell elongate, narrowly umbilicate, rather thin, painted throughout with straight and zigzag bands and streaks of reddish brown; whorls 8-9, sculptured, especially on the first five or six volutions, with coarse striae corresponding to the lines of growth and much broken up



by shallow spiral grooves, thus presenting a malleated appearance; suture impressed and somewhat crenulated; aperture inversely auriform; columella straight, reflexed over the umbilical region, and tinged with purple; peristome simple. Diam. maj. 25, alt. 56.5 mm.; aperture, diam. 11, alt. 22 mm.

*Hab.*—Uganda district.

*LIMICOLARIA SMITHI*, n.sp.

Shell elongate, cylindrical, scarcely perforate, painted with streaks, bands, and blotches of rich red brown, the last concentrated into

a much interrupted band just below the periphery; whorls 8-9, sculptured with irregular spiral striæ, and also, especially on the fourth and fifth volutions, with coarser striæ corresponding to the lines of growth; suture impressed; aperture inversely auriform; columella curved, narrowly reflexed over the umbilicus, purplish white; peristome simple. Diam. maj. 16·5, alt. 43 mm.; aperture, diam. 7·5, alt. 14 mm.

*Hab.*—Uganda district.



This species seems to be intensely variable in colour, some specimens being marked as described above, others are only finely lined with reddish brown, and others still are only painted with a single infra-sutural band; it appears to be closely related to *L. dimidiata*, Marts., but differs from that species mainly in its more cylindrical form, and in its more obsolete, though somewhat coarser, sculpture.

*LIMICOLARIA TENEBRICA*, Rve.

Several brightly coloured specimens exactly similar in marking to a number which I recently received from the northern shore of the Victoria Nyanza.

*LIMICOLARIA TURRIFORMIS*, Marts.

Ten specimens, including the typical form, the others varying in colour from almost black to pale pink and light yellowish brown; some are streaked with zigzag bands of deep chestnut, while others are of an almost uniform pink or brownish yellow.

*SUCCINEA* sp. (?).

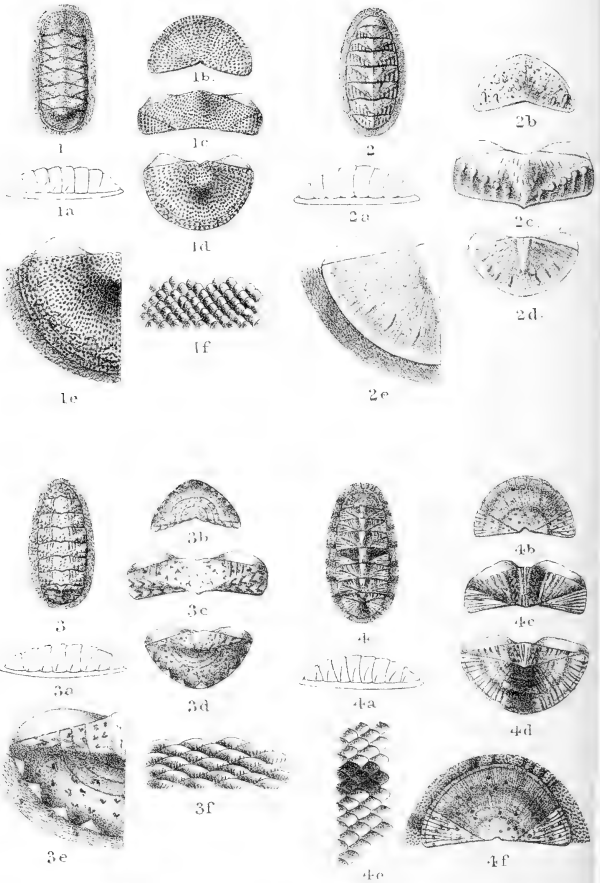
One specimen.

*AMPULLARIA* sp. (?).

One specimen.

Owing to the small amount of material to hand and the exceedingly variable nature of the last two genera, I am unable to specifically determine these.





H Thomas del.

J. Green lith. et imp.

NEW S. AUSTRALIAN POLYPLACOPHORA.



ON NEW SPECIES OF *POLYPLACOPHORA* FROM  
SOUTH AUSTRALIA.

By W. T. BEDNALL and E. H. V. MATTHEWS.

*Read 9th March, 1906.*

PLATE IX.

*CHITON AUREOMACULATA*, n.sp. Pl. IX, Figs. 3-3f.

Shell elongately oval, carinate, side slope but very slightly arched. Central area apparently smooth, but minutely reticulated under the microscope, and showing no jugal track. Towards the base of the area, on each side, are three sulci which are continuous throughout the length of the shell, between the laterals, and but slightly indicated on the terminal valves. Colour creamy white, irregularly besprinkled with golden spots, varying in size and shape. Girdle inconspicuously tinged with green.

Intermediate valves scarcely beaked; of even width, with the exception of the first, which is nearly double that of the others. Posterior margin smooth. Lateral areas narrow, with the diagonal indifferently raised, and ornamented with two rows of pustules which gradually increase in size as the margin is approached; pustules distributed, one row on the diagonal, the other on the posterior margin, intervening space smooth. The anterior valve has a row of 8 pustules round the girdle margin, and three on each side of its posterior margin. The posterior valve has also a row of pustules similarly placed to those on the anterior, as well as three pustules on each end of a raised line, which traverses the valve at right angles across the mucro. Mucro central and well defined; posterior slope excavated. Interior very pale blue. Sinus wide and shallow. Anterior valve with 8 slits, median 1-1, posterior 10. Girdle scales smooth and convex. Length 12, breadth 3.5 mm.

*Hab.*—Marion Reef, Troubridge Island, on a small stone.

*ISCHNOCHITON RESPLENDENS*, n.sp. Pl. IX, Figs. 4-4f.

Shell elongately oval, elevated, scarcely carinated, very minutely but regularly punctured throughout, more indistinctly so on the lateral areas and anterior valve. Central valves slightly beaked; anterior valve larger than the others, and posterior valve with the umbo anterior to the centre. Jugal tract creamy white, radiated with ashen, assuming the appearance of ivory; pleural tracts a rich golden brown, on which are limned bright blue lines, the lines sometimes broken into irregularly shaped markings. Lateral areas but slightly raised, nevertheless distinct, apparently smooth, but pitted like the remainder of the shell when seen through the microscope. They are of the same ivory tint, and painted with ashen streaks like the jugal

tract. Girdle creamy white, clouded at regular intervals with dark brown. Scales large, regular in disposition, rounded, and smooth. Anterior valve with 9 slits, central valves 1-1, and posterior valve 11. Length 25, breadth 15 mm.

*Hab.*—St. Vincent and Spencer's Gulfs.

This species is a close ally to the South Australian form of *I. smaragdinus*, Angas, but is appreciably different. It attains a larger size, and is remarkable for a very distinct and brilliant pattern of coloration, more particularly when viewed alive in its natural element.

[This species was discovered by Mr. Matthews, who has taken all the specimens yet found in our waters; but I have seen an example which was obtained in the adjoining colony of Victoria.—W. T. B.]

ONITHOCHITON ASHBYI, n.sp. Pl. IX, Figs. 2-2e.

Shell oblong, much elevated, valves rounded dorsally, side slopes rapidly descending. Central area smooth, cream-coloured, with spots and blotches of blood colour, more especially on the jugal tract. Intermediate valves beaked. Lateral areas ornamented with a double row of warty nodules of variable size, which, in some cases, coalesce. A single row on the edge of the posterior margin. Anterior valve with numerous little warty excrescences irregularly but not closely disposed over its whole surface. Posterior valve one-half the width of the other valves, which are of even width throughout. No slits visible. Girdle felty, but under the lens covered with minute scales, irregular in size and shape, like grains of sand. Sinus wide and deep for a shell of this size. Length 8.5, diam. 4.5 mm.

*Hab.*—South Australia.

The figures of this species were not drawn by Mr. Thomas, and are not very successful.

LEPIDOPLEURUS MATTHEWSIANUS, Bednall, n.sp. Pl. IX, Figs. 1-1f.

Shell elongate, regularly arched; keel and lateral areas indistinct, but clearly defined when seen through the lens; jugal area absent; lateral slopes rounded. Colour grayish white. Anterior valve closely, minutely, regularly, radiately granulated throughout. Central valves similarly ornamented, the granulations running longitudinally on the dorsal area, and radially on the lateral areas, the granulations by their direction defining the areas. Sutural plates small, triangular, and very distant, the jugal sinus consequently being exceedingly wide; posterior dorsal margin straight. Posterior valve as the others, and with prominent central obtuse elevated apex, the slope to the margin being slightly concave. (Bednall.) Length 9, breadth 3.5 mm.

*Hab.*—St. Vincent Gulf.

ON A SPECIES OF THE LAND MOLLUSCAN GENUS *DYAKIA*  
FROM SIAM.

By Lieut.-Colonel H. H. GODWIN-AUSTEN, F.R.S.

Read 6th April, 1906.

## PLATE X.

I AM indebted to Captain Stanley Flower, who was in Siam in 1898, for the land shell I now describe. He collected and preserved a good many species in spirits which he was good enough to place in my hands. The genus *Dyakia*, type *Hugonis*, Pfr., was described by me in 1891 in a paper on a collection of land mollusca formed by the late Mr. A. Everett in Borneo, a naturalist who discovered so many new and beautiful species in that island.<sup>1</sup>

In this genus I included certain species described by Professor Semper,<sup>2</sup> which he had placed in *Ariophanta*, a genus almost restricted to Peninsular India, which has since been proved to be very distinct and very distantly related to these Malayan forms. These species were *Rumphii*, v. d. Busch, sinistral, from Java; *nemorensis*, Müller, dextral, from Celebes; *rareguttata*, Mousson, dextral, from Adanara, near Flores; and *striata*, Gray, dextral, from Singapore, this last collected by Von Martens. It is the same shell as *naninoides* of Benson, from the same locality. On a comparison of the shells in the Natural History Museum a variety of this last species is, I find, the subject of this paper, and was collected at Chantaboon. I show further on its anatomical characters; it well agrees with Professor Semper's description and figures of this species on pl. iii, figs. 21a-b, with a few small specific differences. The interest lies in the generic extension of range from Borneo and the Malay Archipelago and peninsula very much more to the north up to the continental area. Pfeiffer (Mon. Helic. Vivent., vol. i, p. 70) gives the island of Chusan as a habitat of *conicoides*. This would be a remarkable distribution for the genus, and I should like to see it really confirmed by examination of the animal.

*DYAKIA STRIATA* (Gray), var.*Hab.*—Chantaboon (Capt. Stanley Flower).

Specimen dissected. Diam. maj. 27, min. 24.75 mm.; alt. 13 mm.

*Animal.*—Sole of foot (Fig. III) rather smooth, not divided, folded down the centre by contraction in the spirit specimen. The extremity of the foot very square (Fig. I), no lobe above the mucous gland (Fig. II), which is an oval depression, and in life I imagine somewhat pit shaped (*vide* Wiegmann's drawing, pl. xxxvi, fig. 13, of *D. Hugonis*?).

Sides of foot rather smooth, the peripodial grooves distinct, with a broad fringed margin below them (Fig. I). The dorsal lobes

<sup>1</sup> Proc. Zool. Soc., 1891, pp. 22-47.<sup>2</sup> Reisen im Archipel der Philippinen.

(Fig. IV) are small, especially the left. The visceral sac is sparsely speckled, with occasional dots on the apical portion. The buccal mass is short and globose, with a very strong retractor muscle at the base. The salivary glands are quite separate and well developed.

The jaw (Fig. XIII) is slightly arched, with no central projection.

The formula of the radula (Fig. XIV) is 61 : 17 : 1 : 17 : 61, or 78 : 1 : 78. The central tooth is tricuspid, narrow, and elongate, the first admedians also tricuspid. The cusps get gradually smaller until about the 14th tooth, and they merge into the curved, aculeate teeth of the laterals (Figs. 22, 25). The marginal teeth (Fig. marg.) are very minute.

*The Genitalia* (Figs. V–XII). — Commencing at the generative aperture, the penis (Fig. Va) is a simple shaft, joined by the vas deferens and retractor muscle at the posterior end, the epiphallus being exceedingly short. Close adjacent and just within the vestibule is the opening of the amatorial organ (Fig. VII), a much larger muscular eversible tube than the penis, about 6 mm. in length. At its further end is situated a short, sharp-pointed, transparent calcareous dart, on the point of a conical tubercle (Fig. XI). The tube is here contracted into a long, gradually tapering, rope-like duct (Fig. VIII) about 8 mm. long. To the eye this has a twisted appearance, but closer examination shows it to be a thinly sheathed cord (Fig. XII), closely convoluted or puckered; it may thus possibly act as a spring on the extension of the dart. This cord bifurcates more than once (Fig. IX), and the ends are buried in a close, solid, cellular mass of ellipsoidal form, folded and pointed at the anterior end, where it is attached to the uterus by a short membrane (Fig. V), and thus kept in position. In life no doubt this mass is less solid than as I represent it; hardened and contracted by the spirit, it would be divided into lobes more or less separable. When the animal retires within the shell, this glandular mass lies packed alongside, and almost covers the basal portion of the dart-sac (Figs. VI and VII), the cord-like connection being folded beneath it (Fig. V). The spermatheca (Fig. VI) is small, with rather a thickened base, thin and fining to a point, having an attachment to the uterus, close to that of the dart-sac gland.

Although the form of the teeth approaches those of *D. striata* from Singapore, as described by Professor Semper (p. 54), there are not nearly so many in the row, 156 : 190 respectively. The jaw of *striata* has a central projection which is absent in this Siam species. The form of the darts also differs (*vide* Semper's fig., pl. iii, fig. 21*b*). It is thus a variety of *striata*. The genus can be divided into two distinct sections by the form of the spermatheca, which is quite long in *Hugonis*, *nasuta*, *rareguttata*, *nemorensis*, and *Martini*, moderately long in *Rumphii*, very short in *striata*. In the first six species the secretory glands of the amatorial organ are foliated, while in the last two they are massed together.

It is interesting to note that this genus is not recorded by Drs. Paul & Fritz Sarasin, in their valuable and excellent work on the fauna of Celebes (p. 33), as being found on the main island. On

anatomical grounds they record *D. rareguttata* under *Nanina* (*Xesta*), from the small island of Saleyer, lying off the south coast, and thus in connection with and through Flores, Sumbawa, and Bali, the extreme eastern limit of its range, as yet known.

Borneo would appear to be its centre of dispersal, whence it extended westward to the Malay Peninsula and as far as South Siam. It will be interesting to see by what species it is represented in Cambodia and Annam. The same interest applies to another very remarkable genus, *Everettia*, the type, *jucunda* (P.Z.S., 1891, p. 33), possessing curious multifid secretory glands on the amatorial organ. The bounds of its distribution are unknown. Wiegmann's researches have shown that it extends to Celebes (see his excellent drawings of *Everettia Möllendorffi*, Kobelt, pl. xxiv, figs. 1-14), and it is recorded by the brothers Sarasin (Land Moll. Celebes, p. 132). A species, *fulvocarnia*, Marts., is placed with a doubt in the genus by Wiegmann; the Sarasins put it into *Macrochlamys*, which, in spite of the radula being as in that genus, is very doubtful. Its true position cannot be known until the generative organs are seen, and these I do not expect will be like those of the typical Indian species; the shell-lappets are quite unlike, to begin with.

The Bornean shell *consul*, Pfr., is undoubtedly an *Everettia*, but I see the Sarasins overlooked this, and in dealing with the distribution of the fauna of Celebes (p. 38), in a comparative list of land shells of Java, Sumatra, and Borneo, *consul* is put into *Macrochlamys*, and its range extended to Sumatra. This requires verification by anatomical examination of the animal. *E. consul* belongs to a type of shell most difficult to determine by shell character, and it has been recorded from very unlikely habitats, such as Buru, probably from this cause. We now know that very different animals construct very similar shells, particularly those in the family Zonitidæ, so that the shells alone become very dangerous and deluding material in the study of present distribution in relation to past geological change.

The genus *Dyakia* now contains the following nine species, conclusively shown by the work of Professor F. Wiegmann in his excellent contribution to the *Abhandlungen Senckenbergisch naturforsch. Gesellschaft*, 1898, vol. xxiv, pp. 287-557, 11 pls., entitled "Landmollusken (Stylommatophoren): Zootomischer Teil," with very accurately drawn plates:—

*Dyakia*:

*Hugonis*, Pfr., type of the genus. Figured by Godwin-Austen, P.Z.S., 1891, pl. v, figs. 5-5b. Borneo.

*Hugonis*, Pfr. (?). Figured by Wiegmann, l.c., pl. xxvi, figs. 13-23. Borneo.

*nasuta*, Metcalfe. Figured by Godwin-Austen, l.c., pl. v, figs. 4-4c. Borneo.

*Rumphii*, v. d. Busch. Figured by Semper, Reisen, pl. iii, fig. 18. Java.

*rareguttata*, Mouss., var. *sparsa*, Semper, l.c., pl. iii, fig. 17. Wiegmann, l.c., pl. x, figs. 16-20; pl. xi, figs. 1-3. Flores, Solor (Wallace).

*Javanica*, Lam. Java.

*nemorensis*, Müller. Figured by Wiegmann, l.c., pl. ix, figs. 15-22; pl. x, figs. 1-5; Semper, l.c.; pl. iii, fig. 19. Flores.

*cidaris*, Lam. Figured by Wiegmann, pl. ix, figs. 12-14. Rotti. Wiegmann states that although the generative organs were incomplete, the five secretory glands were present on the amatorial organ.

*amphidroma*, v. Mart. (= *Martini*, Pfr.). Sumatra.

*striata*, Gray (= *naninoides*, Benson). Figured by Semper, l.c., pl. iii, figs. 21a-b. Singapur.

The following (all from Borneo) are provisionally placed in this genus, but the animals have yet to be examined:—*intradentata*, God.-Aust.; *regalis*, Benson; *Busanensis*, God.-Aust.; *janus*, Pfr.; *Mindaiensis*, Bock; *Moluensis*, God.-Aust.

Malacologists are frequently led to speculate on the function of accessory glands and cæcum-like appendages of the genitalia of the land mollusca, more particularly when they assume the large and striking structure exemplified in the genera *Dyakia* and *Eveirettia*, situated at the distal end of the dart-sac. It seems unlikely that we shall ever know what their true office may be, whether of an excitant sensory nature or some nature unknown to us. Pilsbry calls them the 'coronal glands,' a good term indicating their position with respect to the dart itself. We may assume they are in a measure associated with the beautifully formed calcified darts, because in other eastern genera the amatorial organ is less specialized, the dart more or less soft and muscular, and the organ as a whole of simple cylindrical form. Yet in contradiction to this we are met with the fact that equally elaborately formed calciferous darts are present in *Damayantia*, *Parmarion*, *Microparmarion*, etc., with accessory coronal glands absent.

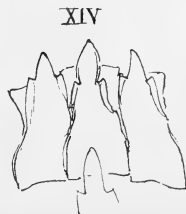
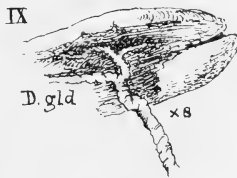
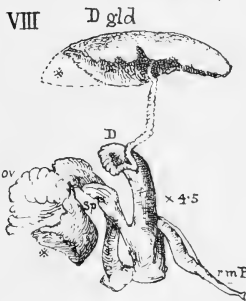
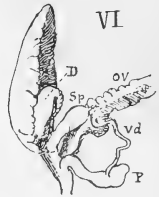
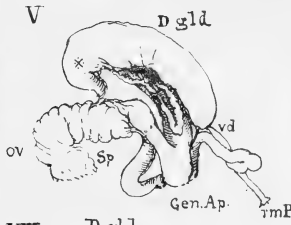
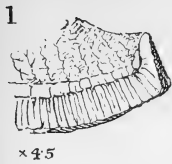
This leads me to allude to another anomalous, inexplicable condition of the generative organs having reference to the dart-sac, viz. that in species of *Sitala*, *Durgella*, *Taphrospira*, etc. The amatorial organ is absent altogether, thus robbing it of much of its importance in the reproductive economy, a state of things even more difficult to account for than the presence and use of the complicated coronal glands in the genera I have mentioned.<sup>1</sup>

#### EXPLANATION OF PLATE X.

FIGS. I-XIV. *Dyakia striata*, var.

*D.* amatorial organ; *D.gld.* gland of amatorial organ; *ov.* ovary; *P.* penis; *r.m.P.* retractor muscle of penis; *sp.* spermatheca; *ut.* uterus; *v.d.* vas deferens.

<sup>1</sup> While writing this paper the October part (vol. xi, No. 8) of the Journal of Conchology has come to hand, which contains a list of the sinistral shells in the Manchester Museum by Mr. R. Standen. I notice the genus *Ariophanta* is still made the receptacle for animals differing most widely from each other. Mr. Standen has evidently not seen what has been published by myself in 1891, and later by Professor Wiegmann in 1898. In this list only *levipes* (the type), *fovcata*, *thyreus*, and *Bajadera* represent the genus *Ariophanta*.



H. H. G.-A. del.





DESCRIPTIONS OF NEW SPECIES OF LAND SHELLS FROM PERU  
AND COLOMBIA AND TWO NEW SPECIES OF *CURVELLA*  
FROM THE PHILIPPINE ISLANDS.

By S. I. DA COSTA.

Read 6th April, 1906.

PLATE XI.

*GONIOSTOMUS SUBHYBRIDUS*, n.sp. Pl. XI, Fig. 1.

Testa elongato-oblonga, fusiformis, anguste umbilicata, lævigata, alba, nigro-fusco flammata, punctis opaco-albis, irregularibus aspersa; spira acuminata; anfract.  $6\frac{1}{2}$ –7, convexiusculi, ultimus ad suturam marginatus, spira paulo brevior, basi attenuatus, obtuse compresso-carinatus; columella recta, reflexa; apertura oblonga, basi angulata et canaliculata; labrum subincrassatum, brevier expansum, rubrum. Long. 50, diam. 19 mm.; apertura 22 mm. longa, 9 lata.

*Hab.*—Pozuzo, Eastern Peru, 800 metres.

Of this fine shell only one specimen has been received. Its general form resembles *G. hybridus*, Gould, from Brazil; it is, however, much more ventricose, has an additional whorl, is ornamented with blackish flames on a white ground, instead of yellow on a dark purple ground, but its most distinctive feature is that it is quite smooth, whereas both *G. hybridus* and *G. goniostoma* are sculptured with close and unequal spiral granules.

*DRYMÆUS SPADICEUS*, n.sp. Pl. XI, Figs. 2, 3.

Testa pyramidali-ovata, umbilicata, tenuiuscula, lævigata, nitida, oblique obsolete striata, albida, strigis spadiceis longitudinalibus flexuosis picta, supra anfract. ultimum fasciisque 2 castaneo-nigricantibus (altera mediana et altera basali), albo-punctatis ornata; spira elongata, ad apicem obtusula, purpurea; anfract. 6, leviter convexi, ultimus  $\frac{2}{3}$  longitudinis æquans; apertura ampla, valde obliqua, oblongo-ovalis, intus violacea; perist. album, undique dilatatum, margine dextro valde expanso, columellari dilatato et reflexo. Long. 39, diam. 19 mm.; apertura cum perist. 21 mm. longa, 16 lata.

*Hab.*—Bogota.

This beautiful shell, described from an unique specimen, bears some resemblance in its elaborate painting to *D. flexuosus*, Pfr., but differs considerably in form, the last whorl being much larger and more diagonally produced, and, in consequence, the aperture becomes more oblique and larger; also the whorls of the spire are flatter than in *D. flexuosus*, and the body-whorl lacks the dark crescent behind the umbilicus as in that species.

*DRYMÆUS ALABASTRINUS*, n.sp. Pl. XI, Fig. 4.

Testa fusiformi-ovata, late et profunde rimato-perforata, nitida, translucida, alba, lævigata, sub lente transversim minute striata; spira subacuta, elongata, apice acutiusculo, pallide roseo; anfract.  $7\frac{1}{2}$ , leviter convexi, ultimus convexiusculus,  $\frac{2}{3}$  longitudinis æquans; sutura impressa, fere horizontalis; columella recta, late reflexa, dilatata; apertura ovata, effusa; perist. album, late expansum et reflexum. Long. 33, diam. 15 mm.; apertura cum perist. 15 mm. longa, 10 lata.

*Hab.*—Honda, Colombia.

A shell that reminds one of some of the forms of *D. trigonostomus*, Jonas, from Venezuela. It differs, however, from that species, both in the outline of the spire and the ovate and smaller aperture. Besides the very fine spiral striæ already referred to, the surface exhibits the usual oblique lines of growth.

*DRYMÆUS ROSENBERGI*, n.sp. Pl. XI, Fig. 6.

Testa acuminato-ovata, anguste umbilicata, vix solidiuscula, nitida, albida, strigis irregularibus castaneis ornata; spira acutiuscula, anfrac. 6, modice convexi, sub lente tenuissime striati, ultimus  $\frac{2}{3}$  longitudinis æquans; apertura parum obliqua, acuminato-ovalis; perist. tenue, luteum, margine externo anguste expanso, columellari dilatato et reflexo. Long. 20.5, diam. 9 mm.; apertura 9 mm. longa, 5 lata.

*Hab.*—Pozuzo, Eastern Peru.

The writer, after searching the records of Pfeiffer and Pilsbry, as well as among the collections of D'Orbigny and others in the British Museum, concluded that this elegant little *Drymæus* was a new species and deemed it worthy of description.

*DRYMÆUS CASTANEO-STRIGATUS*, n.sp. Pl. XI, Fig. 5.

Testa oblongo-conica, anguste umbilicata, solidiuscula, lævigata, albida, strigis irregularibus castaneis ornata, strigis in anfractu ultimo ad basim non attingentibus; spira subobtusa; anfrac. 6, convexiusculi, ultimus  $\frac{3}{4}$ - $\frac{1}{2}$  longitudinis æquans; sutura impressa; apertura ovalis, intus lutescens; perist. tenue, anguste expansum, margine dextro luteo, columellari dilatato et reflexo. Long. 19, diam. 8.5 mm.; apertura 8.5 longa, 4.25 lata.

*Hab.*—Pozuzo, Eastern Peru.

This shell somewhat resembles *D. Rosenbergi*, but differs in having a blunter spire, more convex whorls, and notably in the stripes terminating before reaching the base of the shell.

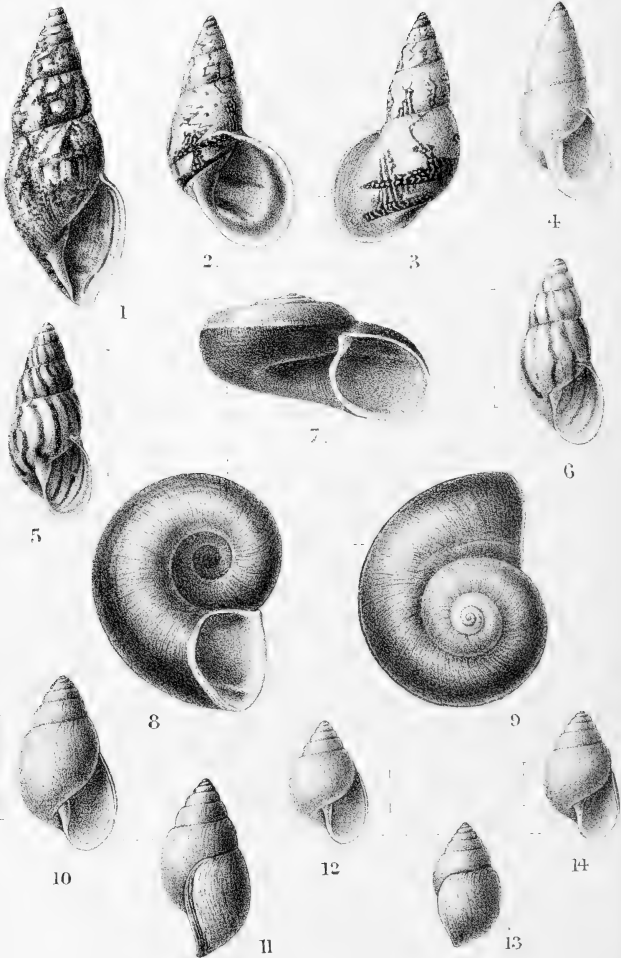
*NEOCYCLOTUS PERUVIANUS*, n.sp. Pl. XI, Figs. 7-9.

Testa ampliter aperte umbilicata, depressa, ustulato-fusca, supra peripheriam fascia angusta fulva cingulata, infra saturate late fasciata; anfract.  $4\frac{1}{2}$ , convexi, ad suturam impressi, oblique filoso-striati; apertura oblique circularis, albo-cærulescens. Diam. maj. 38, min. 29 mm.

*Hab.*—Pozuzo, Eastern Peru.

There is a certain resemblance between this shell and *N. cingulatus*, Sowb., from Colombia, but it is less openly umbilicated and not so





J. Green del. lith. et imp.

NEW SPECIES OF GONIOSTOMUS, DRYMÆUS, NEOCYCLOTUS & CURVELLA.

strongly striated. The different geographical distribution of the two species should be sufficient to distinguish them. The shelly operculum is thick and consists of 8-9 whorls, which are thickened at the inner edge.

*CURVELLA MINUTA*, n.sp. Pl. XI, Figs. 12-14.

Testa oblongo-ovata, umbilicata, curvatim rugulose-striata, tenuis, cretacea, alba; anfractus  $5\frac{1}{2}$ , convexi, ultimus  $\frac{3}{8}$  longitudinis æquans; apertura semi-ovalis; peristoma simplex, margine dextro arcuato, supra recedente, columellari recto, dilatato et reflexo. Long. 7.5, diam. 4.5 mm.; apertura 5 mm. longa, 2.5 lata.

*Hab.*—Malbato, Busuanga I., Philippines.

These little shells formed part of Dr. Hungerford's collection, purchased many years ago by the writer, and were labelled "*Stenogyra* sp.," but from their peculiar sculpture they belong to the genus *Curvella*, formerly named *Hapalus*.

*CURVELLA ALABASTRINA*, n.sp. Pl. XI, Figs. 10-11.

Testa oblongo-ovata, umbilicata, tenuis, nitida, curvatim rugulose-striata, pellucide albida; anfractus 6, convexiusculi, ultimus  $\frac{3}{8}$  longitudinis æquans; apertura ovalis; peristoma simplex, margine dextro arcuato, columellari recto, leviter recedente dilatato et reflexo. Long. 17, diam. 9 mm.; apertura 9 mm. longa, 4.5 lata.

*Hab.*—Guimaras, Philippines.

From the same collection as the preceding species.

EXPLANATION OF PLATE XI.

- FIG. 1. *Goniostomus subhybridus*, n.sp.  
 ,, 2, 3. *Drymæus spadiceus*, n.sp.  
 ,, 4. ,, *alabastrinus*, n.sp.  
 ,, 5. ,, *castaneo-strigatus*, n.sp.  
 ,, 6. ,, *Rosenbergi*, n.sp.  
 ,, 7-9. *Neocyclotus Peruvianus*, n.sp.  
 ,, 10, 11. *Curvella alabastrina*, n.sp.  
 ,, 12-14. *Curvella minuta*, n.sp.

NOTE ON SWAINSON'S GENUS *VOLUTILITHES*.

By R. BULLEN NEWTON, F.G.S.

Read 6th April, 1906.

## PLATE XII.

I HAVE been induced to examine the history of Swainson's genus *Volutilithes* in consequence of an enquiry made by Professor W. H. Dall, of Washington, as to the value of *Volutilithes pertusa*, a new species of fossil shell described and figured in the original account of that genus. As a result of my investigations, I find that conchologists have hitherto associated the wrong type with *Volutilithes*; and instead of that being the *Conus spinosus* of Linnæus ("Systema Naturæ," 1758, 10th ed., p. 715) it should be Lamarck's *Voluta muricina*. A discrepancy of this kind has probably arisen through some difficulty in obtaining the work known as "Zoological Illustrations," where Swainson first described the genus in 1831. This author's later and better known book of 1840, called "A Treatise on Malacology," contained a second notice of *Volutilithes*, the form *spinosus* being the first mentioned among a number of established species which were included in the genus, and that which has ever since been regarded as the type. This Linnæan shell, it should be noted, is in no way referred to by Swainson in the original description of *Volutilithes*; in fact, his earlier observations are not even alluded to in this subsequent account of the genus. To further elucidate some of the points connected with the subject, it is advisable to include here a transcription of the full text of Swainson's first notice of the genus, so that students not acquainted with the work in question may be in a position to consider the matter for themselves. In making this extract I have inserted certain references within square brackets for purposes of explanation which are not in the original text:—

## "VOLUTILITHES MURICINA. [Pl. XII, Fig. 1.]

[Zoological Illustrations, 1831, ser. II, vol. ii, No. 12, pl. liii, fig. 1.]

Family Volutidæ. Subfamily Volutinæ. *Nob.* (Genus *Voluta*, Lam.)  
*Generic character.*—Spiral whorls regularly and gradually diminishing towards the apex, which is always acute. Plaits of the pillar numerous, always indistinct, generally evanescent, and sometimes wanting. *Nobis.*

*Type.*—*Voluta musicalis* (?), Lam.

*Specific character.*—Shell nearly fusiform, the base narrow and smooth; the upper part with longitudinal, subcostated, spinous plaits: inner lip thickened, the last plait on the pillar very thick, and separated from the others, which are slender and nearly obsolete, by a deep groove.

*Voluta muricina*, Lam., [Hist. Nat. Anim. sans Vert., 1822, 1st ed., vol. vii, p. 350, non "Système," as quoted by Swainson ;] Eney. Méth., pl. 383, fig. 1.

The fourth principal division of the Lamarckian Volutes has hitherto been found only in a fossil state, unless, indeed, the *Voluta Braziliiana* really belongs to this type. The species are very numerous, both in the London Clay and in the *Calcaire grossier* of Grignon. They offer some beautiful types of form, representing the conterminous groups in this family, some of which we may hereafter notice more particularly. The pre-eminent type may probably be the *V. musicalis* of Lamarck; as yet, we only know this fossil from descriptions and figures, but it has obviously been confounded with several others. Lamarck has given a character so exquisitely finished of *V. muricina* that we have done little more than translate his words. Our specimen appears to be from Grignon, and was furnished to us with the following by Messrs. Stuchbury, 33, Theobald's Road, Bedford Row.

VOLUTILITHES PERTUSA. [Pl. XII, Fig. 2.]

Shell subfusiform, and the base striated; the upper part with thick, remote, and somewhat nodulous ribs; transversed near the suture with lines of punctured striæ; inner lip thickened, plaits on the pillar distinct, the last very strong, the two next smaller, and the upper very slender.

This species is certainly undescribed by Lamarck, nor do we find it in Dr. Fleming's useful compendium of the 'Mineral Conchology.' Our specimen has the grey tinge of the London Clay fossils. Neither of these species are typical, as they represent the recent costated Volutes in the adjoining group."

It is obvious from this account that Swainson was in doubt as to the type of *Volutilithes* from the fact that he queried *Voluta musicalis* of Lamarck, the form selected as the type, and by further stating in the text that "the pre-eminent type may probably be the *V. musicalis* of Lamarck," he being only familiar with that species from figures and descriptions and not from actual specimens.

In the present argument, however, such a point is apparently of little consequence, for on analysing the Lamarckian species, which is a well-known Eocene shell common to the Anglo-Parisian basin, it is found to be a closely related form of the modern *Voluta musica*, the type of *Voluta* as emended by Lamarck, and therefore a member of that genus.

It follows then that Lamarck's *musicalis*, being a true *Voluta*, necessarily invalidates its subsequent use by Swainson as an example of *Volutilithes*; and while on the subject of *Voluta* it may be mentioned that the genus *Volutolyria* was founded by H. Crosse in 1877 for the reception of *Voluta musica* of Linnæus, and therefore becomes a synonym of *Voluta*, this fact having been explained by M. Cossmann in his "Essais de Paléconchologie Comparée," 1899, 3rd livraison, pp. 109, 110.

The second species included by Swainson in *Volutilithes* was the *Voluta muricina* of Lamarck, a shell known alike in the Eocene

deposits of both England and France. As far as can be ascertained, this species was never previously occupied for the type of another genus, so that it is clearly available for recognition as the type of *Volutilithes*. It is certain, also, that Swainson was anxious to emphasize the importance of Lamarck's shell, since he headed the whole history of his new genus with "*Volutilithes muricina*."

The late Paul Fischer also used the same Lamarckian shell for the type of *Eopsephæa*, consequently this will now become a synonym of *Volutilithes*. In all Gastropods the details of the protoconch are of essential value for purposes of classification, and particularly among the Volutidæ, where so much variation has been observed by Cossmann, Dall, Crosse, and other authorities. This character is very distinctive in well-preserved examples of *Volutilithes muricina*, especially those obtained from the Parisian Eocene, the protoconch consisting of two smooth mammillated whorls surmounted by a laterally situated, conically pointed nucleus.

Such a change of types as is here suggested unfortunately renders a long list of species, hitherto regarded as *Volutilithes*, without a generic name. Many of these shells are referred to by M. Cossmann in his comprehensive treatise already alluded to ("Essais," etc.), at the head of which stands the Eocene *Voluta* [*Conus*] *spinosa*, Linnæus, Swainson's type of his later *Volutilithes*. To embrace this group of species under the same type it is proposed to replace Swainson's *Volutilithes* of 1840 by the new name of *Volutospina*.

The third shell referred to as belonging to *Volutilithes* is the new species, *pertusa*, which is said to exhibit "the grey tinge of the London Clay fossils." This term "London Clay," as used in Swainson's time, was applied to most of the fossiliferous clays found in the Lower Tertiary rocks of the London and Hampshire Basins, and not as at present restricted for a particular geological horizon. It is therefore not surprising to find, after a careful comparison of the fossil Volutes in the "Frederick Edwards" and other collections at the British Museum, that this *Volutilithes pertusa* is the same shell as was figured by J. Sowerby as *Voluta costata* in the "Mineral Conchology," 1821, vol. iii, pl. cxc, figs. 2, 4, but which, differing from Solander's shell (represented by fig. 1 of Sowerby's plate) of an earlier date and similar name, was subsequently included by Edwards in his *Voluta humerosa*<sup>1</sup> (Mon. Palæontog. Soc., 1854, p. 171, pl. xxii, fig. 6), a characteristic Upper Eocene species found in the Barton Clay of Hampshire, and which is apparently unknown in the corresponding deposits of the Paris Basin.

<sup>1</sup> It should be noted that the original figures of *V. humerosa* of Edwards do not clearly exhibit the characteristic spiral striations which are so well expressed in the types as well as in all other examples of the species. This ornamentation, as in Swainson's figures of *pertusa*, is mainly confined to the sutural and basal areas of this shell, thus differing from Solander's *V. costata*, where the entire surface of the volutions is transversely lineated. There are, of course, other distinctions to separate these species, but it is not necessary to enlarge upon them at the present time.



Swainson's *V. pertusa* was, however, never referred to by Edwards in his monograph on the Eocene Mollusca, and it is possible that he was not familiar with the "Zoological Illustrations" for 1831; in any case it is quite certain that the older name must be acknowledged, whilst *V. humerosa* must be relegated to synonymy.

Since Swainson's description appeared this shell has only been once systematically noticed in literature, and that was by Deshayes (see Deshayes and Milne Edwards' edition of Lamarck's Hist. Nat. Anim. sans Vert., 1844, vol. x, p. 430), who described it as *Voluta pertusa*, Swainson, and localised it as a "Fossile de Courtagon." No locality is given in Swainson's original text for this species, so that the statement as to "Courtagon" was made without authority and is absolutely incorrect, the shell having been obtained from Barton and not from the French Eocenes. In much more modern times M. Cossmann has recognized that *Voluta humerosa* of Edwards should be associated with Gray's genus *Lyria* (see Cossmann's "Essais de Paléoconchologie Comparée," 1899, 3rd livr., p. 114), although the evidence is greatly in favour of its being a true *Volutilithes*, the protoconch appearing to have the same elements of structure as characterize Lamarck's *muricina*.

The genera and species involved in this discussion may be tabulated as under, the distribution in time being taken from Cossmann's "Essais" before quoted:—

#### VOLUTA, Linnæus, *emend.* Lamarck.

Linn., Systema Naturæ, 1758, 10th ed., p. 729; Lamarck, Mém. Soc. Hist. Nat. Paris, 1799, p. 70.

*Synonym.*—*Volutolyria*, H. Crosse, Journ. Conchyliologie, 1877, vol. xxv, p. 99.

*Type.*—*Voluta musica*, Linnæus. A fossil example = *Voluta musicalis*, Lamarck.

*Distribution in time.*—Tertiary (Eocene) to Recent.

#### VOLUTILITHES, Swainson.

Zoological Illustrations, 1831, ser. II, vol. II, pl. liii, fig. 2.

*Synonym.*—*Eopsephæa*, P. Fischer, Manuel Conchyliologie, 1883, p. 607.

*Type.*—*Voluta muricina*, Lamarck. Another example is *Volutilithes pertusa*, Swainson.

*Distribution in time.*—Cretaceous (Turonian) to Tertiary (Eocene).

#### VOLUTOSPINA, R. Bullen Newton, *nom. mut.*

*Synonyms.*—*Plejona*, Bolten, *pars*, Museum Boltenianum, 1798, p. 59; *Volutilithes*, Swainson, A Treatise on Malacology, 1840, p. 318, *non* Swainson, 1831.

*Type.*—*Conus spinosus*, Linnæus.

*Distribution in time.*—Cretaceous (Turonian) to Recent (= *Philippiana*, Dall).

## VOLUTOCORBIS, W. H. Dall.

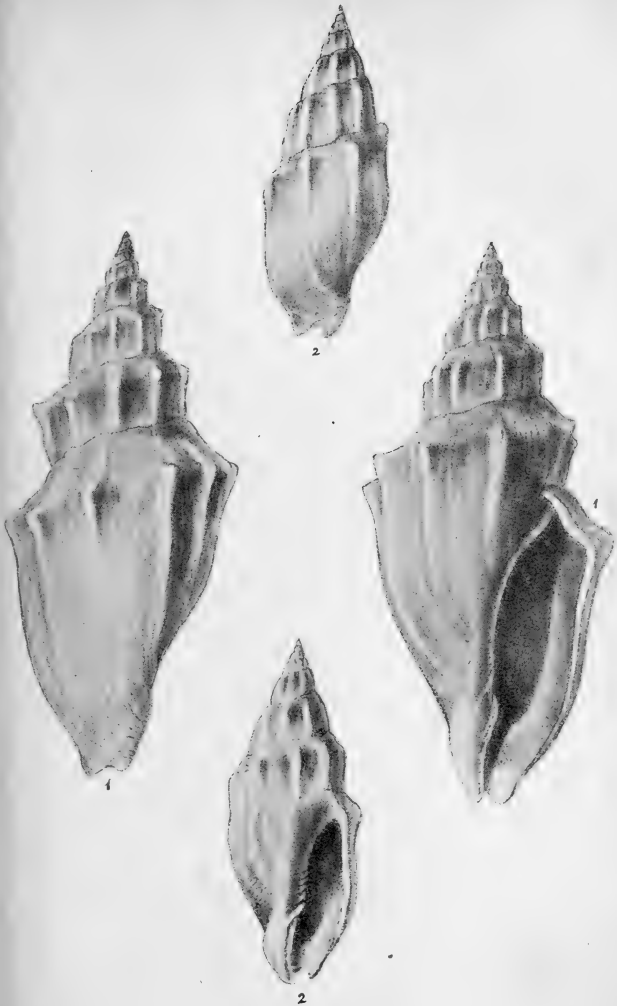
Trans. Wagner Free Instit. Sci. Philadelphia, 1890, vol. iii, p. 75.

*Type.*—*Voluta limopsis*, Conrad.

*Distribution in time.*—Cretaceous (Senonian) to Recent (= *Voluta abyssicola*, Adams & Reeve, and *Volutilithes Gilchristi*, G. B. Sowerby).

Professor Dall described this form (*Volutocorbis*) as a subgenus of Swainson's *Volutilithes* of 1840.

NOTE.—Since the reading of this paper, Professor W. H. Dall has published some notes on the Volutidæ in *The Nautilus* for April, 1906, vol. xix, No. 12, p. 143. Referring to *Volutilithes* of Swainson, he states that the name "was proposed for the shells to which Fischer later gave the name of *Eopsephæa*. The type is *Voluta muricina*, Lam. The shells typified by *Voluta spinosa*, and which are usually called *Volutilithes*, will probably take the name of *Plejona*, Bolten, 1798." The claims of the Boltenian name are, however, much too unsatisfactory for serious consideration, as a glance at its history will readily demonstrate. *Plejona* was founded by Bolten in 1798 (*Museum Boltenianum*, p. 59), the first species referred to, and which should be regarded as the type, being *P. fossilis*, a form based upon some figures in Dezallier d'Argenville's "L'Histoire Naturelle éclaircie dans deux de ses parties principales. La Lithologie et la Conchyliologie," 1742, pl. xxxiii, fig. 10, p. 393. Now this so-called figure 10 comprises four separate illustrations of what are termed "Muricites," all of which belong to different shells, and which may be fairly easily recognizable, commencing from the left of the plate, as *Voluta musicalis*, *Volutilithes muricina*, *Volutospina spinosa*, and *Melongena melongena* (this last shell kindly determined for me by Mr. E. A. Smith). It is not possible from a group of shells like this to select one in particular as the type of *Plejona*, and Bolten having failed to specify that which he regarded as such, there is no alternative but to omit this name from the conchological list. I am indebted to Mr. B. B. Woodward, F.L.S., for kindly directing my attention to Professor Dall's interesting communication on this subject.



1. *muricina*.

**VOLUTILITHES.**

2. *pertusa*.

(Reproduction of Swainson's plate.)



FURTHER REMARKS ON THE GENUS *CHLORITIS*, WITH  
 DESCRIPTIONS OF ELEVEN NEW SPECIES.

By G. K. GUDE, F.Z.S.

Read 6th April, 1906.

PLATE XIII.

SINCE writing my former article on the genus *Chloritis* (*ante*, pp. 40-50) new material of much interest has reached me from various sources. Colonel Beddome, Messrs. Sowerby & Fulton, Mr. E. A. Smith, and Mr. E. R. Sykes—to whom I am much indebted—have all contributed undescribed forms, and my own collection has further yielded three new species. Mr. Schepman, of Rhoon, Holland, has kindly sent to me for inspection a number of shells belonging to the Leyden Museum. Of these I refer three, from the Xulla Islands to *C. macrostoma*; they vary somewhat in elevation of the spire, and the peristome is somewhat more thickened than in the type; one of them, moreover, has the umbilicus narrower, and half covered by the columellar margin of the peristome, while the last whorl descends a little, but is not deflexed. Another of the Leyden Museum shells I refer to *C. biomphala*; it is from Taliabu Island, a new habitat for the species. I have appended a list of the species of *Chloritis*, brought up to date, adding all bibliographical references not included in Pilsbry's Manual of Conchology. I have omitted from the list the species named *bulbulus*, *zodiacus*, *Howesi*, and *Bonthainensis*, the brothers Sarasin having demonstrated that they pertain to the genus *Planispira*. On the other hand, I have included several species placed by Pilsbry in *Planispira*, e.g. *delibrata* and its allies, as these appear to me to fall more naturally into the genus under consideration.

I take this opportunity of recording my deep obligation to Mr. Smith for valuable assistance in compiling the list.

*CHLORITIS* BEDDOMEI, n.sp. Pl. XIII, Fig. 1.

Shell widely umbilicated, solid, depressed conoid, dark chestnut, shining under a velvety deciduous cuticle, finely and distantly plicatostriate, decussated with close microscopic spiral lines; spire convex, apex obtuse, suture somewhat deep. Whorls  $5\frac{1}{2}$ , increasing slowly and regularly, compressed above, rounded at the periphery, flattened below, obtusely angulated round the widely excavated umbilicus; last whorl scarcely descending in front, slightly dilated towards the mouth. Aperture elliptic, little oblique, margins convergent, united by a flexuous thread-like ridge. Peristome a little thickened, expanded, and reflexed; upper and outer margins arcuate, basal sinuous, projecting forward, columellar obliquely ascending into and impinging upon the umbilicus, then curved forward and towards the body-whorl and continued into the flexuous thread-like parietal ridge. Diam. maj. 28.5, min. 23.5 mm.; alt. 15.5 mm.

*Hab.*—New Guinea.

Type in Colonel Beddome's collection.

. Compared with its only known ally, *C. selenitoides*, from Buru, the new species is larger, has  $\frac{1}{2}$  whorl more, a relatively larger diameter, and shorter axis, the whorls are more flattened, the umbilicus is wider, and the columellar margin of the peristome ascends farther into the umbilicus, while the aperture is more dilated transversely, and the peristome is more expanded. Dedicated to Colonel Beddome, who received the shell from the Leyden Museum, and who has kindly placed this and two other species in my hands for description.

CHLORITIS HOLOSERICA, n.sp. Pl. XIII, Figs. 2, 2a.

Shell umbilicated, discoid, pale chestnut brown, finely striated, shining under a velvety deciduous cuticle; spire plane, suture shallow. Whorls 5, increasing slowly and regularly (the last rather suddenly), subangulated above, rounded at the side and below; last whorl a little dilated behind the peristome, descending nearly as far as the periphery, not deflected in front. Aperture oblique, roundly crescentic; margins distant, united by a slightly raised flexuous callus, upper margin ascending slightly at first, then arcuate; basal nearly straight; columellar dilated a little, ascending forward, slightly overhanging the narrow deep umbilicus, peristome white or roseate, thickened, expanded, and reflexed. Diam. maj. 24, min. 21.5 mm.; alt. 12.5 mm.

*Hab.*—North New Guinea (Mus. Cuming).

Type in the British Museum?

Two specimens from the Cuming Collection were labelled *C. Gruneri*, var. They are, however, distinct, measuring more than one-third less in diameter, and not being granulated like that species; the plane spire, wider umbilicus, and much less developed peristome and callus still further separate this species.

CHLORITIS TERES, n.sp. Pl. XIII, Figs. 3, 3a.

Shell moderately umbilicated, depressed conoid, fulvous corneous, irregularly striated, shining under a velvety deciduous cuticle (Fig. 3a), somewhat sparsely covered with stiff, short, dark bristles arranged in quincunx; when denuded, the surface is seen to be studded with small tubercles placed in shallow depressions. Whorls 4-4 $\frac{1}{2}$ , increasing slowly, the last rather suddenly, and dilated towards the mouth, deeply deflected in front, tumid, scarcely angled round the umbilicus. Aperture subrotundate, oblique, margins convergent; peristome white or tinged with fuscous, thin, a little expanded, not reflexed; margins curved evenly, columellar obliquely ascending, triangularly dilated, and slightly overhanging the moderate umbilicus. Diam. maj. 19.5, min. 16 mm.; alt. 13 mm.

*Hab.*—New Ireland (Cox Collection).

Type in the British Museum.

A series of shells was received from Messrs. Sowerby & Fulton, accompanied by a note in Dr. Cox's writing—"I can't come to any conclusion about these specimens. From New Ireland." At first it was thought they pertained to *C. eustoma*, but upon careful comparison

with the type in the British Museum it was found that this form presented considerable differences which justified its being raised to specific rank. It is less depressed in the spire, the umbilicus is narrower, not obliquely excavated, and much less angulated, the whorls are more tubular, the last whorl is more dilated at its termination, the axis is higher in proportion to the diameter; the peristome is thinner, less expanded, not reflexed, and the hairs are more distant. The most salient feature, however, is the character of the raised tubercles placed in shallow depressions. The shells before me can be grouped into two series in about equal proportions; one typical, ranging in size from diam. 21.5, alt. 15 mm. to 19.5 and 13 mm.; the other a little more depressed in the spire, the axis a little shorter in relation to the diameter, and the umbilicus a little wider, ranging in size from diam. 21, alt. 14 mm. to 18.5 and 12.5 mm.

CHLORITIS SILENUS, Angas.

*Chloritis conjuncta*, Gude, *ante*, p. 47.

When considering this species I thought the material at my disposal justified me in separating a number of forms as a distinct species under the name *C. conjuncta*. Messrs. Sowerby & Fulton have kindly submitted a number of shells which demonstrate that the two extremes are linked by intermediate forms, and the name *conjuncta* must therefore be relegated to the synonymy of *C. silenus*.

CHLORITIS FRAUDULENTA, n.sp. Pl. XIII, Fig. 4.

*C. Rehsei*, Gude (not of Mart.): Proc. Malac. Soc., vol. vi (1904), p. 115.

Shell moderately umbilicated, depressed globose, blackish chestnut, shining; spire conoid, apex obtuse, suture shallow. Whorls 4, subcompressed, subangulated above the periphery, dilated towards the mouth, then constricted, more so below, obtusely angulated round the obliquely excavated umbilicus; finely plicate-striate, the striae arcuate and pronounced at the suture; the first  $2\frac{1}{2}$  whorls covered with minute, very crowded hair-points, arranged in quincunx, becoming sparser on the last half of the penultimate whorl, disappearing altogether on the last whorl, which descends shortly, but deeply, in front. Aperture semi-ovate, oblique; peristome thickened, expanded and reflexed, bluish, becoming blackish at the edge, margins a little convergent, evenly curved, columellar triangularly dilated and overhanging the umbilicus. Diam. maj. 39, min. 31 mm.; alt. 31 mm.

*Hab.*—Dinawa, British New Guinea (E. A. Pratt).

Type in my collection.

The present shell was at first considered to be a form of *C. Rehsei*, but careful comparison has convinced me that we have here a distinct species. The axis is shorter in proportion to the diameter, the spire is more depressed, the aperture is more dilated transversely, the last whorl is more dilated towards the mouth, less tumid below, devoid of hair-scars and spiral furrows below, the narrower umbilicus is subangulated, the peristome less expanded and less reflexed, the surface more plicate, and the hair-scars on the earlier whorls more crowded. An immature specimen of  $3\frac{1}{4}$  whorls in beautifully fresh condition

shows the hair-points as minute tubercles; these disappear somewhat suddenly near the termination of the third whorl.

*CHLORITIS CHALLENGERI*, n.sp. Pl. XIII, Figs. 5-5b.

Shell umbilicated, depressed conoid, fragile, dark reddish-chestnut, finely striated, shining under a velvety deciduous cuticle, decussated with close microscopic spirals; spire conoid, suture impressed, apex raised, the nepionic ( $1\frac{1}{2}$ ) whorls finely granulated. Whorls  $4\frac{1}{2}$ , rounded above, subangulated above the periphery, slightly compressed below, subangulated round the moderate umbilicus, which has one or two spiral sulci inside, last whorl scarcely descending in front, a little constricted behind the peristome. Aperture oblique, roundly obovate; margins approaching, evenly rounded; peristome thin, rosy-purple, slightly expanded; columellar margin triangularly dilated and slightly overhanging the umbilicus. Diam. maj. 16, min. 14 mm.; alt. 10 mm.

*Hab.*—Queensland ("Challenger" Expedition).

Type in the British Museum.

Six specimens, one of them immature, showing the finely granulated nepionic  $1\frac{1}{2}$  whorls very distinctly. The present species is allied to *C. mansueta*, being similar in shape, but the latter is more solid and paler, and the whorls increase more slowly, while the granules, so conspicuous in that shell, are lacking in the new species. *C. Porteri*, another allied form, has a narrower umbilicus and a more contracted aperture; the short, stiff, dark bristles still further differentiate that species from both *C. mansueta* and *C. Challengeri*.

*CHLORITIS ASTÆUS*, n.sp. Pl. XIII, Figs. 6-6c.

Shell umbilicated, conoid, finely striated, whitish corneous, covered with soft, short, very crowded, pale hairs, arranged in quincunx (Fig. 6c); spire conoid, apex obtuse, suture impressed. Whorls 4, convex, obtusely angulated round the narrow umbilicus; last whorl slightly descending, then suddenly and shortly deflexed in front, slightly dilated, then strongly gibbous and narrowly constricted behind the peristome. Aperture subovate, oblique, margins convergent; peristome rosy-red, a little thickened, somewhat broadly expanded and flattened, not reflexed; upper and outer margins arcuate, basal nearly straight, forming a slight angle with the columellar margin, which ascends obliquely, is triangularly dilated, and slightly impinges upon the obliquely excavated umbilicus, which has a short furrow on the oblique portion. Diam. maj. 9.5, min. 8 mm.; alt. 5.5 mm.

*Hab.*—Cardwell, Queensland.

Type in Colonel Beddome's collection.

Allied to *C. brevipila*, but the last whorl is more gibbous and contracted behind the peristome, which is more expanded and flattened, but not reflexed; basal margin straight, and the hairs excessively minute and close.

*CHLORITIS AGAMEMNON*, n.sp. Pl. XIII, Figs. 7-7c.

Shell narrowly umbilicated, depressed conoid, reddish corneous, very finely striated, covered with excessively crowded and short



bristles (Fig. 7c); spire depressed, apex obtuse, suture deep, channelled. Whorls  $4\frac{1}{2}$ , increasing regularly, tumid, subangulated round the narrow but deep umbilicus; last whorl not descending. Aperture lunate, little oblique, margins convergent. Peristome fuscous, thin, little expanded; upper and outer margins arcuate; basal straightened, forming a slight angle with the columellar margin, which ascends obliquely, is reflexed, and triangularly dilated, impinging upon the umbilicus. Diam. maj. 10.5, min. 9 mm.; alt. 6 mm.

*Hab.*—Cardwell, Queensland.

Type in Colonel Beddome's collection.

A pretty little species, unlike any I have seen from that region, but evidently belonging to the group of *C. brevipila*. This and the preceding species were received with Brazier's MS. names, which I have adopted, as specimens may have been distributed to other collectors under those names.

CHLORITIS MANSONENSIS, n.sp. Pl. XIII, Figs. 9-9b.

Shell moderately umbilicated, thin, translucent, shining, corneous, rather evenly and distantly ribbed above and at the side, slightly striated below, the striæ decussated by distant shallow spiral sulci. Spire strongly depressed, apex obtuse, suture rather deep. Whorls  $4\frac{3}{4}$ , a little flattened above and below, rounded at the periphery; obtusely angulated round the moderate, deep umbilicus; last whorl descending a little, and slightly deflexed in front, a little dilated towards the mouth. Aperture rotundate-lunate, oblique; margins convergent; peristome thin, not thickened, slightly expanded, columellar margin slightly dilated above and impinging upon the umbilicus. Diam. maj. 16, min. 13.5 mm.; alt. 8 mm.

*Hab.*—Tonkin.

Type in my collection.

From Mr. Fruhstorfer I received this shell with the MS. name "*Mansonensis*, Mlldff.," but as it does not appear to have been published I venture to describe and figure it. The species is allied to *C. insularis*, but that shell possesses  $5\frac{1}{2}$  whorls, and measures 18 mm. It is also more depressed in the spire, while it lacks the ribs of the new species.

CHLORITIS RUFOFASCIATA, n.sp. Pl. XIII, Figs. 8-8c.

Shell umbilicated, discoid, fragile, translucent, pale corneous, with a narrow, red, supra-peripheral band, finely and regularly striated, very minutely and densely granulated, the granules arranged in quincunx (Fig. 8c); spire plane, suture impressed. Whorls 4, convex above, obtusely angulated above the periphery, obliquely sloping and convex below, distinctly angulated round the funnel-shaped umbilicus; last whorl slightly descending in front, not deflexed. Aperture securiform, scarcely oblique; margins a little convergent, united by a thin callus. Peristome thin, acute, white, a little expanded; upper margin nearly straight, outer strongly curved, basal nearly straight, forming an angle with the columellar margin, which is reflexed, triangularly dilated, and impinges slightly upon the umbilicus. Diam. maj. 15, min. 12 mm.; alt. 7 mm.

*Hab.*—West Sumatra.

Type in Mr. Sykes' collection.

Allied to *C. Smithi*, but not tubercled like that species. It is smaller, the last whorl is not deflexed, not concave above the periphery, and the peristome is thinner and not reflexed.

CHLORITIS SYKESI, n.sp. Pl. XIII, Figs. 10–10*c*.

Shell umbilicated, depressed conoid, pale corneous, fragile, translucent, shining under a velvety cuticle (Fig. 10*c*), finely striated, covered with very short, crowded, pale bristles arranged in quincunx. Spire subplane, apex sunk, suture impressed. Whorls  $4\frac{1}{2}$ , convex above, rounded at the side, slightly compressed below, obtusely angulated round the moderate pervious umbilicus; last whorl scarcely descending, not deflexed in front, slightly dilated towards the mouth. Aperture crescentic, little oblique, margins convergent; peristome thin, fuscous, shortly reflexed; upper and outer margins arcuate, basal forming an obtuse angle with the columellar margin, which is nearly vertical, slightly dilated above, shortly ascending forward, and slightly impinging upon the umbilicus. Diam. maj. 16·5, min. 14·5 mm.; alt. 10 mm.

*Hab.*—West Sumatra.

Type in Mr. Sykes' collection.

The present species resembles *C. Fruhstorferi* in contour, but is a little more depressed, the hairs are much crowded, not tubercled; the peristome is thinner, and the columellar margin less dilated. Compared with *C. Everetti*, the whorls are less tumid, and the umbilicus is wider. Another ally is *C. tabularis*, but that species is larger, less depressed, darker in colour, the columellar margin is less oblique, the umbilicus narrower, less obliquely excavated, and less angulated, while the hairs are slightly less crowded. This and the preceding species were kindly placed in my hands for description by Mr. Sykes.

CHLORITIS EURYCHASMA, n.sp. Pl. XIII, Figs. 11–11*c*.

Shell perforate, compressed conoid, pale corneous, rather thin, translucent, finely striated, covered with very short, crowded hairs arranged in quincunx (Fig. 11*c*). Spire conoid, apex prominent, suture impressed. Whorls 4 (the first two minutely granulated), convex above, obtusely angulated at the periphery, becoming rounded towards the mouth, tumid below; last whorl descending shortly, abruptly deflexed in front below the periphery, gibbous and then narrowly constricted behind the peristome. Aperture obovate, margins distant, united by a somewhat solid callus on the parietal wall. Peristome fuscous, a little thickened, shortly reflexed; upper, outer, and basal margins arcuate, columellar broadly dilated, more than half covering the narrow perforation of the umbilicus. Diam. maj. 15, min. 13·5 mm.; alt. 11 mm.

*Hab.*—Sjerah Island (? Sera), north of Tenimber.

Type in my collection.

I have adopted the MS. name *C. eurychasma*, Boettger, under which the shell was received by the writer from the late Bruno Strubell.

The name occurs in Mr. Fulton's list in Proc. Malac. Soc., vol. iii (1899), p. 213, but, as far as I am aware, no description was ever published. In the shape of the aperture and the broadly dilated columellar margin of the peristome, the new species resembles *C. Romaensis*, but that shell is more globose, more elevated in the spire, the umbilicus is completely covered, and the cuticle is devoid of hairs or scars.

## Genus CHLORITIS, Beck.

## Section CHLORITIS, s.s.

- C. unguilina*, Linn.; var. *minor*, Fér. Ceram.  
*C. Eduardi*, Gude.<sup>1</sup> Moluccas.  
*C. unguiculina*, Mart.; var. *fusca*, Gude.<sup>2</sup> Buru.  
*C. biomphala*, Pfr. Ceram, Celebes, Taliabu.  
*C. omphalospira*, Mlldff.<sup>3</sup> China.  
*C. diplomphala*, Mlldff. China.  
*C. biconcava*, Hde. China. = *Outangensis*, Crosce.  
*C. molina*, Hde. China.  
*C. Minahassæ*, Sar.<sup>4</sup> Celebes.  
*C. Martensi*, Pfr. Ceram.  
*C. cheratomorpha*, Tap. New Guinea.  
*C. Talabensis*, Kob.<sup>5</sup> Celebes.  
*C. heteromphala*, Pils.<sup>6</sup> Moluccas.  
*C. mima*, Fult.<sup>7</sup> Buru.  
*C. circumdata*, Fér. Aru, Mysol, Waigiou, New Guinea.  
*C. molliseta*, Pfr. Mysol.  
*C. pervicina*, Smith.<sup>8</sup>  
*C. Lansbergiana*, Dohrn. ? New Guinea.  
*C. Maforensis*, Tap.; New Guinea. Var. *micromphalus*, Pils.; Aru.  
*C. unguiculastra*, Mart.; var. *Buruensis*, Mart.; var. *Amboinensis*, Mart.; var. *pilosa*, Mart. Buru, Amboina.  
*C. flexuosa*, Pfr. = *Ceramensis*; Pfr. Ceram.  
*C. unguicula*, Fér. = *Yoldii*, Mörch. Ceram, Amboina.  
*C. Ponsoybi*, Gude.<sup>9</sup> Moluccas.

Section PTYCHOCHLORITIS, Mlldff.<sup>10</sup>

- C. Gruneri*, Pfr. Buru.  
*C. mirabilis*, Mlldff.<sup>11</sup> Buru.  
*C. holoserica*, n.sp.<sup>12</sup> New Guinea.

<sup>1</sup> Ante, p. 41.<sup>2</sup> Ante, p. 41.<sup>3</sup> Nachr. Blatt Deutsch. Malak. Ges., 1897, p. 29.<sup>4</sup> Die Land-Mollusken von Celebes, 1899, p. 199, pl. xxv, fig. 250.<sup>5</sup> Abh. Zool. Mus. Dresden, vol. vi (1896-7), No. 5, p. 3.<sup>6</sup> Man. Conch., vol. vi (1891), pl. li, figs. 60-62. (No description.) Gude, ante, p. 43.<sup>7</sup> Proc. Malac. Soc., vol. iii (1899), p. 214, pl. xi, fig. 7.<sup>8</sup> Ann. & Mag. Nat. Hist., ser. vi, vol. xx (1897), p. 411, pl. ix, figs. 8-10.<sup>9</sup> Ante, p. 42.<sup>10</sup> Nachr. Blatt Deutsch. Malak. Ges., 1902, p. 199.<sup>11</sup> Loc. cit., p. 199.<sup>12</sup> Ante, p. 106.

- C. exacta*, Pfr. New Guinea.  
*C. Buruana*, Mlldff.<sup>1</sup> Buru.  
*C. macrostoma*, Gude.<sup>2</sup> Bangaya, Xulla.  
*C. latecostata*, Kob.<sup>3</sup> Borneo.  
*C. Balantensis*, Kob.<sup>4</sup>  
*C. Beddomei*, n.sp.<sup>5</sup> New Guinea.  
*C. selenitoides*, Fult.<sup>6</sup> Buru.

Section EUSTOMOPSIS, n. Type, *C. eustoma*.

- C. eustoma*, Pfr.; New Georgia, Solomon Islands. Var. *erinaceus*, Pfr.; New Georgia, New Ireland.  
*C. Moellendorffi*, Anc.<sup>7</sup> Tuom Island, New Georgia.  
*C. Simbangensis*, Kob.<sup>8</sup> New Guinea.  
*C. subtilis*, Gude.<sup>9</sup> New Guinea.  
*C. Durandi*, Bav. & Dautz.<sup>10</sup> Tonkin.  
*C. Leei*, Cox; Louisiade Archipelago. Var. *Sudestensis*, Hedl.<sup>11</sup>; Sudest Island. Var. *Woodlarkensis*, Hedl.<sup>12</sup>; Woodlark Island. Var. *Papuensis*, Hedl.<sup>13</sup>; New Guinea.  
*C. multisetosa*, Fult.<sup>14</sup>  
*C. teres*, n.sp.<sup>15</sup> New Ireland.  
*C. tenebrica*, Fult.;<sup>16</sup> var. *pallida*, Gude; <sup>17</sup> var. *tumida*, Gude.<sup>18</sup> New Ireland.  
*C. subcorpulenta*, Smith. Louisiade Archipelago.  
*C. discordialis*, Fér. New Ireland.  
*C. fausta*, Gude.<sup>19</sup> New Ireland.  
*C. Dentrecasteauxi*, Smith. Admiralty Islands.  
*C. murina*, Pfr. Admiralty Islands.  
*C. ursina*, Pfr. Admiralty Islands.  
*C. delphax*, Dohrn.<sup>20</sup> New Guinea.  
*C. dinodeomorpha*, Tap.<sup>21</sup> New Guinea.

<sup>1</sup> Loc. cit., p. 199.

<sup>2</sup> Ante, p. 42.

<sup>3</sup> Conch. Cab., *Helix*, Abth. iv (1894), p. 700, pl. cc, figs. 3, 4.

<sup>4</sup> Abh. Zool. Mus. Dresden, vol. vi (1896-7), No. 5, p. 2.

<sup>5</sup> Ante, p. 105.

<sup>6</sup> Proc. Malac. Soc., vol. iii (1899), p. 215, pl. xi, fig. 9.

<sup>7</sup> Proc. Linn. Soc. N.S. Wales, 1897, ser. II, vol. x, p. 773, pl. xxxvi, fig. 7; Gude, ante, p. 44.

<sup>8</sup> Nachr. Blatt Deutsch. Malak. Ges., 1898, p. 93.

<sup>9</sup> Ante, p. 44.

<sup>10</sup> Journ. de Conchyl., 1900, pp. 111, 441, pl. xi, figs. 1-3.

<sup>11</sup> Proc. Linn. Soc. N.S. Wales, 1891, ser. II, vol. vi, p. 83.

<sup>12</sup> Loc. cit., p. 83.

<sup>13</sup> Loc. cit., p. 83.

<sup>14</sup> Ann. & Mag. Nat. Hist., ser. VII, vol. ix (1902), p. 315.

<sup>15</sup> Ante, p. 106.

<sup>16</sup> Ann. & Mag. Nat. Hist., ser. VII, vol. ix (1902), p. 316.

<sup>17</sup> Ante, p. 45.

<sup>18</sup> Ante, p. 45.

<sup>19</sup> Ante, p. 45.

<sup>20</sup> Conch. Cab., *Helix*, Abth. iv (1893), p. 648, pl. clxxxvi, figs. 5-7.

<sup>21</sup> Loc. cit., p. 648, pl. clxxxvi, figs. 8, 9.

- C. Linteræ*, Gude.<sup>1</sup>  
*C. fuscopurpurea*, Smith.<sup>2</sup> Woodlark Island.  
*C. ephamilla*, Smith.<sup>3</sup> New Guinea.  
*C. perambigua*, Smith.<sup>4</sup> New Guinea.  
*C. nephele*, Strub.<sup>5</sup> New Guinea.  
*C. silenus*, Ang.=*conjuncta*, Gude.<sup>6</sup> New Ireland.  
*C. Gaimardi*, Desh.=*adustus*, Hinds. New Ireland.  
*C. exigua*, Gude.<sup>7</sup> New Ireland.  
*C. fraterna*, Gude.<sup>8</sup> New Ireland.

## Section SULCOBASIS, Tap.

- C. sulcosa*, Pfr. Aru Islands.  
*C. rubra*, Alb. Mysol; Aru Islands.  
*C. concisa*, Fér. Aru Islands; New Guinea.  
*C. Cumingi*, Gude.<sup>9</sup> New Guinea.  
*C. Beatricis*, Tap. New Guinea.  
*C. leptocochlea*, Anc.<sup>10</sup> German New Guinea.  
*C. Kohdei*, Dohrn.<sup>11</sup> New Guinea.  
*C. Djammensis*, Kob.<sup>12</sup> Djamma Island, New Guinea.  
*C. lepidophora*, Dohrn.<sup>13</sup> New Guinea.  
*C. anceps*, Strub.<sup>14</sup> Ferguson Island, New Guinea.  
*C. Minnegerodei*, Strub.<sup>15</sup> Normanby Island, New Guinea.  
*C. Rehsei*, Mart.=*Gerrardi*, Smith; var. *obtecta*, Reinh. New Guinea.  
*C. fraudulentata*, n.sp.<sup>16</sup> New Guinea.  
*C. Prestoni*, Gude.<sup>17</sup> New Guinea.  
*C. globosa*, Preston;<sup>18</sup> var. *major*, Smith.<sup>19</sup> New Guinea.  
*C. stirophora*, Smith;<sup>20</sup> var. *Collingwoodensis*, Preston.<sup>21</sup>

- <sup>1</sup> Journ. Malac., vol. xii (1905), p. 13, pl. iii, fig. 5.  
<sup>2</sup> Proc. Malac. Soc., vol. ii (1897), p. 288, pl. xvii, figs. 12-14.  
<sup>3</sup> Ann. & Mag. Nat. Hist., ser. vi, vol. xv (1895), p. 232; vol. xvi, p. 363, pl. xx, fig. 10. Conch. Cab., *Helix*, Abth. iv (1895), p. 823, pl. ccxxiii, figs. 7, 8.  
<sup>4</sup> Loc. cit., vol. xv, p. 233; vol. xvi, p. 363, pl. xx, fig. 11.  
<sup>5</sup> Nachr. Blatt Deutsch. Malak. Ges., 1895, p. 151; Conch. Cab., *Helix*, Abth. iv (1895), p. 822, pl. ccxxiii, figs. 5, 6.  
<sup>6</sup> Ante, p. 47.  
<sup>7</sup> Ante, p. 48.  
<sup>8</sup> Ante, p. 47.  
<sup>9</sup> Ante, p. 48.  
<sup>10</sup> Proc. Linn. Soc. N.S. Wales, 1897, ser. II, vol. x, p. 772, pl. xxxvi, fig. 1.  
<sup>11</sup> Conch. Cab., *Helix*, Abth. iv (1893), p. 644, pl. clxxxv, figs. 3, 4.  
<sup>12</sup> Loc. cit., p. 699, pl. cc, figs. 1, 2.  
<sup>13</sup> Loc. cit., p. 644, pl. clxxxv, figs. 5-8.  
<sup>14</sup> Loc. cit., p. 821, pl. ccxxiii, figs. 1, 2.  
<sup>15</sup> Loc. cit., p. 822, pl. ccxxiii, figs. 3, 4.  
<sup>16</sup> Ante, p. 107.  
<sup>17</sup> Journ. Malac., vol. ix (1904), p. 114, figs. 1-4.  
<sup>18</sup> Proc. Malac. Soc., vol. v (1902), p. 17, fig. 1.  
<sup>19</sup> Ann. & Mag. Nat. Hist., ser. VII, vol. xvi (1905), p. 194.  
<sup>20</sup> Op. cit., ser. vi, vol. xv (1895), p. 231; vol. xvi, p. 363, pl. xx, fig. 9. Journ. Malac., vol. v (1896), p. 17; Moss & Webb, ib., p. 33, pl. iii, figs. 1, 2; shell, figs. 3-7, anatomy.  
<sup>21</sup> Proc. Malac. Soc., vol. v (1902), p. 17, fig. 5.

- C. Bougainvillei*, Pfr. = *Angasiana*, Newc. Solomon Islands.  
*C. majuscula*. New Hanover; New Ireland; Admiralty Islands.  
*C. Isis*, Pfr. Admiralty Islands.  
*C. quercina*, Pfr.; Solomon Islands. Var. *Hombroni*, Pfr. = *Janellii*,  
 Hombr. & Jacq.; Solomon Islands; Admiralty Island.

## Section AUSTRORHODORITIS, Pils.

- C. Spinei*, Cox = *hystrix*, Cox. Queensland.  
*C. Porteri*, Cox. Queensland.  
*C. mansueta*, Pfr. Queensland; New South Wales.  
*C. Challengeri*, n.sp.<sup>1</sup> Queensland.  
*C. Blackalli*, Braz. Queensland.  
*C. Buxtoni*, Braz. Thursday Island.  
*C. brevipila*, Pfr. Victoria; South Australia; New South Wales;  
 Queensland; islands in Torres Straits.  
*C. astæus*, n.sp.<sup>2</sup> Queensland.  
*C. Novocambrica*, Gude.<sup>3</sup> New South Wales.  
*C. disjuncta*, Gude.<sup>4</sup> New South Wales.  
*C. Layardi*, Gude.<sup>5</sup> Islands in Torres Straits.  
*C. Agamemnon*, n.sp.<sup>6</sup> Queensland.  
*C. mendax*, Mart. Timor.  
*C. rhodochila*, Mlldff.<sup>7</sup> Timorlaut (Tenimber).  
*C. aridorum*, Cox. Queensland.  
*C. pelodes*, Pfr. = *prunum*, auct. (*non Fér.*) = *pseudoprunum*, Pils.  
 North-West Australia.  
*C. Coxeni*, Cox. Queensland.  
*C. Bennetti*, Braz. Queensland.  
*C. Blackmani*, Cox. Queensland.  
*C. Cozenæ*, Braz. Queensland.  
*C. mucida*, Pfr. Percy Isles, north-east coast of Australia.  
*C. occulta*, Pfr. Aru Islands.  
*C. chloritoides*, Pils. New Guinea.  
*C. Micholitzii*, Mlldff. Tenimber.  
*C. goniostoma*, Mlldff.; var. *major*, Mlldff. Tenimber.  
*C. telitecta*, Mlldff. Tenimber.  
*C. tenuitesta*, Mlldff. Tenimber.  
*C. rectilabrum*, Smith.<sup>8</sup> North-West Australia.  
*C. millepunctata*, Smith.<sup>9</sup>; Baudin Island. Var. *Cassiniensis*, Smith.<sup>10</sup>;  
 Cassini Island.

<sup>1</sup> Ante, p. 108.<sup>2</sup> Ante, p. 108.<sup>3</sup> Ante, p. 49.<sup>4</sup> Ante, p. 49.<sup>5</sup> Ante, p. 49.<sup>6</sup> Ante, p. 108.<sup>7</sup> Nachr. Blatt Deutsch. Mal. Ges., 1892, p. 95.<sup>8</sup> Proc. Malac. Soc., vol. i (1894), p. 88, pl. vii, fig. 14.<sup>9</sup> Loc. cit., p. 88, pl. vii, fig. 11.<sup>10</sup> Loc. cit., p. 88, pl. vii, fig. 12.

- C. Maforinsulæ*, Preston.<sup>1</sup> Mafor Island, New Guinea.  
*C. argillacea*, Fér.=*cyclostomopsis*, Lea. Timor, Flores, Solor, Sumba.  
 Adonare, Rawak, Alor, Boneratu, Oinanisa.  
*C. Romaensis*, Mlldff.<sup>2</sup> Roma.  
*C. eurychasma*,<sup>3</sup> n.sp. Sjerah I., Moluccas.  
*C. subplicifera*, Smith.<sup>4</sup> New Guinea.

## Section TRICHOCHLORITIS, Pils.

- C. Hungerfordiana*, Nev. China; Formosa.  
*C. Tanqueryi*, Cr. & F. Cochin China.  
*C. Condoriana*, Cr. & F. Pulu Condor.  
*C. Norodomiana*, Morl. Cambodia.  
*C. Fouresi*, Morl. Cambodia; Siam.  
*C. propinqua*, Pfr. India.  
*C. delibrata*, Bens.; Bengal; =*procumbens*, Gould; Assam, Burma.  
 Var. *fasciata*, G.-A.; Assam. Var. *Khasiensis*, G.-A.; Assam.  
*C. gabata*, Gould; Burma. Var. *Merguiensis*, Phil.; Mergui.  
*C. pilisparsa*, Mart.<sup>5</sup> Celebes.  
*C. Smithi*, Bock. Sumatra.  
*C. rufofasciata*, n.sp.<sup>6</sup> Sumatra.  
*C. caseus*, Pfr. Siam; Laos; Cambodia.  
*C. Lambineti*, Bav. & Dautz.<sup>7</sup> Tonkin.  
*C. Siamensis*, Mlldff.<sup>8</sup> Siam.  
*C. platytropis*, Mlldff.<sup>9</sup> Malay Peninsula.  
*C. Mansonensis*, n.sp.<sup>10</sup> Tonkin.  
*C. athrix*, Mlldff.<sup>11</sup> Tonkin.  
*C. insularis*, Mlldff.<sup>12</sup> Tonkin.  
*C. miara*, Mab. Tonkin.  
*C. Herziana*, Mlldff. Hainan.  
*C. rhinocerotica*, Hde. Cochin China.  
*C. Franciscanorum*, Greidl.; var. *purpurea*, Greidl. China.  
*C. seriatseta*, Roch. Cambodia.  
*C. Malayana*, Mlldff. Perak.  
*C. percussa*, Hde. China.  
*C. breviseta*, Pfr. Siam; Perak.  
*C. microtricha*, Mlldff.<sup>13</sup> Annam.

<sup>1</sup> Op. cit., vol. v (1902), p. 18, fig. 3.

<sup>2</sup> Nachr. Blatt Deutsch. Mal. Ges., 1903, p. 156.

<sup>3</sup> Ante, p. 110.

<sup>4</sup> Ann. & Mag. Nat. Hist., ser. vi, vol. xv (1895), p. 232; vol. xvi, p. 363, pl. xx, fig. 12.

<sup>5</sup> Land-Mollusken von Celebes, 1899, p. 198, pl. xxv, fig. 249.

<sup>6</sup> Ante, p. 109.

<sup>7</sup> Journ. de Conchyl., 1899, p. 28, pl. i, fig. 3.

<sup>8</sup> Nachr. Blatt Deutsch. Mal. Ges., 1902, p. 156.

<sup>9</sup> Proc. Zool. Soc., 1894, p. 150, pl. xvi, fig. 10.

<sup>10</sup> Ante, p. 109.

<sup>11</sup> Nachr. Blatt Deutsch. Mal. Ges., 1901, p. 73.

<sup>12</sup> Loc. cit., p. 113.

<sup>13</sup> Nachr. Blatt Deutsch. Mal. Ges., 1898, p. 71.

- C. tenella*, Pfr. Siam.  
*C. submissa*, Desh. China.  
*C. deliciosa*, Pfr. Cambodia.  
*C. remoratrix*, Morl. Cambodia.  
*C. Lemeslei*, Morl.<sup>1</sup> Tonkin.  
*C. Marimberti*, Bav. & Dautz.<sup>2</sup> Tonkin.  
*C. Balansai*, Morl.; var. *cineta*, Dautz. & Fisch.<sup>3</sup> Tonkin.  
*C. quinaria*, Pfr. Cambodia.  
*C. Shanica*, Bedd. Burma.  
*C. Colletti*, Bedd. Burma.  
*C. bifoveata*, Bens. Burma.  
*C. diplochone*, Mlldff.<sup>4</sup> Annam.  
*C. nautiloides*, Val. *Hab.*?  
*C. Samuiana*, Mlldff.<sup>5</sup> Samui Archipelago.  
*C. crassula*, Phil. = *Storiana*, Mouss. Java; Sumatra.  
*C. Gereti*, Bav. & Dautz.<sup>6</sup> Tonkin.  
*C. brachystoma*, Mart.<sup>7</sup> Borneo.  
*C. Kühni*, Mlldff.<sup>8</sup> Buru.  
*C. helicinioides*, Mouss. Java.  
*C. Eceretti*, H. Ad. Borneo.  
*C. tetragyra*, Mlldff.<sup>9</sup> Java.  
*C. Frühstorferi*, Mlldff.<sup>10</sup> Java.  
*C. transversalis*, Mouss. Java; Bali.  
*C. conjecta*, Smith.<sup>11</sup> Sumba.  
*C. hemiopta*, Bens. Andaman Islands.  
*C. meander*, G.-A. Borneo.  
*C. plena*, G.-A.; Labuan. Var. *Celebensis*, Smith<sup>12</sup>; Celebes.  
*C. tabularis*, Gude.<sup>13</sup> Sumatra.  
*C. Sykesi*, n.sp.<sup>14</sup> Sumatra.  
*C. albodentata*, Smith.<sup>15</sup> Flores.  
*C. Sibutuensis*, Smith.<sup>16</sup> Sulu Islands.  
*C. Suluana*, Mlldff.<sup>17</sup> Sulu Islands.  
*C. Penangensis*, Stol. Perak; Penang.

<sup>1</sup> Journ. de Conchyl., 1891, p. 249, pl. vii, fig. 1.

<sup>2</sup> Journ. de Conchyl., 1905, p. 90, pl. iii, figs. 5-9.

<sup>3</sup> Op. cit., 1900, pp. 111, 440, pl. x, figs. 4-6.

<sup>4</sup> Nachr. Blatt Deutsch. Mal. Ges., 1898, p. 72.

<sup>5</sup> Proc. Zool. Soc., 1894, p. 150.

<sup>6</sup> Journ. de Conchyl., 1900, pp. 112, 442, pl. ix, figs. 7-9.

<sup>7</sup> Sitz. Ber. Ges. naturf. Berlin, 1903, p. 422.

<sup>8</sup> Nachr. Blatt Deutsch. Mal. Ges., 1902, p. 198.

<sup>9</sup> *Ib.*, 1897, p. 68.

<sup>10</sup> *Ib.*, 1897, p. 68.

<sup>11</sup> Ann. & Mag. Nat. Hist., ser. vii, vol. iii (1899), p. 410.

<sup>12</sup> Proc. Malac. Soc., vol. ii (1896), p. 97.

<sup>13</sup> Journ. Malac., vol. x (1903), p. 48, pl. iii, fig. 5.

<sup>14</sup> *Ante*, p. 110.

<sup>15</sup> Ann. & Mag. Nat. Hist., ser. vii, vol. iii (1899), p. 411; Gude, Journ. of Malac., vol. x (1903), pl. iii, fig. 7.

<sup>16</sup> Ann. & Mag. Nat. Hist., ser. vi, vol. xiii (1894), p. 53, pl. iv, fig. 4.

<sup>17</sup> Nachr. Blatt Deutsch. Mal. Ges., 1894, p. 209.



- C. tomentosa*, Pfr. Borneo; Sumatra; Banguay; Karamon.  
*C. Kinabaluensis*, Kob.<sup>1</sup> = *Kinibalensis*, Kob.<sup>2</sup> Borneo.  
*C. Dammaensis*, Smith<sup>3</sup> = *subcarinata*, Mlldff.<sup>4</sup> Damma Island;  
 Oinainisa Island.  
*C. Euphrosyne*, Smith.<sup>5</sup> Panalingoan I., S.W. of Palawan.  
*C. brevidens*, Pfr. Mindoro.  
*C. albolabris*, Pils.<sup>6</sup> Loo Choo.  
*C. Hirasei*, Pils.<sup>7</sup> Japan.  
*C. subsulcata*, Mlldff.<sup>8</sup> Philippine Islands.  
*C. Fultoni*, Mlldff.<sup>9</sup> Mindoro.  
*C. Malbatensis*, Hid.<sup>10</sup> Philippine Islands.  
*C. Malangensis*, Bullen.<sup>11</sup> Java.  
*C. Leytensis*, Mlldff.<sup>12</sup>; Luzon; Leyte. Var. *Samarensis*, Mlldff.<sup>13</sup>;  
 Samar.  
*C. quieta*, Rve. Mindanao.  
*C. inquieta*, Dohrn.<sup>14</sup> Palawan.  
*C. bracteata*, Pils.<sup>15</sup> Japan.  
*C. fragilis*, Gude.<sup>16</sup> Japan.  
*C. pumila*, Gude.<sup>17</sup> Japan.  
*C. oscitans*, Mart. Japan.  
*C. Echizenensis*, Pils.<sup>18</sup> Japan.  
*C. perpunctata*, Pils.<sup>19</sup> Japan.  
*C. Tosana*, Pils.;<sup>20</sup> var. *Osumiensis*, Pils.<sup>21</sup> Japan.  
*C. obscura*, Pils.<sup>22</sup> Loo Choo.

<sup>1</sup> Smith: Proc. Zool. Soc., 1895, p. 113, pl. iii, fig. 16.

<sup>2</sup> Conch. Cab., *Helix*, Abth. iv (1894), p. 706, pl. cci, figs. 5, 6.

<sup>3</sup> Ann. & Mag. Nat. Hist., ser. vi, vol. xiv (1894), p. 62.

<sup>4</sup> Nachr. Blatt Deutsch. Mal. Ges., 1899, p. 156.

<sup>5</sup> Proc. Zool. Soc., 1895, p. 113, pl. iii, fig. 17. Conch. Cab., *Helix*, Abth. iv (1897), p. 884, pl. cxxviii, fig. 7. Hid., Obras Malac., vol. i (1901), p. 190, pl. clviii, fig. 3.

<sup>6</sup> Nautilus, vol. xvi (1902), p. 76.

<sup>7</sup> Proc. Acad. Philad., 1901 (1902), p. 565.

<sup>8</sup> Nachr. Blatt Deutsch. Mal. Ges., 1894, p. 95. Hidalgo: Obras Malac., vol. i (1901), p. 190, pl. cxxxiv, figs. 1-3.

<sup>9</sup> Abh. Naturf. Ges., Gorlitz, vol. xxii (1898), p. 95, reprint p. 70.

<sup>10</sup> Obras Malac., vol. i (1901), p. 132, p. 189, pl. xx, fig. 10.

<sup>11</sup> Proc. Malac. Soc., vol. vi (1905), p. 192, pl. xi, fig. 2.

<sup>12</sup> Nachr. Blatt Deutsch. Mal. Ges., 1890, p. 203; Ber. Senck. Ges., 1893, p. 80, pl. iii, fig. 8.

<sup>13</sup> Abh. Naturf. Ges., Gorlitz, vol. xxii (1898), p. 95, reprint p. 70.

<sup>14</sup> Conch. Cab., *Helix*, vol. iv (1893), p. 652, pl. clxxxvii, figs. 9, 10; Astrolabe Bay, New Guinea; ? error. Hid., Obras Malac., vol. i (1901), p. 192.

<sup>15</sup> Nautilus, vol. xvi (1902), p. 21.

<sup>16</sup> Proc. Malac. Soc., vol. iv (1900), p. 70, pl. viii, figs. 18-20; Pils. ib., vol. vi (1905), p. 290, pl. xiv, figs. 14, 16-19 (anatomy).

<sup>17</sup> Proc. Acad. Philad., 1901, p. 617.

<sup>18</sup> Nautilus, vol. xvi (1903), p. 116.

<sup>19</sup> Ib., vol. xv (1902), p. 116.

<sup>20</sup> Ib., vol. xvi (1903), p. 134; vol. xvii (1903), p. 31.

<sup>21</sup> Proc. Acad. Philad., 1904, p. 629.

<sup>22</sup> Ib., p. 628.

## Section ALBERSIA, H. Ad.

- C. granulata*, Q. & G. New Guinea, Waigiou.  
*C. Waigiouensis*, Sykes.<sup>1</sup> Waigiou.  
*C. pubicepa*, Mart.; Halmaheira; Batjan; = *Waterstraati*, Mlldff.<sup>2</sup>; Obi.  
*C. Obiensis*, Mart.<sup>3</sup> = *Obiana*, Mlldff.<sup>4</sup> = *omissa*, Dautz.<sup>5</sup> Obi.  
*C. subspherica*, Fult.<sup>6</sup> Gebi Island.  
*C. ariontiformis*, Kob.<sup>7</sup> Djamma Island, New Guinea.  
*C. pseudocorasia*, Strub. Halmaheira.  
*C. zonulata*, Fér. = *lemniscata*, Less. New Guinea; Waigiou; Aru Islands. Var. *Recluziana*, Le Guil.; New Guinea.  
*C. tenuis*, Pfr. *Hab.*?

## EXPLANATION OF PLATE XIII.

- FIG. 1. *Chloritis Beddomei*, n.sp.  
 FIGS. 2, 2a. ,, *holoserica*, n.sp.  
 ,, 3, 3a. ,, *teres*, n.sp.  
 FIG. 4. ,, *fraudenta*, n.sp.  
 FIGS. 5-5b. ,, *Challengeri*, n.sp.  
 ,, 6-6c. ,, *astacus*, n.sp.  
 ,, 7-7c. ,, *Agamemnon*, n.sp.  
 ,, 8-8c. ,, *rufofasciata*, n.sp.  
 ,, 9-9b. ,, *Mansonensis*, n.sp.  
 ,, 10-10c. ,, *Sykesi*, n.sp.  
 ,, 11-11c. ,, *eurychasma*, n.sp.

<sup>1</sup> Journ. of Malac., vol. xi (1904), p. 88, pl. ix, fig. 16.

<sup>2</sup> Nachr. Blatt Deutsch. Mal. Ges., 1902, p. 189.

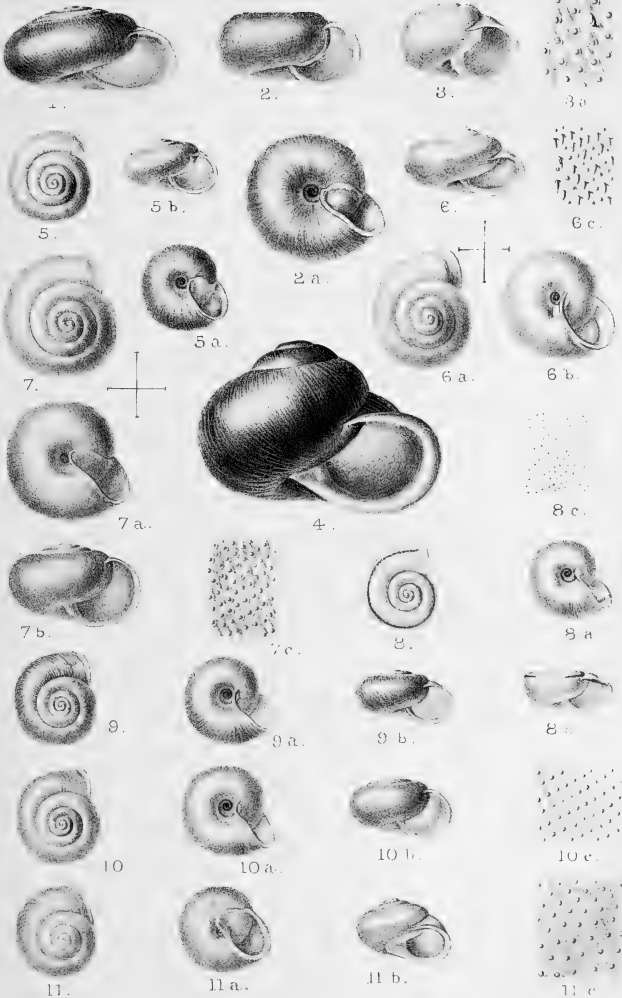
<sup>3</sup> Sitz. Ber. Ges. naturf. Berlin, 1898, p. 161; Arch. für Naturg., 1899, p. 28, pl. iii, figs. 6, 7.

<sup>4</sup> Nachr. Blatt Deutsch. Mal. Ges., 1902, p. 191.

<sup>5</sup> Le Naturaliste, vol. xxiv (1902), p. 247, fig. 2.

<sup>6</sup> Journ. of Malac., vol. xi (1904), p. 53, pl. iv, figs. 8, 9.

<sup>7</sup> Conch. Cab., *Helix*, Abth. iv (1894), p. 707, pl. cci, figs. 9, 10.



A. H. Searle, del et lith.

Huth, imp

NEW SPECIES OF CHLORITIS.



ON THE OCCURRENCE OF *VERTIGO PARCEDENTATA*, AL. BRAUN,  
IN HOLOCENE DEPOSITS IN GREAT BRITAIN.

By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S., etc.

*Read 6th April, 1906.*

IN 1890 Mr. T. Scott noted the occurrence in a Holocene deposit at Kirkland Leven, Scotland, of a form of *Vertigo*, which, although resembling *V. pygmaea*, yet, since it was edentulous, might prove to be a distinct species, and he suggested the provisional name of *V. concinna*.<sup>1</sup>

In 1891 this form was described and figured by the same author, the provisional name of *concinna* being again used.<sup>2</sup> In the same year Mr. T. D. A. Cockerell pointed out that there might be confusion between this species and *Pupa concinna*, Lowe, from Madeira,<sup>3</sup> which suggestion Mr. Scott, in the note immediately following, accepted, and proposed the new name of *Levenensis*.<sup>4</sup> The species was stated to be not uncommon in the Kirkland deposit. Since its discovery it has not been noted in any other locality.

Several years ago Prof. T. Rupert Jones gave one of us some material from a Holocene deposit at Stamford, and on working it over it yielded a fair number of this species. It had always appeared to us, however, that this form, though certainly distinct from all other British forms, would probably prove to be a previously described continental species, and after a careful perusal of the literature we came to the conclusion that it was probably identical with *Vertigo parcedentata*, Al. Braun. We therefore submitted examples of the Stamford shells to Dr. O. Boettger, who most kindly informed us that they agreed with the variety *Genesisii*, Gredler, of *V. parcedentata*. This species is very variable as to the number of teeth. Typical *parcedentata* possess one or two teeth (the single-toothed form being known as var. *glandicula*, Sandb.), and is very much rarer than the edentulous form var. *Genesisii*. This latter form is known in a recent state from St. Genesien, near Bozen, in the Tyrol; from Oester-goetland, Sweden (Westerlund); and Isarauswurf, near Munich.

The var. *Genesisii* has been recorded in a fossil state by Dr. Boettger from the Pleistocene of Mosbach, Kleinert, near Grosszimmern, the

<sup>1</sup> "Preliminary notes on a Post-Tertiary Fresh-water Deposit at Kirkland Leven and at Elie, Fifeshire": Proc. Royal Phys. Soc. Edin., vol. x, p. 334.

<sup>2</sup> Scottish Naturalist, 1891. T. Scott: "Some notes on the Scotch species of the Molluscan genus *Vertigo*," p. 49 and pl. i.

<sup>3</sup> Op. cit., p. 141.

<sup>4</sup> Op. cit., p. 141.

Loess of Schierstein Heidingsfeld and Regensburg, and in the Holocene of Grossen Bruchs, near Traisa (province of Starkenburg and of Zusmarshausen, near Augsburg).<sup>1</sup>

Dr. E. W. Wüst, in 1903, gave the following additional localities: Pleistocene of Wilzenburg and Osterode, Loess, in the neighbourhood of Strassburg, Roten Hause, near Eckbolsheim, and of Hurst'schen Ziegeleigrube near Achenheim<sup>2</sup>; whilst Dr. Boettger informs us that it has also been recorded from the peat of Kutzenhausen by S. Clessin and the Loess of Pelleracker Pinningen, near Basel, by Dr. A. Gutzwiller.

It will thus be seen that the names *concinna* and *Levenensis* must be added to the already overburdened list of synonyms of *V. parcedentata*, whilst an extremely interesting continental species must now be included in our list of extinct non-marine mollusca.

---

<sup>1</sup> Dr. O. Boettger, "Die Entwicklung der *Pupa*-Arten": Jahrb. d. Nassau. Ver. f. Naturk., Jahrg. xxii, 1889, pp. 308-310.

<sup>2</sup> "Pleistozäne Flussablagerungen mit *S. schumacherii* in Thüringen und in nördlichen Harz-Vorlande": Zeitschrift für Naturwissenschaften, 1903, Bd. lxxv, p. 316.

## ORDINARY MEETING.

FRIDAY, 11TH MAY, 1906.

E. R. SYKES, B.A., President, in the Chair.

Edward Comber was elected a member of the Society.

The following communications were read:—

1. "Note on the subgenus *Malluvium*, Melvill." By E. A. Smith, I.S.O.
2. "Notes on some species of Mitridæ, with the description of *M. Brettinghami*, n.sp." By E. A. Smith, I.S.O.
3. "On some Land and Fresh-water Mollusca from Sumatra. Part II." By Rev. R. Ashington Bullen, B.A., F.L.S.
4. "Report upon a Collection of Nudibranchiata from the Cape Verd Islands, with notes by C. Crossland." By Sir Charles Eliot, K.C.M.G.
5. "Notes on Indian and Ceylonese Species of *Glessula*." By Col. R. H. Beddome, F.L.S.

Mr. A. S. Kennard, on behalf of Mr. Collier, exhibited a number of specimens of *Helix nemoralis* from the West of Ireland showing extreme variation in size.

Mr. E. A. Smith exhibited specimens of *Amussium* from the Gulf of Manaar.

Mr. R. H. Burne exhibited some molluscan egg-capsules.

## ORDINARY MEETING.

FRIDAY, 8TH JUNE, 1906.

E. R. SYKES, B.A., President, in the Chair.

Dr. J. Thiele was elected a member of the Society.

The following communications were read:—

1. "Mollusca of the 'Porcupine' Expeditions, 1869-1870. Supplemental Notes, Part III." By E. R. Sykes, B.A.
2. "On the dates of publication of the 'Mineral Conchology' and 'Genera of Recent and Fossil Shells.'" By E. R. Sykes, B.A.
3. "Note on a new variety (var. *longispira*) of *Oliva ispidula*." By F. G. Bridgman.
4. "On *Chloritis heteromphalus*, Pilsbry." By H. A. Pilsbry.
5. "On *Burtoa nilotica* and its relationship to *Achatina*." By A. Reynell.

NOTE ON THE SUBGENUS *MALLUVIUM*, MELVILL.

By EDGAR A. SMITH, I.S.O.

Read 11th May, 1906.

IN the last part of these Proceedings (p. 81) Mr. Melvill has made some observations upon the genera *Amalthea* of Schumacher and *Capulus* of Montfort, and has created a new subgenus of the former to include a species described by me as *Capulus lissus*. I do not agree with the conclusions he has arrived at, hence the few following remarks.

Schumacher included two species in his genus *Amalthea*, namely, *A. conica* (= *Patella australis*, Lamk.) and *A. maxima* (= the well-known *Capulus hungaricus*). The latter had already been appropriated by Montfort for his genus *Capulus*, and therefore *Amalthea* is typically represented by the first species, *A. conica*.

The account of the animal of this species given by Quoy & Gaimard (Voy. Astrolabe, Zool., vol. iii, p. 434, pl. lxxii, figs. 25-34) shows that it is practically of the same character as that of *Hipponyx antiquatus* (see Fischer, Man. de Conch., p. 753, fig. 519), which is the type of that genus, for "*H. nitrata*, Gmelin," as quoted by DeFrance, the author of the genus *Hipponyx*, is presumably merely a misprint of *nitrida*, Gmelin, which is synonymous with *H. antiquatus*. With regard to *Amalthea*, Messrs. H. & A. Adams observe that it is "like *Concholepas* [= *Hipponyx*], but it simply excavates with its foot a superficial cavity in the surface of the shell or stone on which it fixes itself, not forming a shelly plate distinct from the substratum."

Such, however, is not invariably the case, for sometimes a shelly base, although it may be thin, is certainly secreted. It is also stated by Dr. Turton that he had in his collection a specimen of *Capulus hungaricus* which had formed "a thin laminar under-valve," but Jeffreys thought he must have been mistaken. His account of the circumstance, however, is so exact that I see no reason to doubt it.

Tryon observes concerning *Hipponyx*, "the same species will either excavate a cavity to which it adheres, or secrete a testaceous support." Seeing, therefore, that the same species of *Amalthea*, and perhaps *Capulus* also, either may or may not construct a shelly basal support, this cannot be regarded as an essential generic feature.

The *Capulus lissus* upon which Mr. Melvill has founded his subgenus *Malluvium* appears to form a thickened shelly base only under exceptional circumstances. On a specimen of *Rostellaria delicatula* from the Bay of Bengal it has formed a scar on the surface, and only secreted a film of callus and a slight thickening at the edge of the depression. The fact of its being smooth, instead of radiately striated like other species, does not seem to me of subgeneric value, nor do I regard the presence or absence of colour-rays of any importance.



If difference of sculpture be sufficient to constitute a new subgenus, we might propose one for *Capulus irregularis*, Smith, which is neither smooth nor radiately ridged or striated, but only concentrically lamellated. It also possesses one of the other features characteristic of *Malluvium*, namely, colour-rays. To sum up—(1) We have at present no knowledge of the soft parts of this mollusc (*C. lissus*), so that it is impossible to say whether it will show greater affinity with *Capulus* or *Amalthea*.<sup>1</sup> (2) Conchologically it differs only from *Amalthea* in being smooth instead of radiately ridged or striated, a feature even variable in degree among the known species, for *A. australis* (Lamk.), the type of the genus, is very strongly radiately costate, whereas *A. antiquata* (Linn.) is conspicuously concentrically lamellated with only very faint delicate striæ. I think, therefore, that *Malluvium*, at all events, may be regarded as premature, if not unnecessary.

In conclusion, I may point out that the genus *Hipponix* (*sic*) was described by DeFrance in the Journ. de Physique, 1819, vol. lxxxviii, p. 215, and not in the Bull. Soc. Philom., 1819, p. 9, which is only a notice of it by Blainville.

---

<sup>1</sup> Since this was written the radulæ, extracted from some dried-up specimens, have been very kindly examined by Professor H. M. Gwatkin. He is of opinion that, among the genera known to him, the odontophore of *C. lissus* is certainly nearest that of *Amalthea*.

NOTES ON SOME SPECIES OF MITRIDÆ, WITH THE DESCRIPTION  
OF *M. BRETTINGHAMI*, n.sp.

By EDGAR A. SMITH, I.S.O.

Read 11th May, 1906.

CONSIDERABLE confusion exists respecting the names which should be applied to certain species of *Mitra* which have been described and figured in the various monographs of this genus under the names *M. versicolor*, *M. nebulosa*, *M. propinqua*, and *M. infecta*, and in order to clear up the confusion I beg to submit the following notes and synonymy.

MITRA VERSICOLOR, Martyn.

*Mitra versicolor*, Martyn, Univers. Conch., vol. i, fig. 23; Reeve, Conch. Icon., vol. ii, fig. 2; Sowerby, Thesaurus Conch., vol. iv, fig. 44; Tryon, Man. Conch., vol. iv, pl. xxxii, fig. 6; Dohrn, Malak. Blätt., 1861, vol. viii, p. 134.

*Voluta nubila*, Gmelin, Syst. nat., p. 3450.

*Hab.*—Friendly Is. (Martyn); Zanzibar (Reeve); Viti and Tonga Is. (Garrett).

In rectifying the synonymy of this species, Dohrn unfortunately fell into an error with regard to the next, having overlooked a note respecting it by A. Adams in the Proc. Zool. Soc. for 1851.

MITRA PROPINQUA, A. Adams.

*Mitra propinqua*, A. Adams, Proc. Zool. Soc., 1851, p. 270.

*M. nebulosa*, Reeve (*non* (Swainson) Broderip), Conch. Icon., vol. ii, fig. 3; Sowerby, Thes. Conch., vol. iv, pl. ccliv, fig. 39.

*M. versicolor*, partim, Tryon, Man. Conch., vol. iv, pl. xxxii, figs. 7, 8 (*bad*); Kiener (*non* Martyn), Coq. Viv., pl. vii, fig. 18.

*M. erronea*, Dohrn, Malak. Blätt., 1861, vol. viii, p. 134.

*Hab.*—Madagascar (Reeve); Zanzibar (Sowerby and Mus. Cuming); Viti and Tonga Is. (Garrett).

This species is very closely related to the preceding, *M. versicolor*, and it is possible that an extended series of specimens might afford the connecting links. It seems to be a more slender form, more strongly punctate in the striæ, and the coloration is not quite the same.

MITRA BRETTINGHAMI, n.sp.

*Mitra propinqua*, Sowerby (*non* A. Adams), Thesaurus Conch., vol. iv, p. 3, pl. cclvi, fig. 59; Tryon, Man. Conch., vol. iv, p. 112, pl. xxxiii, fig. 11.

Testa anguste ovato-fusiformis, alba, strigis longitudinalibus rufofuscis, irregularibus, plus minus undulatis, picta, transversim sulcata, sulcis angustissimis, minute punctatis; spira producta, acuminata; anfractus 12(?), apicales abrupti, cæteri leviter convexiusculi, sutura paululum obliqua sejuncti, ultimus antice leviter ascendens; apertura alba, longit. totius  $\frac{1}{2}$  paulo minor; labrum subincrassatum, ad marginem denticulatum; columella quinque-plicata, infra medium

callo crasso induta, callo interdum sursum producto et labro juncto. Long. 70, diam. 23.5 mm.; apertura 33 mm. longa, 8 lata.

*Hab.*—?

The transverse punctate sulci are eight to nine in number on the penultimate whorl, and about six on the upper whorls. There are about twenty-five on the body-whorl, exclusive of those upon the extreme anterior end.

In 1874, when the late Mr. Sowerby published his monograph of the genus *Mitra*, three specimens of the present species in the British Museum from the Cuming Collection were labelled "*propinqua*, A. Ad." These the late Mr. Sowerby, evidently without investigation, regarded as correctly named. However, as pointed out by Tryon, they belong to quite a distinct species, and it is to be regretted that he did not at the time give it a distinctive name. The name *propinqua* was subsequently used by Garrett<sup>1</sup> for two species of Mitridæ, namely, *Mitra propinqua*, from the Society Islands, and *Turricula propinqua* from the Viti Islands. As nothing is known of these species beyond their descriptions, no figures of them having yet appeared, it seems advisable at present not to suggest fresh names for them, but to wait until we have more evidence of their validity as distinct species.

A few months ago Mr. Sowerby kindly called my attention to this confusion of nomenclature, and therefore, with his permission, I have associated with this fine but hitherto wrongly named species the name of Brettingham, a patronymic connected with five successive generations of the Sowerby family.

#### MITRA NEBULOSA, Broderip.

*Mitra nebulosa* (Swainson, MSS.), Broderip, Proc. Zool. Soc., 1835, p. 193; Dohrn, Malak. Blätt., 1861, vol. viii, p. 134.

*M. infecta*, Reeve, Proc. Zool. Soc., 1844, p. 173; Conch. Icon., vol. ii, fig. 75; Tryon, Man. Conch., vol. iv, pl. xlvii, fig. 377.

*Hab.*—Annaa I., Paumotu Archipelago.

Reeve was the first to cause confusion with regard to this species, and, although his error was pointed out by Dohrn, the correction was not noted by the late Mr. Sowerby in his monograph of the genus.<sup>2</sup> On p. 17 he observes: "Erroneously represented in Reeve as a smooth shell." This remark, however, is not correct, for Reeve carefully described the species as "encircled with impressed striæ," which are also faintly indicated in the figure. The shell figured by Mr. Sowerby as *M. infecta* (pl. cclxxviii, fig. 607) has quite strong transverse sulci, and appears to me to represent another species. Tryon, as was his wont, made matters worse by lumping together the typical form, Sowerby's version of it, and the *M. Barclayi* of Hanley. The last species is certainly distinct, but allied to *M. abbatis*. It is, however, more finely striated, and has not the turreted whorls of that species, although it closely resembles it in style of coloration.

<sup>1</sup> Journ. of Conch., vol. iii (1880), pp. 22 and 58.

<sup>2</sup> Thes. Conch., vol. iv (1874).

ON SOME LAND AND FRESH-WATER MOLLUSCA FROM SUMATRA.  
PART II.<sup>1</sup>

By Rev. R. ASHINGTON BULLEN, F.L.S., F.G.S.

*Read 11th May, 1906.*

THE shells catalogued and described in this communication have come to hand direct from Sumatra since November, 1905. I list them all, as some of the localities are probably new or unknown hitherto.

1. *ARIOPHANTA GRANARIA* (Bock).*Hab.*—Mount Sago and Mount Ophir.

One specimen has the umbilicus completely covered by a membrane, a quite unusual feature.

Two specimens are young and show very marked features, differing from the adult form, especially in coloration.

2. *ARIOPHANTA MAARSEVEENI* (Bock).*Hab.*—Mount Sago.3. *ARIOPHANTA (DYAKIA) SMITHIANA*, Gude.*Hab.*—Mount Sago.4. *HEMIPLECTA DENSE* (Ad. & Reeve).Syn. *Helix Schumacheriana*, Busch.*Hab.*—Mount Sago, Mount Talang, and Bangkinan.

The specimen from Bangkinan is immature.

I have specimens also from the Malay peninsula sent by Mr. Abraham Hale.

5. *XESTA GLUTINOSA* (Metc.).*Hab.*—Mount Sago.6. *CHLORITIS TABULARIS*, Gude.*Hab.*—Mount Ophir.7. *EVERETTIA MALACCANA* (Pfr.).*Hab.*—Mount Sago.8. *GANESELLA CONULUS* (von Marts.).*Hab.*—Mount Bongson.9. *AMPHIDROMUS SUSPECTUS*, von Marts.*Hab.*—Mount Ophir.10. *OPEAS* sp.*Hab.*—Loeboek Bangko.

Allied to *brevis*, Smith. Most probably a variety merely, and not needing a varietal name. The ova are still within the shells.

---

<sup>1</sup> Part I, see Proc. Malac. Soc., vol. vii, pp. 12-16, pl. ii.

11, *CLAUSILIA SUMATRANA*, Martens; and 12, *C. ROBUSTIOR*, n.sp.

Dr. E. von Martens<sup>1</sup> described two forms of his *Clausilia Sumatrana*, which he termed var. *a* and var. *b*. He did not, however, give them the varietal names, *attenuata* and *brevior*, as stated by Mr. Sykes,<sup>2</sup> those being merely the first words of the descriptions respectively. I have never seen such a large specimen ( $31\frac{1}{2}$  mm. in length) of the var. *a*, as described by Martens, the largest example that has come under my notice being only 30 mm. long, the actual length of Martens' figure. When placed side by side with the var. *b* (hereafter named *robustior*) I cannot believe that they belong to the same species, the form is so very unlike, and the number of whorls is constantly different, judging from the specimens examined. The large example above referred to, from Mount Sago, has  $11\frac{1}{2}$  whorls, which are peculiar on account of their exceptional flatness. This, however, may partly be due to attrition. It also presents a very remarkable



abnormality of the peristome in the form of a loop at the termination of the lamella superior. This irregularity of growth is doubtless due to an accident, as evidences of a fracture of the lip at this point are observable. It is, however, so very peculiar that I have thought it worth figuring. The sculpture of the body-whorl, which is only slightly worn, is not quite similar to that of the short form (var. *b*), being a trifle coarser, but the 5 plicæ suturales, which vary in number from 5-7 in the short variety, are of the same character exactly.

Three other examples of this species from Loeboek Bangko are intermediate in size between vars. *a* and *b*, being 25 mm. in length, and consist of  $10-10\frac{1}{2}$  whorls. They are conspicuously more slender than var. *b* (*robustior*) and the spire more tapering, but in sculpture and with regard to the plicæ they are almost similar, the former, however, being *coarser*, as in the large abnormal specimen from Mount Sago.

<sup>1</sup> Preuss. Exped. Ost-Asien, Zool., vol. ii, p. 379, pl. xxii, figs. 17-17c.

<sup>2</sup> Proc. Malac. Soc., vol. i, p. 28.

Var. *vicaria*.

A single small specimen from Mount Singalong, 16 mm. in length, 3.75 wide, of a dark purple-brown colour, with a white peristome, and consisting of  $9\frac{1}{2}$  whorls.

Placing this shell beside var. *a* or var. *b*, the great difference of size seems to indicate more than varietal rank; indeed, although up to the present it has appeared advisable to regard these in the light of varieties of a single species, it seems more than likely, when their range is known and the animals studied, both alive and anatomically, that differences will be discovered by which we shall be enabled to distinguish them specifically. It may be that we are really dealing with two, if not three, distinct species, namely, var. *a*, which should be regarded as typical *Sumatrana*, var. *b*, which would require a name, *brevior* being already in use, and var. *vicaria*, a name which it might retain as a species. At present, however, I am certainly of opinion that the so-called var. *b* should be considered a distinct species from the rest, its form being *very different*, the whorls only  $8\frac{1}{2}$  in



number, and the sculpture finer. For this shell I therefore propose the name *Clausilia robustior*. A specimen in the Natural History Museum is marked Kepahiang.

The var. *vicaria* of Sykes should, I think, at present be regarded as a variety of *Sumatrana*, for, although it is more glossy and smaller, still the sculpture is of about the same strength, and the form and proportions of the shell are similar.

In conclusion, I would refer to the relative proportional length of the two last whorls compared with the rest of the spire. In *robustior* the upper part<sup>1</sup> occupies about  $\frac{1}{3}$  of the entire length, whereas in *Sumatrana* and var. *vicaria* it occupies just  $\frac{2}{7}$ , and in the abnormal specimen, above described, the length of the two parts of the shell is 14 and 16 mm. respectively.

I have placed the specimens mentioned in this note in the Natural History Museum, South Kensington, so that they will always be available for future reference.

<sup>1</sup> The portion above the second suture, the aperture being towards the eye.

13. *PTEROCYCLUS ASPERSUS*, n.sp.

Testa discoidalis, aperte umbilicata, ad apicem subelata, sordide albida, supra fusco-purpureo tincta; anfractus  $4\frac{1}{2}$  satis rotundati, sutura profunda discreti, striis incrementi obliquis sculpti, ultimus antice descendens; peristoma duplex, margine exteriori late expanso, tenui, albo, continuo, anfractui conjuncto, interno tenui, continuo; operculum corneum, tenue, spiraliter carinatum, anfractibus circiter 9 transversim striatis. Diam. maj. 19, min. 14.5 mm.; alt. 9 mm. Apertura intus 6 mm.

*Hab.*—Loeboek Bangko.



The adult specimens are denuded of periostracum, and are coloured as described above, but an immature specimen consisting of three whorls and probably belonging to this species, is yellowish, copiously blotched above and below with rich brown markings, and it also exhibits a somewhat broken-up peripheral zone. Under a strong lens the protoconch is beautifully spirally punctate. The centre of the operculum, which is concave, is also very finely spirally striated.

14. *LEPTOPOMA FULTONI*, Aldrich.

*Hab.*—Bongsoe.

15. *ISIDORA (BULINUS) SUMATRANA*, von Martz.

*Hab.*—Mount Ophir.

Four examples possess seven whorls, and are large and well developed; four possess six only, and two of these are stunted specimens.

16. *PLANORBIS SAGOENSIS*, n.sp.

Testa orbicularis, depressa, subcarinata, pallide luteo-cornea, lineis incrementi obliquis tenuibus sculpta; anfractus  $3\frac{1}{2}$  superne convexi,

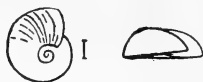


inferne sub-convexi; apex depressus; umbilicus satis depressus; apertura oblique lunata, ad peripheriam subangularis. Diam. max. 6, min. 5 mm.; alt. 2 mm.

*Hab.*—Mount Sago.

17. *SEGMENTINA KENNARDI*, n.sp.

Testa tenuis, discoidalis, compressa, carinata, brunneo-cornea, subpellucida, septis internis instructa; apex modice depressus; latus



inferius planum, in regione umbilici leviter impressum; anfractus 3, ultimus superne subrotundatus; apertura acute lunata. Diam. 2.5, alt. 1 mm.

*Hab.*—Mount Singalong.

The periostracum is somewhat masked by iron deposit.

18. *MELANIA TUBERCULATA* (Müll.).

*Hab.*—River at Souliki.

19. *MELANIA UNIFASCIATA*, MOUSS.

*Hab.*—Mount Merapi and river at Souliki.

20. *MELANIA CURVICOSTA*, von Marts., var. *PRESTONIANA*, Bullen.

*Hab.*—Mount Merapi.

21. *CORBICULA SUBROSTRATA*, Bullen.

*Hab.*—River Kwantan.

Originally described from Java. This is an interesting extension of its habitat.

In conclusion I beg to return my thanks to Mr. E. A. Smith for much kind help, especially in connection with the *Clausilia*.



REPORT UPON A COLLECTION OF NUDIBRANCHIATA FROM THE  
CAPE VERD ISLANDS, WITH NOTES BY C. CROSSLAND.

By Sir C. N. E. ELIOT, K.C.M.G.

Read 11th May, 1906.

PLATE XIV.

THE collection of Nudibranchs which forms the subject of the present paper was made by Mr. Crossland in the Cape Verd Islands (St. Vincent, St. Jago, and Boa Vista) during the Summer of 1904. His notes on the living animals are in most cases reproduced verbatim, but have not had the advantage of his revision, as he is absent in the Sudan, and he is not responsible for the anatomical notes, nomenclature, or views contained in the following pages.

The new forms discovered by Mr. Crossland are neither very striking nor very certain, and the interest of the collection lies mainly in the light which it throws on the distribution of this group of Mollusca, and on the differences between the fauna of the tropical Atlantic and the tropical Pacific. A list of the species, as far as they can be determined, is given below, but the identification has often been a matter of difficulty, as nearly all the specimens are small and inconspicuous. This may mean that they are immature. If the animals spawn in the Spring, half-grown individuals would be frequent at the time that Mr. Crossland collected. On the other hand, an examination of the Nudibranchs collected by myself in Samoa, and by Mr. Stanley Gardiner in the Maldive and Laccadive Islands, suggests that specimens from small islands, which have never been connected with the mainland, are not as large as those found on the shores of the mainland and its adjacent islands.

LIST OF SPECIES.

NAME.	PREVIOUSLY RECORDED FROM.
1. <i>Tritonia moesta</i> , Bergh, var. <i>pallescens</i> , n.var.	Mediterranean.
2. <i>Staurodoris atypica</i> , n.sp. ... ..	Allied species from Mediterranean and West Atlantic.
3. <i>Discodoris indecora</i> , Bergh ... ..	Trieste.
4. <i>Discodoris muta</i> , Bergh ... ..	Guadaloupe.
5. <i>Discodoris</i> sp.	
6. <i>Geitodoris reticulata</i> , n.sp. ... ..	Allied species from Plymouth.
7. <i>Peltodoris</i> sp.	
8. <i>Rostanga Evansi</i> , n.sp.	
9. <i>Cadlina Clarae</i> , von Ihering ... ..	Naples.
10. <i>Chromodoris gracilis</i> (Delle Chiaje) ... ..	Mediterranean.
11. <i>Doridopsis grandiflora</i> , juv. (Rapp) ... ..	Mediterranean.
12. <i>Doriopsisilla Pelseneeri</i> (?), <i>D. areolata</i> (?) ... ..	South Portugal, west coast of Africa, Mediterranean.
13. <i>Plocamopherus Maderæ</i> (Lowe) ... ..	Madeira.
14. <i>Doto obscura</i> , n.sp.	
15. <i>Doto cinerea</i> , Trinchese ... ..	Mediterranean.
16. <i>Spurilla neapolitana</i> (Delle Chiaje) ... ..	Mediterranean.
17. <i>Amphorina pallida</i> , n.sp.	
18. <i>Phidiana longicirrhæ</i> , n.sp.	
19. <i>Facelina Drummondi</i> (Thompson) ... ..	British and Scandinavian waters.
20. <i>Favorinus carneus</i> ? (A. & H.) ... ..	South England.
21. <i>Favorinus</i> sp.	

Mr. Crossland, in a paper on the *Œcology and Deposits of the Cape Verd Marine Fauna* (Proc. Zool. Soc. London, 1905, vol. i, pp. 170-186), points out that the islands lie in the path of the southern division of the Gulf Stream, which is joined by another current from near the Straits of Gibraltar. Both of these are cold currents, the warm stream from the Gulf of Guinea passing a little to the south of the islands. The above list is quite in keeping with this system of currents, for there is a marked absence of characteristic tropical forms, whereas the Mediterranean element is large, and species recorded from the West Indies and tropical Atlantic are represented. Probably this western element is really larger than it appears to be, for our knowledge of West Indian Nudibranchs is very imperfect, and hardly twenty have been identified with certainty. It is also probable that many of the Mediterranean forms are not specially Mediterranean, but also found in the Azores, Canaries, Madeira, etc.

The lists of molluscs given by Rochebrune ("Matériaux pour la Faune de l'Archipel du Cap Vert," in *Nouvelles Archives du Muséum d'Hist. Nat. Paris*, 1881, ser. II, tome iv) yield much the same result. Of 201 molluscs, 21 are recorded only from the islands, 5 from the coast of America, 16 from European seas, and 70 from the Mediterranean; while of 285 marine invertebrates of all kinds, 48 are recorded only from the islands, 23 from the west coast of America, and 91 from the Mediterranean. Rochebrune mentions only one Nudibranch, *Peltodoris Sawagei*, which is perhaps a colour variety of *P. crucis*.

Regarded as tropical Nudibranchs, the present collection offers a remarkable contrast with the forms found in the corresponding latitudes of the Indo-Pacific. There are no specimens of *Platydoris*, *Bornella*, *Kentrodoris*, *Hexabranhus*, *Phyllidia*, *Trevelyana*, or *Asteronotus*, and the Chromodorididæ are represented by only one small species. The first two of the above-mentioned genera are recorded from the West Indies, but the rest have not been found in the Atlantic, though the "Talisman" obtained a *Phyllidiopsis* in the Bay of Biscay. Mr. Crossland (l.c.) also notices the absence of large and highly coloured Planarians, which are very abundant in the Indo-Pacific. In many parts of that ocean, for instance, Zanzibar and the east coast of Africa, the coast in sheltered parts consists of flat, table-like coral reefs, which house an incredible amount of marine life. Alcyonarians are abundant, and sometimes form a living carpet. In the Cape Verd Islands the conditions are widely different: Alcyonarians and corals are rare, and the organic rocks are formed chiefly of Nullipores and *Vermetus* between tides, and below tide-marks of *Lithothamnion* and great quantities of a Foraminiferan.

As we have no information about the Nudibranchs of the West African coast between the Cape Verd Islands and the Cape of Good Hope, it would be rash to assume that the present collection is typical of the fauna of the Equatorial Atlantic. It may be that on reaching the warm current from the Gulf of Guinea, passing to the south of the Cape Verd Archipelago, we should find other forms. But what

does seem to be clear is, that in the Atlantic there is for Nudibranchs (and probably for many other groups) a faunistic district which extends from the level of the Mediterranean at least as far south as 15° N., whereas in the Indo-Pacific the equatorial fauna extends as far north as Suez and Karachi. The southward limit of the Atlantic sub-tropical fauna is unknown. To the north it gradually passes into the northern fauna, the boundary being somewhere about the British Isles. A good many species are common to both faunas, but the north is characterized by such Dorids as *Acanthodoris*, *Lamellidoris*, *Adalaria*, etc., and by an abundance of such Æolidids as *Æolidia*, *Galvina*, *Coryphella*, and *Cratena*. It is perhaps a mere matter of chance that the last genus is not recorded from the Mediterranean, but clearly these forms are more abundant towards the north. *Gonicolis*, *Chlamylla*, and *Doridunculus* appear to be exclusively northern.

It is noticeable that several of the forms from the Cape Verd Islands, here described as new, are closely allied to known species (e.g. *Staurodoris atypica*, *Geitodoris reticulata*), and many of those referred to known species present well-marked variations (e.g. *Tritonia mæsta*, *Doto cinerea*, and *Spurilla neapolitana*). Taken together, these facts suggest that forms found in the Mediterranean and the parts of the Atlantic in about the same latitude become differentiated further south.

As isolated facts of interest may be noticed the habit ascribed to *Doriopsisilla* (? *areolata*) of sunning itself in tide-pools; the absence of a penial armature in the young *Doridopsis grandiflora*, suggesting that this feature is developed with age; and the development of the teeth, as shown in the young *Cadlina Claræ*.

*TRITONIA MÆSTA*, Bergh, var. *PALESCENS*, n. var. Pl. XIV, Fig. 1.

*Tritonia mæsta*, Bergh: Semper's Reisen im Arch. Philip., pt. xv, pp. 734-736 (1884); Vayssière, Ann. Mus. Marseille, vol. vi, pp. 100-1 (1901).

Mr. Crossland's notes on the living animal are as follows:—

"Small and opaque white, with pink organs dimly showing through. Between the bases of the rhinophores some have a broad crescent of dark crimson lake.

"Of the usual high square-cut shape, but the back slopes gently down to the tail: this is long and tapering, colourless and transparent. The long rhinophore-cups have a light brown tinge. A few specks of dark red occur on the back in some specimens, but several are merely white all over. Velum with 2 long anterior processes, and 2 shorter lateral. Rhinophores long, with a central pillar surrounded by a cluster of delicate tentacle-like processes. Gills, 3 pairs. The first pair largest, with 2 main branches: the rest have simple branches with short papilla like side branchlets. The foot adheres very strongly, and is damaged in several specimens. It is quite colourless and transparent. In some specimens the expanded lateral margin of the foot is seen when the animal is crawling, but sometimes not at all. The anterior processes of the velum may be carried vertically at times.

Found under a stone whose lower surface was covered with a red Alcyonarian, some Polyzoa and *Tubularia*. They seemed to haunt the Polyzoan principally. Found in the same habitat on two occasions."

The preserved specimens are much contracted, the largest being only 3.5 mm. long, and the external characters described by Mr. Crossland can be verified only with difficulty. The four digitations on the frontal veil still remain in the form of knobs, but in some specimens the outer pair are distinctly grooved, showing that they represent tentacles. The foot is rounded in front. The branchiæ are reduced to mere lumps: the plumes have perhaps been rubbed off.

In the specimen dissected the formula of the radula is  $21 \times 11.1.1.1.1.11$ . The teeth are as represented by Bergh (l.c., pl. lxxiv, fig. 21). The median tooth is distinctly tricuspid; the first lateral less clumsily shaped than usual in the genus, and distinctly hamate, the hook bending over the side and top of the median tooth. The jaws are as in Bergh's pl. lxxvi, fig. 3, but bear at least eight rows of denticles on the edge. There are no stomach plates.

These specimens are remarkable externally for having only four processes (including the tentacles) on the oral veil, a character which is shared by *T. lineata* and *T. mæsta*, but they approach more nearly to the typical *T. mæsta* because they have a narrow radula and no lines on the dorsal surface. The coloration also approaches that of *T. mæsta*. According to Vayssière (l.c., pl. i, fig. 19), the animal is not so much black as yellowish, with a good deal of black down the centre of the back. In the present variety this dark pigment is reduced to a band between the rhinophores and some spots on the dorsal surface.

*T. mæsta* is possibly the same as the *Duraucelia gracilis* of Risso (Hist. nat. Europe Mérid., vol. iv, pp. 38-9, 1826).

STAURODORIS ATYPICA, n.sp. Pl. XIV, Fig. 2.

Mr. Crossland's notes on the living animals are as follows:—

"Under stones at Porto Praya, lee of Quail Island. Bright light yellow, gills same tint, but perfoliations of rhinophores a little deeper. The rhinophores stand vertically, and only the perfoliated part is shown. Back covered with small warts evenly distributed. Mantle fairly broad, nearly colourless and translucent. Rhinophores and gill pockets not raised. Gills simply pinnate, and peculiarly long and slender (see the coloured sketch), ten<sup>1</sup> in number, very sensitive. Under side shows head and foot (latter broad) of a deep yellow, especially head and anterior edge of foot which is grooved, though there seems to be no notch in the anterior lip of the groove. Back rather broad and rough, showing spicules. Shape flat, but not conspicuously stiff.

"A smaller specimen from St. Vincent: in this only the head of all the under surface is of a deeper yellow."

<sup>1</sup> Twelve in sketch, but ten here and in nature.—C. E.

The larger specimen is very flat and much bent. It is about 15 mm. long, 7 mm. broad, and 4 mm. high. The dorsal surface is covered with warts of various sizes, bearing smaller prominences. The integuments are full of spicules, which are fairly straight rods, not branched, but jointed. The pockets of the rhinophores and branchiæ do not project, and their margins bear tubercles which are similar to those which cover the rest of the dorsal surface, and are not specially developed to act as lobes or defences. The branchiæ are ten in number, long and simply pinnate. The foot is large, nearly as long as the body, and 6 mm. broad. It is grooved in front, but not notched. The tentacles are much as in *Archidoris tuberculata*.

No labial armature was found. The radula consists of 38 rows, with a formula of about 30 . 0 . 30. The teeth are hamate, rather straight and stout, with long bases. The innermost and outermost are not so large as those in the middle of the half-row, and the two or three outermost are quite small.

No armature was discovered in the genitalia.

The common *S. verrucosa* shows great variation in the size and number of the dorsal tubercles, and these specimens might be regarded as a variety in which the usual protective valves of the rhinophores and branchiæ have not been developed. I hesitate, however, to take this view without further evidence, because the dorsal tubercles in the present specimens are not smooth and clavate, but low, rough warts bearing secondary projections. The radula also is narrower than is usual in *S. verrucosa*.

#### DISCODORIS, Bergh.

This genus consists of rather large animals of a flat shape, with a granulated or minutely tuberculate dorsal surface, and usually a wide mantle margin completely covering a moderately broad foot. A labial armature is present. The radula has no central tooth, but bears a considerable number of simply hamate laterals. There is no armature in the genitalia, but a prostate is present.

*Platydoris* somewhat resembles *Discodoris* in general appearance, but has a peculiar hard consistency, a characteristic armature in the genitalia, and no labial armature.

Bergh, in his *System der Nudibranchiaten Gasteropoden*, enumerates eighteen species, to which the following have since been added: (19) *D. Edwardsi*, Vayssière; (20) *tristis*, Bergh; (21) *erubescens*, Bergh; (22) *maculosa*, Bergh; (23) *dubia*, Bergh; (24) *egena*, Bergh; (25) *Heathi*, MacFarland; (26) *labifera*, (Abraham); (27) *D. (?) Sibogæ*, Bergh; (28) *D. (?) liturata*, Bergh; (29) *D. (?) lutescens*, Bergh; (30) *D. (?) versicolor*, Bergh; (31) *D. (?) rubra*, Bergh. The last five forms are regarded by Professor Bergh as only doubtfully referable to *Discodoris*, and it must be admitted that many of the species described agree only incompletely with his original definition of the genus.

Most of the species are recorded from the Indo-Pacific, but *D. notha* and *muta* are from the West Indies, *D. Edwardsi* from the west coast of Morocco, *D. tristis* from the Azores, *D. erubescens* from Naples,

*D. egena* from Trieste, *D. Heathi* from California, and *D. dubia* and *D. egena* from Tasmania. The genus is thus fairly widely distributed, but seems to shun the northern Atlantic and the coasts of South America. The allied *Geitodoris*, however, occurs in the former region, and the Nudibranchs of the latter have been little investigated. It is clear, however, that the genus is most abundant in the warmer seas.

Many of the species recorded from the Atlantic have a harder consistency than the more typical forms from the Indo-Pacific, and this is certainly the case with the specimens noticed below.

Bergh originally classified the *Doris Elliotti* of Alder & Hancock (Notice of a collection of Nudibranchiate Molluscs made in India) as *Platydoris*, but in his recently published account of the Nudibranchs found by the Siboga he identifies it with a *Discodoris* in that collection. I have, however, examined the type-specimen preserved in the Hancock Museum at Newcastle-on-Tyne, and ascertained that the earlier classification under *Platydoris* is correct. The animal has no lip plates, but a very strong armature of hook-bearing scales on the genitalia. The Siboga specimens should perhaps be called *Discodoris Berghi*, n.sp.

#### DISCODORIS INDECORA, Bergh.

*Discodoris indecora*, Bergh: Semper's Reisen, Supp., Heft ii, 1881, pp. 108-112.

Mr. Crossland's notes on the two living specimens are as follows:—

"Dorid, blue grey. Found among Nullipore nodules 5-10 fathoms in Porto Grande, St. Vincent, and also under a stone in Porto Praya, Santiago. About 18 mm. long by 10 mm. wide, white below, of a cool grey above with a bluish bloom. Quite smooth, no papillæ, but harsh to the touch, very sluggish. Colour is modified by the presence of minute black specks thickly sown over the dorsal surface. At a point where the mantle joins the body dorsally is an irregular line of irregular white blotches made up of opaque white specks, larger than the black ones.

"Rhinophores and gills both completely retractile. Both tipped with white. The latter have an extraordinarily thick rhachis, and the branched parts are extremely small, but it is possible that they were not seen fully expanded. They appear to be bipinnate. The specimen from Porto Praya has no bluish tint, and is of a cool grey colour. Gills as described, even when fully expanded, 4 in number, bipinnate and not so very small. This specimen is warty, and the other markings, etc., are as above."

The preserved specimen from Porto Praya is of a cool grey colour, and hard and stiff in texture. It is much bent, but, if straightened out, would be about 30 mm. long and 15 mm. broad. It is very flat, the maximum height being only 5 mm. On the outer parts of the dorsal surface are scattered tubercles, extending 5-8 mm. inwards from the margin. They are of various sizes, the largest being about a millimetre broad and half a millimetre high. The middle of the back appears smooth, but under the lens shows indications of obscure flat tubercles. The spaces between the tubercles are finely granulated.

The rhinophore openings are on small hillocks, but there are no projecting sheaths. The branchial pocket is nearly closed, and not at all raised. It was possibly stellate when open. There are four branchiæ and an asymmetrical small plume. The rhachis is stout; the ramifications scanty, and mostly only bipinnate. The foot is considerably shorter than the body, with a wide margin. It is much bent and contracted, but measures about 15 by 7 mm. It is apparently grooved and notched in front. The tentacles are digitate, with a slight groove on the outside.

The internal organs are mostly white. The labial armature consists of two hatchet-shaped plates, which might also be possibly regarded as representing a circle with two processes extending backwards. The constituent elements are minute rods of rather irregular shape, often swollen at the ends. The radula is narrow and of rather unusual appearance. There are 51 rows, containing not more than 16 or 17 teeth on each side of the bare rhachis. The teeth are rather straight and broad, and those in the middle of the half-rows are almost spoon-shaped and hardly hamate in appearance. The innermost and outermost teeth are smaller. The bases are long, especially those of the innermost teeth. Such stomach as there is appears to be wholly outside the liver, but it is very small and merely a dilatation of the general digestive tract. Both it and the intestine are thickly laminated inside. The liver is greyish, not very compact, and with many lacunæ. It is clothed with the dead-white follicles of the hermaphrodite gland. The connecting tubes between the follicles are more distinct than usual.

The renal organ is very distinct and exhibits beautifully dendritic ramifications. The blood-gland is double and much lobed, especially the anterior portion. The central nervous system is granulate and enclosed in a strong capsule. The ganglia could not be clearly separated.

The genitalia appear to be as usual in the genus. A spermatheca, spermatocyst, and prostate were found, but no armature. There is perhaps an accessory folliculate gland in the vestibule.

The second specimen is externally as described by Mr. Crossland. The white blotches are somewhat raised and almost tubercular. The branchiæ are four, but one is bifid. The tentacles have a slight but distinct groove on the outer side.

These specimens may be referred with some certainty to Bergh's *Discodoris indecora*, recorded from Trieste, with which they agree not only in general characters, but in such details as the narrow radula and grooved tentacles.

#### DISCODORIS MUTA, Bergh.

*Discodoris muta*, Bergh: Semper's Reisen, Heft xii, 1877, pp. 532-4.

One specimen. The notes on the living animal are as follows:—

"Dorid, large grey. Under a stone (Gastropod shell mass), Boa Vista.

"Leathery but not harsh to the touch. Foot broad, mantle moderately so, of wavy outline and rather mobile.

"Gills of moderate size, tripinnate. Rhinophores stand vertically. Both pockets close completely, edges a little raised when open. The

lateral branches of the gills stand vertically, so that the gills form a cabbage-shaped tuft, rather than a flat rosette. Autotomy of mantle-edge during apparently healthy life. Colour light grey with darker spots which are small and irregularly scattered, gills and the rhinophores coloured like the body, perfoliations of rhinophores rather darker. Under side uniformly white. Foot grooved and notched. Tentacles small but pointed."

The preserved specimen is 47.5 mm. long and 19 high. The breadth is about 30, but the edges of the mantle have been thrown off. It would appear that this margin was ample when it was complete, and measured about 15 mm. The colour is pearly grey, mottled in places, but not everywhere, with rather darker greyish spots, which are sometimes confluent. The back is minutely granulate, and in most places feels quite smooth, but here and there the granulations are covered with a hard, white deposit, and in these patches (the largest of which measures about  $5 \times 3$  mm.) the skin feels harsh and rough. The general consistency is waxy.

The foot is grooved and notched in front. The tentacles are rather small, but distinct and pointed. The left is bifid, which is no doubt a monstrosity. The gill and rhinophore-pockets are completely closed, and invisible from the outside. There is no trace of a raised rim or tubercles, but the inside of the gill-pocket looks as if it might have been stellate when open. The rhinophores are stout and yellow. The branchiæ consist of six main plumes, but one is deeply divided, so that they might be counted as seven. They have a faint green tinge and are tri- or quadripinnate, stout, but not ample, with broad stems and somewhat scanty ramifications.

The integuments are thick, and contain a dense mass of rod-like spicules which have a tendency to arrange themselves in a reticulate pattern. On removing them is seen the liver, covered by the yellowish hermaphrodite gland, contrasting markedly with the other organs (buccal mass, œsophagus, stomach, etc.), which are waxy white. The strong labial cuticle bears an armature of two very distinct, triangular, brown plates, composed of a dense collection of longish rods which can be seen separately only at the edges. The radula consists of 30 rows of teeth, of which 20 seem to be in use. The rows contain at most 40-45 teeth on each side of the rhachis, but many are much shorter. The teeth near the rhachis are smaller than the others, and very irregularly arranged, being apparently easily displaced. Those in the middle of the half-row are largest: the outer 8 or 10 begin to decrease, and the two or three outermost are markedly smaller, but not rudimentary. There are two yellowish salivary glands, about 5 mm. long and 2.5 broad. The long, thin ducts measure about 12 mm. The œsophagus, 13 mm. long, runs straight to the stomach and enters its under side. The stomach (12 mm. long, 6.5 mm. broad) has moderately strong walls and lies on the front part of the liver, completely outside it. The intestine is long. The œsophagus, intestine, and stomach are all laminated internally. The liver is large, and, as preserved, is drawn up into a sort of globular dome at the back. It shows signs of a division into several lobes, and is very loose in texture, with



many lacunæ. It is covered with a remarkably thick layer of the hermaphrodite gland, which is everywhere at least 1 mm. deep, and in some places as much as 3 mm.

There are two distinct blood-glands, one before and one behind the central nervous system. They are irregularly lobed, but not much indented, and olive green, contrasting markedly with the white organs around them. The central nervous system is yellowish, and enclosed in a strong, white capsule. The ganglia seem to be close to one another, and I was not successful in separating them. Their surface is granulated. The yellowish lens of the eyes is very large, the black part small.

A prostate is present, but no armature of the reproductive organs was found. The spermatheca is very large, and coloured brown by its contents.

This form seems to agree in its principal external and internal features with *Discodoris muta*, Bergh, recorded from Guadaloupe.

*Discodoris fragilis* (A. & H.) is another species which has been observed to mutilate itself and throw off portions of the mantle-margin while alive.

#### DISCODORIS sp. Pl. XIV, Fig. 3.

Mr. Crossland's notes on the living animals are as follows:—

"In a crevice of rock, at low tide level, among surf. Porto Praya. Very flat, stiff, and harsh, but back not in any way warty, papillate, or pitted. To naked eye appears of a uniform orange brown, darker on the visceral mass, lighter round the mantle-edge. Opaque white marks, irregularly scattered round mantle-edge, and larger ones near the middle of the body where mantle joins the visceral mass. Rhinophores of a darker shade, points directed backwards. Gills 6, tri-pinnate, rather small. Gill-pocket with 6 large teeth, but cannot close completely. Rhinophore-pockets also raised, with large and small teeth irregularly placed. Gills sandy and dark brown, former colour predominating. Under lens, colour seen to be due to a dark-brown network with very small round yellow meshes.

"Under side shows ample mantle with wavy outline. Foot grooved and notched. Oral tentacles fairly long. All bright yellow, except for small deep brown spots on the inner part of the mantle."

The larger specimen accords with this description, but the orange brown has become grey. There are some reddish spots on the under side near the junction of the mantle and the body. The shape is very flat. The length 34 mm., the breadth 21.5 mm., and the height 5.5. The mantle-edge overhangs the body all round, and in some places is 8 mm. wide. The back is finely granulate; the integuments stiff, waxy, and brittle.

The smaller specimen is similar, but has preserved more of the orange colour, and is only half the size.

The foot is much shorter than the body, being only 18 mm. long in the larger specimen. It is ample in front, but in neither specimen is it clear that there is a groove. The tentacles are rather large and digitate. The branchiæ are 6, besides a small detached plume. The

integuments are full of short, rod-like spicules. On opening the body-cavity, the intestines were found to be much hardened and badly preserved in both specimens.

There is a labial armature of two small brownish plates. They are rather faint and not at all strong. They are composed of scale-like elements, and resemble the mosaic found on the masticating edge of *Tritonia* rather than the labial plates usual in *Discodoris* (Fig 3).

The radula consists of 46 rows, each containing from 65 to 70 teeth on either side of the narrow, bare rhachis. The innermost teeth are smaller, and often cross one another over the rhachis, so as to give a false impression of median teeth. The outermost teeth are degraded and plate-like, but not serrulate. The rest are hamate, moderately bent, and moderately tall. There are a few bifid teeth, but they appear to be merely monstrosities.

The blood-gland is white. The central nervous system is not well preserved, but appears concentrated.

The state of preservation renders it impossible to make any certain statements about the digestive and reproductive organs. There appeared to be a distinct stomach, external to the liver, but I could not find the usual layer of the hermaphrodite gland spread over the liver. The male branch of the reproductive system terminates in a pouch containing the much convoluted vas deferens. In both specimens the efferent genital ducts seemed to bear colourless scales or prominences, so thin and transparent as to be almost invisible.

In the uncertainty as to many of the internal organs, I do not think it worth while to create a new species for these specimens. They are not certainly identifiable with any described form, but may possibly represent a variety of one of the Mediterranean *Discodoris* or *Paradoris*.

#### GEITODORIS, Bergh.<sup>1</sup>

This genus resembles *Rostanga* in many points, on the one hand, and, on the other, comes very near to some of the *Archidoris*s, such as *A. testudinaria*, which I identify with the *A. stellifera* of Vayssière and von Ihering. In this form the teeth grow longer and thinner towards the end of the row, though not so sharply differentiated as in *Geitodoris*, and, according to Vayssière, a labial armature is present.

The *Doris planata* of Alder & Hancock probably belongs to this genus (v. Eliot, l.c.), and is possibly not really distinct from the type species *G. complanata* (Verrill) from the coast of New England. Two other species have been described by Bergh, *G. immunda* from Panama and *G. mollina* from the West Indies. The latter does not entirely conform to the type of the genus.

GEITODORIS RETICULATA, n.sp. Pl. XIV, Figs. 4, 5a, 5b.

Mr. Crossland's notes on the living animals are as follows:—

“August 16. At St. Vincent. Found under a stone in company

<sup>1</sup> Vide Eliot, Journ. Mar. Biol. Assoc., vol. vii (1906), on *Archidoris testudinaria* and *Geitodoris planata*.

with red sponge and red Alcyonarian. 8 bipinnate gills, some showing tendency to become tripinnate.

"August 17. 5 specimens under a lighter, in company with red sponge of same tint as the Dorid.

"Brilliant vermilion, about  $1\frac{1}{2}$ " by  $\frac{3}{4}$ ". Colour, at first sight, appears uniform, but under a lens (mag. 10) are seen numerous specks of black pigment, most numerous on the visceral mass, less so on the mantle. The skin is pitted sparsely on mantle, but on the body the pits are very numerous, so that this part appears to be covered with a raised vermilion network, blunt papillæ being situated at the larger junctions. In some specimens these are more numerous and better developed than in others. The pigment-specks are much more numerous in the pits, so that they are a dark grey, throwing up the red network surrounding them. The ends of the rhinophores and the anterior gills are pigmented with black and sandy colour. The lower or posterior gills are the same colour as the body. Small specks of sandy colour occur sometimes also on the body, but are conspicuous only in one specimen. Gills comparatively small, apparently bipinnate, but of so close texture that this is not easily made out. Completely contractile, but pocket does not close. Edge of pocket slightly raised and slightly undulating, sometimes with a thin line of sandy pigment round the edge. Rhinophore-pockets ditto. Rhinophores long and deeply perfoliated.

"The creatures are very soft indeed; the mantle is ample, with a wavy margin. Foot is fairly broad, grooved and notched in front. Tentacles long, slender and mobile. Under surface uniformly vermilion."

Mr. Crossland added the following notes on an orange-brown specimen, which he rightly regarded as a variety of this species:—

"Most probably only a variety of last species. Rather flat, mantle ample, harsh to touch but not particularly stiff. Ground colour a dull light yellow, plentifully besprinkled, especially on the visceral mass, with small blotches made of minute specks of orange-brown. Also dark grey ill-defined dots. Network with pits in meshes over visceral mass, very distinct. Rhinophores large, gills small. Rhinophores perfoliate, all over dark brown and white. The two anterior gills are of the same colour; the six posterior orange. They are simply pinnate and quite symmetrically arranged. Edges of rhinophore and gill-pockets slightly raised, darker brown; gill-pocket with a thin white edging."

The buccal parts and other internal characters are as in the other specimens. The gills, though straight and scanty, can be seen under the microscope to be bipinnate in places.

The ten specimens preserved differ somewhat in appearance, some being white and some reddish brown, but agree in anatomical and essential external features. The white specimens are the larger.

The animals are much bent, but, if straightened out, the largest would be about 50 mm. long and 35 mm. broad. They are very flat, the maximum height being only 8–9 mm. The ample mantle-margin (9–10 mm. wide) overhangs the foot on all sides. The foot is not narrow (about 15 mm. wide), and has expanded margins. The dorsal

integuments are thin; the mantle-edge thickens. The texture and external characters are as described by Mr. Crossland. The pits and ramifying lines are still visible, but not conspicuous (Fig. 4). The openings of the rhinophores and branchiæ are not stellate or markedly tuberculate. The branchial pocket is shallow, and the lateral branchiæ can be counted as either six or eight, the third and fourth plumes on either side being united at the base (Fig. 4). There is generally a small unpaired plume in front, opposite the anal papilla, which completes the circle behind, so that the whole number of plumes seen protruding from the pocket is nine.

The labial armature consists of two greenish plates, composed of short, slightly curved rods, with rather swollen tips. These tips form a mosaic.

The radula is fragile and easily becomes confused. There are about 25 rows, with a formula reaching at least  $10 + 35 \cdot 0 \cdot 35 + 10$ . At the outer ends of each row is a bunch of long, thin teeth (Fig. 5*b*) lying very close to one another, so that they are difficult to count. There are, however, at least 10 in the bunch or sheaf, and perhaps considerably more. The other teeth (Fig. 5*a*) are comparatively low, hamate, with long bases. The rhachis is narrow, and the innermost laterals of the two sides almost cross one another.

The intestines are whitish. The œsophagus is moderately long, but varies somewhat in different specimens. In all cases, however, it enters the liver without any external dilatation, and the stomach is wholly within the liver.

The hermaphrodite gland is ample, forming a thick, white layer over the liver. There is a large mucous gland, gelatinous, colourless, and semi-solid externally, hard and yellow in the inside. The spermatheca is large and roughly spherical; the spermatocyst small and elongate. No armature of the glans penis was discovered and no prostate.

This species is very nearly allied to the *Geitodoris* found at Plymouth (v. Eliot, l.c.), which is probably identical with the animal called *Doris planata* by Alder & Hancock. It is not improbable that the African and British forms are merely varieties of one species, the tropical specimens being, as is natural, larger and more brightly coloured. But I have thought it safer to describe them under a separate specific name.

#### PELTODORIS, Bergh.

This genus differs from *Discodoris* only in not having a labial armature, and would perhaps be better regarded as a subgenus, for the armature in question is merely a collection of small rods which strengthens the labial cuticle, and, unless it is much developed, is not a conspicuous or important character. The following species have been described:—

1. *P. atromaculata*, B. Mediterranean.
2. *P. crucis* (Oersted). West Indies. = *P. Sawagei*, Rochbr., Cape Verd.
3. *P. Mauritanica*, B. Mauritius.

4. *P. angulata*, Eliot. E. Africa.
5. *P. aurea*, Eliot. E. Africa.
6. *P. rubescens*, B. Malay Archipelago.

Rochebrune (Nouv. Arch. du Muséum d'Hist. Nat. Paris, 1881, ser. II, vol. iv, p. 263) has described a species from the Cape Verd Islands as *P. Sauvagei*, though without any indication of its internal characters. It is probably only a variety of *P. crucis*, which has a green back, spotted with black, and black rhinophores, whereas *P. Sauvagei* is of a uniform green, with violet rhinophores. Both have yellow branchiæ.

#### PELTODORIS sp.

Mr. Crossland's notes on the living animal are as follows:—

"Dorid, yellow. Porto Praya.

"Back covered with small papillæ. 8 rather small, abruptly-ended, dark red-brown gills. Rhinophores with a few red-brown dashes. Colour deep yellow, with numerous small reddish brown blotches, appearing to the naked eye deep orange. Under side nearly white. Elongated in shape, with narrow mantle. Foot rather high."

The single specimen is hard and stiff, rather flat, but the back is somewhat arched. It is much bent, but the dimensions are—length about 12 mm., breadth about 6 mm.

The integuments are full of white, rod-like spicules, fairly straight, and of various sizes. The back is covered with little spiculous tufts, as in *Rostanga Evansi*, but lower and less conspicuous. The edges of the rhinophorial and branchial pockets are not raised, but the surrounding surface forms a sort of hillock. The foot is grooved in front, but apparently not notched. The tentacles are small knobs. The eight branchiæ are dark brown, stout, short, scanty, and apparently bipinnate.

No labial armature was found, and the labial cuticle seems clear and transparent. The radula consists of 52 rows, of which the two hindmost are in process of growth and hardly formed. Each row contains 70–80 teeth on either side of the bare rhachis. The teeth are hamate and very stout. The innermost are smaller.

This specimen seems to belong to the genus *Peltodoris*, but is hardly referable to either *P. atromaculata* (Mediterranean) or *P. crucis* (Antilles). It is probably immature, and it is, perhaps, not worth while to create a new species for it.

#### ROSTANGA, Bergh.

This genus resembles *Geitodoris* in many respects, but differs in having a prostate and simply pinnate branchiæ. The back is covered with small tubercles, from which spicules project. Hitherto it has been recorded only from cold and temperate seas. The species are:—

1. *R. coccinea* (Forbes). Atlantic and Mediterranean.
2. *R. perspicillata*, Bergh. Mediterranean.
3. *R. pulchra*, MacFar. California.
4. *R. rubicunda* (Cheeseman). New Zealand.
5. *R. Evansi*, n.sp. Cape Verd Islands.

This new species is of a violet grey, but in all the others the prevailing coloration is red.

## ROSTANGA EVANSI, n.sp. Pl. XIV, Figs. 6a-6c.

Mr. Crossland's notes on the living animal are as follows:—

"Of a light violet grey. Back covered with minute papillæ. Numerous round darker spots, edged with a whitish line, looking exactly like pits, but, when touched with a needle, seen to be in same plane as rest of surface. These are largest where the mantle passes into the visceral hump. A few papillæ are longer than the rest, and opaque white. Rhinophores also largely white, and a row of white dots is placed round the mantle-edge. Gills simply pinnate and of fair size, 9 in number, of same colour as the body, with pointed ends. They are symmetrically placed round the anus.

"Rough and rather stiff. May be flat in shape, or may take on a high form with flat back. Mantle ample. Foot moderately broad; grooved and notched; very strongly adhesive; whitish in colour.

"Aug. 11th. A small damaged specimen presumably of same species.

"Aug. 17th. St. Vincent. Small specimen from the bottom of the lighter."

The specimen dissected is 14 mm. long, 9 broad, and very flat. The ample mantle completely covers the foot, and is in some places 3.5 mm. wide. The foot, as preserved, is not very distinctly grooved, and has expanded lateral margins. No tentacles were found. The texture is fragile and spiculous. The back is covered with papillæ about a quarter of a millimetre high, generally slightly broader at the top than at the base. Each papilla is supported by a bundle of spicules, set within it vertically, three or four of which project from the top. The intervening dorsal surface is also crowded with spicules. The spicules are all colourless straight rods.

The labial armature consists of yellowish rods, somewhat curved, with thickened ends. The radula is fragile and difficult to keep together. It seems to consist of 18 rows, with a formula of 20 . 0 . 20 or less. The innermost teeth are comparatively small; those in the middle of the half-rows are taller (Fig. 6a). Near the end of the row are about five long and very thin teeth (Fig. 6b), but the two or three outermost are shorter, though thin, and bear 2-3 longish denticles below the tip (Fig. 6c).

No armature was found in the reproductive organs.

The largest specimen (15 mm. long by 9 mm. broad) looks somewhat different, as the dorsal papillæ are relatively much longer and more conspicuous in the smaller specimens. But though the back of this larger specimen appears to be merely minutely granulate, the structure of the granulations and spicules is the same as in the others.

## CADLINA CLARÆ, von Ihering, juv. Pl. XIV, Figs. 7a-f.

*Cadlina Claræ*, von Ihering: Malac. Blätt., 1880, vol. ii, pp. 107-110.

Mr. Crossland's notes on the living animal are as follows:—

"Dorid, minute white.

"Among washings of Nullipore nodules and coal, 5 fathoms or thereabouts. Oblong shape, narrow mantle, and high foot like *Chromodoris*.

"Rhizophores very large, deep chocolate colour, perfoliate in whole visible length, completely retractile, though with difficulty. Gills same colour and appearance, very small, not a quarter of the size of the rhizophores, simply pinnate. 3 in number, all placed anteriorly to the anus, on a broad base. The body is a translucent white, the light brown liver and whitish genitalia showing through. There are a few opaque white spots in the skin, especially at the junction of the mantle and the visceral mass. Two clear black eyes show through some little way behind the rhizophores."

The larger of the two preserved specimens is 4.5 mm. long, 2.5 mm. broad, and rather flat. Otherwise it is just as described above. The contrast between the dark-brown rhizophores and branchiæ and the white body is very remarkable. The rhizophores are very large. The three gills are everted, but appear to be completely retractile into a small round pocket. Strictly speaking, only the ramifications of the branchiæ are brown, the main rhachis being white. The dorsal surface is minutely granulate. There is a ring of rod-like spicules inside the integuments round the mantle-rim, but in the centre of the back there seem to be no spicules. The mantle-margin is fairly wide; the foot rather narrow, grooved and notched in front. A large blunt prominence on either side of the mouth perhaps represents a tentacle. The large dark rhizophores are visible right through the body, and can be seen from the lower side.

There is a labial armature composed of minute mace-shaped elements. The radula consists of 71 rows of teeth. The central tooth is a plate bearing four longish denticles on its upper edge, which point backwards. The first lateral has a larger base and bears six denticles, of which the third from the inside is the largest. In the succeeding teeth this large denticle increases in size, the denticles to the inside of it disappear, and those to the outside become more numerous. Fig. 7 will show how the plate-like median tooth and the hamate, denticulate, lateral teeth are connected by a complete series of intermediate forms. As in the specimens examined by von Ihering, no armature was found in the genitalia.

These specimens are probably the young of *C. Clara*, which is recorded from Naples, and is perhaps itself not full-grown, as it is only 10 mm. long. The most striking characteristic of the species is the contrast between the white skin and the dark colour of the rhizophores and branchiæ. A similar contrast is found in *C. flavomaculata*, MacFarland, from the Californian coast, which is white, with pale-yellow spots, and large black or brown rhizophores.

For a list of species see Cockerell & Eliot, Californian Nudibranchs, Journ. Malac., 1905, vol. xii, p. 34.

#### CHROMODORIS, A. & H.

This genus is very abundant in the tropical Indo-Pacific, and is remarkable for its brilliant coloration and elaborate patterns. It extends as far north as Japan and Puget Sound, and as far south as Tasmania and New Zealand. In European and Atlantic waters the records are relatively scanty, about ten species being known from the

Mediterranean and five from the West Indies. None appear to have been found north of the Mediterranean. Compared with the Pacific forms, these species are soberly coloured, the majority being blue or purplish, with white or yellow markings.

One small blue species was found in the Cape Verd Islands, and is already known from the Mediterranean.

CHROMODORIS GRACILIS (Delle Chiaje).

*Chromodoris gracilis* (Delle Chiaje), von Ihering: Malac. Blätt., 1880, vol. ii, pp. 67-71.

Mr. Crossland's notes are as follows:—

“*Chromodoris* (blue). In a nodule of *Lithothamnion*, 3 or 4 fathoms.

“Of the typical shape, with narrow mantle, about an inch long, foot projecting very little behind mantle. Colour deep blue, almost black, except edges and anterior part of mantle which are bright blue. Parallel to mantle-edge, a thin line of bright yellow. In centre of back a long zigzag line of white, bearing club-shaped or semicircular blotches of light blue laterally. This line is yellow between and in front of the rhinophores. Foot blue-black above, lighter blue below, with white and light blue blotches. Just below mantle a thin bright yellow line. The whitish blotches are largest above, smaller below, and are arranged in 3 rows. Formalin dissolves out a blue solution. Gills 7 in a simple circle, hindmost pair rather smaller, simply pinnate, completely retractile and not reappearing for some time. The plumes are dark blue, with white tips, and white blotches on outer side of rhachis. They spring from a blue-black base. Rhinophores large, almost as high as the gills, black with white tips, and a few white dots.”

The preserved specimens are of a uniform grey. The largest is 9 mm. long, 3.5 broad, and 4 mm. high. The mantle-edge is indistinct; the head and tentacles as usual in the genus. The branchial pocket is not raised, and the plumes are completely retracted within it. The foot is narrow.

The labial armature is a fine yellowish mosaic of rods with bifid tips. The radula consists of about 50 rows, with from 35 to 40 teeth on each side of the naked rhachis. The arrangement of the teeth is as usual in the genus. They are minute and deeply cleft at the top. Under the cleft they bear a few (1-3) fine denticulations. There may perhaps be as many as 5 denticulations, but they are hardly visible.

In most points this specimen corresponds exactly with von Ihering's description of *C. gracilis*, but the three yellow lines on the back are replaced, according to Mr. Crossland's description, by one long “zigzag line” of white and yellow.

DORIDOPSISIDÆ.

This family is divided by Bergh into the genera *Doridopsis* and *Doriopsilla*. The former is numerous in species, and its known distribution is much the same as that of *Chromodoris*. It is abundant in the tropical Indo-Pacific, and the animals are often large and



brightly coloured. Five species are recorded from the Mediterranean and Atlantic, and immature specimens of one of them (*D. grandiflora*) have now been found in the Cape Verd Islands.

*Doriopsilla* is distinguished by its harder consistency, but especially by having the buccal ganglia close behind the pedal ganglia, and not some distance further back, as in *Doridopsis*. Bergh thinks this indicates that the conformation of the anterior digestive tract is not really the same in the two genera. Five species have been referred to *Doriopsilla*.

1. *D. areolata*, Bergh. Atlantic; Mediterranean.
2. *D. (?) granulosa* (Pse.). Sandwich Islands.
3. *D. pallida*, Bergh. Siam.
4. *D. Pelseneeri*, Oliveira. S. Portugal.
5. *D. (?) laevis*, Bergh. Malay Archipelago.

DORIDOPSIS GRANDIFLORA, juv. (Rapp).

*Doridopsis grandiflora* (Rapp): Von Ihering, Mal. Blätt., 1880, vol. ii, p. 104; Bergh, Jahrbüch. deutsch. malak. Gesell., 1880, vol. vii, p. 310, pl. x, fig. 8; pl. xi, fig. 2.

The notes on the living animals are as follows:—

“Two specimens found together under a stone, Porto Praya.

“Rather narrow in shape. Perfectly soft and smooth, with a conspicuously delicate mantle, fairly wide, always much waved in outline and mobile, translucent and marked by colourless lines radiating from the visceral mass. Ground colour yellow in one specimen, pinkish yellow in another. On the visceral mass this is plentifully besprinkled with dark grey blotches and a few smaller ones of dark red brown. 8 large delicate tripinnate gills tipped with white, as also are the rhinophores. Gills are not covered when retracted, and the edge of the gill-pocket is thick and low. Rhinophore-pocket has raised edge closely fitting to the rhinophore.”

The preserved specimens agree fairly well with Mr. Crossland's notes, but are much contracted and bent, the head-parts, in particular, being greatly distorted. The largest is about 10 mm. long, 9 mm. broad, and 8 mm. high. The skin is smooth, soft, and without a trace of tubercles or prominences.

The intestines are yellow, and the liver deeply cleft behind. The digestive organs and nervous system as usual in the genus. The œsophagus is considerably twisted, and forms a complete loop. In spite of a careful examination, the usual armature of hooks on the glans penis could not be found with certainty in either specimen, though there seemed to be some minute rods or scales in the lower part of the vas deferens.

This is probably a young specimen of *D. grandiflora*, which, when adult, is as much as 9 centimetres long. The best external character of the species is afforded by the lines radiating from the visceral mass to the border, as mentioned by Mr. Crossland. It is possible that the armature of hooks on the glans penis is only developed in the older specimens.

## DORIOPSILLA PELSENEERI (?), AREOLATA (?).

(See Oliveira, "Opisthobranches de Portugal," Coimbra, 1895, p. 12; Bergh, Jahrbüch. deutsch. malak. Gesell., 1880, vol. vii, p. 316; id., Zool. Jahrb. Syst., vol. ix (1896), p. 454; Vayssière, Expéd. scient. "Travailleur" et "Talisman," 1902, p. 235; id., Ann. Mus. Marseille, 1901, vol. vi, p. 50, pl. vii, figs. 8-10.)

Mr. Crossland's notes on the living animal are as follows:—

"From a tidal pool, well above the low tide level. The slug exposes itself to the sun. Very flat in shape, with ample mantle. Rather rough and stiff to the touch, but not remarkably so. Back warty. Gills 3, tripinnate. They often appear to be rather small, but can be expanded to a very ample size. Edges of the gill and rhinophore-pocket distinctly raised, especially the latter.

"In crawling, the foot just visible behind the mantle.

"Colour brilliant yellow, but the four specimens vary in the depth of their colour, according to their size. The smallest has a mere tinge of light yellow, but the gills, and especially the rhinophores, are distinctly yellow. The largest is a very deep yellow, and the rhinophores are almost brown. Some of the warts are sand-coloured. Under side rather lighter in colour. Foot very broad. The heart can be seen pulsating, and the gills move in time with it. In the largest specimen there are five gills. Mantle-margin wavy."

The largest of the preserved specimens is about 20 mm. long, 12 mm. broad, and 5 high. The external characters are as described. The back is covered with tubercles, but they are flatter and less noticeable in the centre. This, however, may be due to accidental external pressure. The mantle-edge is ample and thin, with an internal reticulate pattern, which can be seen from the under side. It is formed of spicules arranged in bundles, which anastomose, and are so distinct that they actually project as ridges. Many of the spicules have a prominence on one side, and are sometimes almost Y-shaped. The whole arrangement resembles that found in the Californian *Doridopsis reticulata*. The foot is broad, with expanded margins; it is rounded before and behind, but no anterior groove is visible. The branchiæ are five in the largest specimen. Two small and indistinct lobes above the mouth seem to represent the oral tentacles.

The digestive tract is much as described by Vayssière for *D. areolata*. The tube which issues from the buccal cone is bent on itself and describes a complete circle; it then passes through the nerve collar, runs backwards, and, after becoming very thin and constricted for a short space, dilates into a small round pouch. It is ringed or striated transversely for its whole length. The round pouch is succeeded by another constriction and a sausage-like dilatation.

The glans penis is armed with hooks. They have rather broad bases, and are of irregular and sometimes rather wavy outline.

The central nervous system is enclosed in a hard capsule. The ganglia are more distinct than is usual in the *Doridopsidæ*, but lie close together so that the commissures are short or absent. The eyes

are sessile. The olfactory nerve is long and the distal olfactory ganglion distinct. Close behind the pedal ganglia lie the buccal ganglia, which touch one another as in Bergh's figure.

These specimens have most of the characters of *D. areolata*, Bergh, and in particular agree very nearly with Vayssière's description of the specimens obtained by the "Talisman." But the reticulation on the back between the tubercles, noticed by all previous authors, is not visible in the preserved specimens or mentioned by Mr. Crossland. Possibly they are the *Doriopsilla Pelseneeri* of Oliveira (l.c.), which is said to resemble *D. areolata*, but to have no reticulations and to be red or yellow in colour. But it is also said to be very convex, and to bear large tubercles of varying size on the back. It may be that these specimens, the typical *D. areolata* and *D. Pelseneeri*, are all varieties of one species, which must be called *D. areolata*. The animal's habit of exposing itself to the sun is remarkable.

In any case, it is clear that closely allied forms of *Doriopsilla* are widely spread in the Western Atlantic and the Mediterranean.

#### PLOCAMOPHERUS, F. S. Leuckart.

(See Bergh: Semper's Reisen, Heft xi, pp. 431-439, and Heft xvii, pp. 949-959.)

The genera *Plocamopherus* and *Euplocamus* form a small but distinct group of the Polyceridæ. Externally they are characterized by their flat, ridge-like oral tentacles, and by having branched processes on the oral veil, dorsal margin, and sometimes on the sides of the body. Internally both the buccal parts and the genitalia are distinctive. Mandibular plates are present. The rhachis of the radula is bare and very wide; some (3-11) of the inner teeth are large and hamate, or spoon-shaped; the remainder are flat plates. There is a large and remarkable dendritic prostate which envelops the spermatheca.

*Plocamopherus* is distinguished from *Euplocamus* chiefly by having a large frontal veil and a large crest on the tail. These developments no doubt assist the animal to swim, and mean that it is specially modified for an active life. Some of the species (especially *P. Tilesii*) have a broad laminated groove in the front part of the foot, which perhaps enables them to cling at this point, while the body floats freely. The species described are: (1) *P. ocellatus*, Leuckart; (2) *P. Maderæ* (Lowe); (3) *P. Tilesii*, Bergh; (4) *P. Ceylonicus*, Kelaart (perhaps = *P. navatus*, Abr.); (5) *P. imperialis*, Angas; (6) *P. Amboinensis*, Bergh; (7) *P. indicus*, Bergh; (8) *P. insignis*, E. A. Smith; (9) *P. levivarius*, Abr.

*P. (Histiophorus) maculatus*, Pse., and *P. (Polycera) ramulosus*, Stimpson, are more doubtful forms. The species are fairly well distinguished both by the number and character of the dorsal appendages and by the number and shape of the teeth. All are recorded from the Pacific only, with the exception of *P. Maderæ* from the Atlantic and *P. levivarius* of unknown habitat.

The type species is *P. ocellatus* from the Red Sea, whose external features were briefly described by Leuckart. I have examined some specimens of this form brought by Mr. Crossland from Suakim, and

find that, in internal as well as external characters, they agree with the other members of the genus. The body is chocolate colour, with yellow ocelli; the dorsal margin bears three pairs of processes which show little sign of ramification, but those on the oral veil are said to have been branched in life, and the crest on the tail was a great fleshy hump. The formula of the radula is  $21 \times 9$  (or  $10$ )  $+ 3 \cdot 0 \cdot 3 + 9$  (or  $10$ ). The rhachis is very wide and divided into areas by transverse divisions. The characteristic reticulate prostate is well developed.

Probably all the species can swim. This is specially recorded of *P. Maderæ*, *P. Ceylonicus*, and *P. maculatus*.

*PLUCAMOPHERUS MADERÆ* (Lowe). Pl. XIV, Figs. 8, 9.

*Peplidia Maderæ*, Lowe: Proc. Zool. Soc., 1842, p. 51.

Mr. Crossland's notes on the living animal are as follows:—

“Two specimens from the bottom of a large rowing boat which was covered with Hydroids and Polyzoa. Larger specimens about  $2\frac{1}{2}$  inches long, of a high, narrow shape. Foot narrow, but can adhere strongly. Tail especially high, and has a kind of crest along the top. Gills can be counted as either 5 or 3; tripinnate. Finest branches nearly colourless; very mobile and contractile, but not retractile into a pocket. Body bears three pairs of branched sand-coloured processes, about  $\frac{1}{3}$  inch long; branches very small, pointed, and with bright yellow tips (this colouration only visible under a lens). Laterally there are a few scattered papillæ of the same kind, but smaller. The dorsal ones are placed thus: 1st pair one-third distance between rhinophores and gills, 2nd pair  $\frac{1}{4}$  inch anterior to gills, 3rd, which bear a few small branches,  $\frac{1}{4}$  inch behind gills. Rhinophores perfoliated and retractile (though not readily so) into pockets, the tips of which stand up to form a tube, so that only the perfoliate part of the rhinophore is ever visible. Just postero-laterally to the rhinophores commences a peculiar membranous expansion of the head. This membrane is undulated at the margin, and bears a row of branched projections like tassels. These are tipped with bright yellow, and in this, as in their form, they resemble a further development of the branches of the dorsal papillæ. The apparatus is mobile and sensitive to touch. The colour of the animal is a red orange, almost vermilion. Under the lens this does not appear homogeneous, but as a yellow orange ground colour with dark red specks, and larger spots of vermilion. The colour is deepest dorsally. The margins of the root, which are spread out as an adherent membrane over the substratum, are colourless, with yellow spots and darker specks of brown. The body is very soft and translucent. The small specimen was very much paler and yellower in colour, the dorsal papillæ being bright yellow, as were the tassels of the head-membrane and the ridge of the tail. The big specimen was directly placed in a mixture of alcohol and formol, and contracted very much. The smaller, killed in glacial acetic acid, is comparatively little changed, but the head-membrane is no longer distinct as such. In life it projected freely for at least a  $\frac{1}{4}$  inch in the big specimen.

"Two small specimens were obtained later, from one to five fathoms at some distance off the shore."

The preserved specimens are of a uniform greenish grey. The largest is 24 mm long, and 12 mm. high at the highest point. The breadth is about 9 mm. across the oral veil, and 7.5 across the back. The oral veil is semicircular, and bears on its margin numerous small processes. Fifteen of them are rather larger than the rest and bear minute branches or knobs. Over the mouth are two ridge-like tentacular folds, about 3.5 mm long. The dorsal margin bears three appendages on either side: two pairs between the rhinophores and branchiæ, and one just behind the branchiæ. They show traces of short ramifications and yellow pigment. Below, on the sides of the body, are the remains of a number of smaller lateral processes, which have become somewhat obliterated. On the left side, where they are best preserved, twelve can be made out, apparently arranged in two lines. The rhinophore-sheaths are connected with the oral veil. They are not very high, and have smooth edges. The caudal crest is raised about 2 mm. above the main mass of the tail. As preserved, its edge is smooth. The branchiæ are tripinnate, with a strong rhachis. They can be counted as either 3 or 5. The anterior plume is separate, but the two posterior plumes on either side are connected at the base. The foot is narrow, and a laminated groove is not visible in any of the specimens.

The smaller specimens are only about 12 mm. long, but seem to have preserved their shape better. The processes on the oral veil, dorsal margin, and sides are more distinct, and relatively larger. There are also a few processes on the caudal crest. But it would appear that the animals cannot have been very ramose in life: not, for instance, like *P. Ceylonicus*.

There is a labial armature of two reddish triangular plates, composed of small thickly packed thread-like rods. The radula (Fig. 8) consists of 15 rows which have a formula of  $10 + 4 . 0 . 10 + 4$ . The rhachis is remarkably wide, and divided by transverse lines connecting the rows on either side. The four inner teeth of each row are hamate and somewhat spoon-shaped (Fig. 9). The base is large, and in the innermost tooth so strongly developed that the tooth appears bifid, or produces an illusion of being two teeth. The ten outer teeth are plate-like, and occasionally an eleventh rudimentary tooth is present.

The œsophagus is short, and enters almost immediately the fairly large stomach, which lies in an anterior cleft of the liver, but is not enclosed in the liver. The intestine is fairly long. The buccal mass, œsophagus, and intestine are greenish, the stomach brown. The liver is long, and extends into the tail. It is divided by a cleft into an anterior and posterior portion. Internally it is of a deep chocolate brown. Externally it is lighter, being covered by a white layer of the hermaphrodite gland.

The blood-gland is white and not conspicuous. The central nervous system is white and of a fair size. The cerebro-pleural ganglia touch one another behind, but diverge somewhat in front. The cerebral and pleural portions are not distinctly divided, but the posterior half

shows indications of being a round body fused with a less regular and somewhat oblong body in front. The pedal ganglia are roundish. The eyes are large and black. From the indistinct proximal olfactory ganglia runs a longish and thick connective to the rather large distal olfactory ganglia.

The vas deferens is strong, thick, and convoluted. Into it opens at some distance from its termination the whitish flocculent ramoso prostate, which is also spread over the spermatheca. The spermatheca is very large and globular, greenish, but filled with brown matter. The spermatocyst is small and pear-shaped. The termination of the female branch is very thin. The penis is exerted. The external organs consist of folds of skin and a curved cylindrical tube, nearly 5 mm. long if straightened out. The glans bears hamate spines somewhat resembling the teeth of Dorids, set in numerous regular rows.

This animal is, I think, clearly Lowe's *Plocamopherus* (*Peplidia*) *Maderæ*. He mentions that it swims like the larva of a gnat, and is brilliantly phosphorescent.

DOTO OBSCURA, n.sp. Pl. XIV, Fig. 10.

Five specimens described as coming from washings of seaweed and Pennaria. The notes on the living animals say that the colour as a whole was reddish brown in the small specimens and black or dark grey in the larger. The body was of a very dark grey, almost black, but the shade varied, forming a mottled pattern. The cerata were thick, of a red-brown colour, the tubercles black, or, in small specimens, dark grey. The rhinophore-sheaths were large, with anteriorly expanded rims, the lip being very mobile.

In the alcoholic specimens the body is mottled purplish black, with lighter markings. The cerata are yellowish, with large purplish black spots at the end of the tubercles. The foot is yellowish.

The largest specimen is 7 mm. long, and 4 broad across the cerata. There are seven pairs of cerata, of which even the last bear tubercles, and are not mere warts. Their form is rather irregular; the terminal tubercle is generally remarkably well developed, but sometimes atrophied. As a rule the tubercles are set in four rows—4 (rarely 5) in the topmost row, 5-6 in the middle rows, 4-5 in the two lowest. The tubercles on the inner side of the cerata are often imperfectly developed. The dimensions of the largest cerata are  $3 \times 1.5$  or  $3 \times 2.5$  mm.

The yellow and conspicuous anal papilla is on the right-hand side between the first and second cerata, but further inwards. The genital orifices are under the first of the cerata, on the right-hand side. The rhinophores are white; their sheaths are black, and have the anterior margin expanded and prolonged (Fig. 10). In front of each of the sheaths is a tubercle. The oral veil is rounded, fairly ample, entire, with a yellowish rim.

The jaws are very thin and membranous. The radula consists of a single series of 72 teeth, fairly broad, with a moderately high central cusp and two or three not very distinct lateral denticles. The intestines are yellowish.

It is with considerable hesitation that I create a new species for this form. The important differences in the genus *Doto* are small, and the species are very variable. Still, the five specimens collected by Mr. Crossland all agree in having a distinctive coloration, and a remarkable shape of the rhinophore-sheaths, which is perhaps constant. They present some resemblances to *Doto Africana*, Eliot, and *Doto splendida*, Trinchese. But it is *primâ facie* not likely that the species found on the east and west coasts of the African continent are identical, and Bergh suggests that *Doto splendida* is the same as *D. pinnatifida*. I do not think that this species is the same as *Doto pinnatifida*, for the skin is smooth, whereas in *D. pinnatifida* it bears small tubercles on the back and sides.

DOTO CINEREA, Trinch.

*Doto cinerea*, Trinchese: *Æolid.* Porto di Genova, pt. ii, p. 92, pl. lv, fig. 1; Vayssière, *Ann. Mus. Marseille*, vol. iii, No. 4, p. 102, pl. ii, figs. 5-5b (1888).

Two specimens from Porto Praya, Cape Verd Islands, found on *Sertularia*.

The notes on the living animals say they were narrow and elongate, square-cut in front, and tapering behind. The larger specimen had four symmetrical pairs of cerata; the smaller, five irregular sets. These consisted of (1) a regular pair, (2) a pair consisting of a large cera on the right and a small one on the left, (3) similar to the last pair, but the large one on the left and the small one on the right, (4) one only on left, (5) one median. The colour was dull dirty yellow, covered with irregular blotches of black, especially in the mid-dorsal area. The edges of the velum and of the rhinophore-sheaths bore clear, opaque white dots. Liver branches drab yellow. The tubercles on the cerata were blue and black in the smaller specimen, bluish-white in the larger.

The preserved specimens answer to this description. The largest is 4 mm. long, and its largest cerata 1 mm. high. The tubercles on the cerata are rather elongate and irregularly arranged. In the larger specimen their tips are white, with a dark band below this white part. The rhinophore-sheaths are rather long, with slightly crenulate edges. The general colour of the animals is yellowish, with numerous blackish or brown spots, which are particularly thick down the centre of the back. The foot and the rims of the rhinophore-sheaths are yellow. The foot is broad. The buccal parts are as described by Vayssière. The teeth have two or three irregular and indistinct denticles at the sides of the median cusp.

This appears to be the *D. cinerea* of Trinchese, recorded from Genoa and Marseilles. As these specimens seem rather darker than those previously described, they may perhaps be called var. *nigromaculata*.

SPURILLA NEAPOLITANA (Delle Chiaje).

*Spurilla neapolitana* (Delle Chiaje), Bergh: *Verhandl. zool.-botan.* Wien, 1882, vol. xxxii, p. 13, pl. i, figs. 10-21; Vayssière, *Ann. Mus. Marseille*, vol. iii, No. 4, p. 112, pl. v, figs. 71-79 (1888).

Mr. Crossland describes specimens, which probably belong to this species, under two headings, here called A and B, adding that the two sets are very much alike but differ in details of coloration.

A. "When crawling almost vermiform, foot tapering, but no tail. Tentacles longer than rhinophores. Rhinophores short and perfoliate; yellowish white; in one specimen a little yellow colour basally. Foot expanded and grooved in front, but not drawn out. Ample margins laterally. Cerata regularly tapering and curved; set in rather oblique transverse rows. Ten rows in all, but, seen from the side, the cerata spread out fan fashion. Body and appendages sprinkled with white specks; transparent, so that pink organs in body and slender brown liver diverticula show through. A little pink colour about mouth. Collected under a stone and from bottom of lighter."

B. "Under a stone from the shore. Tentacles and rhinophores about the same length. Latter with about 10 distinct perfoliations. Body slender, cerata long. Foot narrow, dilated and grooved in front, but corners not at all drawn out. Cerata in six transverse rows. The largest cerata are the median ones of the third set. Formula of arrangement:—

3	3	}	close together.
3	3		
5	5		
4	4		
2	2		
1	1		

Body largely colourless and translucent. Large light lilac patch on head between tentacles and rhinophores. Light tint of same on distal half of tentacles. Distal half of rhinophores yellow. Row of large yellowish white blotches along back. A pair of orange yellow streaks on the head. Liver light brown.

"The animal is very active."

The largest specimen belongs to set A. It is not much more than 12 mm. long, but somewhat bent, and about 4.5 broad. The smaller specimens are more slender in proportion. As a rule the cerata are set in about six groups, but, in the largest, only four are distinct, the remaining cerata being crowded together on the tail. The first, third, and fifth rows, generally, are inclined somewhat towards the head, the second, fourth, and sixth, somewhat towards the tail, but the cerata do not seem to be arranged in definite horseshoes, as in some forms. The rhinophores and tentacles are both short, the former strongly perforate. The anal papilla is situated on the side, behind the second row of cerata. The genital orifice lies in front of it, under the first row. The foot is rounded in front.

The pale yellow buccal mass is somewhat flattened and compressed. The jaws bear fine but rather irregular denticles on the edges. There is some discrepancy in the statements of previous authors as to the presence or absence of these denticles. It is probable that the edge of the jaw is originally denticulate, but becomes worn smooth with age. The radula consists of 14 pectiniform teeth. They are not bilobed, but



there is always one low denticle in the middle which divides them into two halves. On either side of this median denticle are 30-45 longer ones. They are fairly regular and straight.

No essential differences could be found between these specimens and those marked B. The latter are smaller (the largest 5 mm. long and 3 broad), but have larger and more inflated cerata. The radula of the specimen dissected consisted of 11 teeth, which had somewhat fewer denticles on each side (25-30), and were perhaps bent into a somewhat narrower arch.

All the specimens of both sets are white, as preserved, and I think all can be referred to *Spurilla neapolitana*. They are probably immature, for the species attains a length of about 4 cm. in the Mediterranean, and, this being so, one cannot be sure that they represent distinct colour varieties in the adult. It would appear from Vayssière's figure of one of the cerata (l.c., 9a), that they are covered with minute, white dots, as in these specimens.

AMPHORINA PALLIDA, n.sp. Pl. XIV, Fig. 11.

Only one specimen preserved. Mr. Crossland's notes are as follows:—  
"Æolid. 26/7/04.

"On a stone which was coated with *Spirorbis*. In these surroundings, not visible to the naked eye, but this probably an accidental circumstance.

"Elongated, but foot is as broad as the ventral surface. No pedal tentacles. Oral tentacles rather thick and blunt, about half as long as the rhinophores. Latter not perfoliated and (like the cerata) blunt and thick at the tip. Whole dorsal surface and its appendages snowed over with pure white pigment, the brown liver only showing at the narrowed bases of the cerata. There is, besides, a pair of clear areas above the eyes, postero-laterally to the rhinophores. Ring composed of bright orange-red dots, half way up the rhinophores, and the oral tentacles have a similar colour, less definitely arranged. Foot ends in a long slender transparent tail. Cerata in four sets, of which the third is the largest and contains the longest cerata. Each set consists of but two cerata. The first pair have three or four red specks anteriorly."

The preserved specimen is white, 3.5 mm. long, and stoutly built. There are only two cerata in each of the four rows. They are inflated, and the largest are about 1.5 mm. high. The other external characters correspond with the description of the living animal.

The jaws are very thin, and hardly visible. I could not make out any denticles on the masticatory edge. The radula consists of a single row of about 80 teeth. As in *Amphorina cœrulea* (see Vayssière, l.c.), the teeth are of different sizes, about 35 being large and 45 small. They are of the horseshoe shape, but somewhat asymmetrical. They bear a strong median denticle, which rises rather far back, and three lateral denticles only, on each side (Fig. 11).

No stylet or chitinous tube could be discovered on the penis, but its absence cannot be regarded as certain.

This specimen is perhaps immature, but it seems to be sufficiently

characterized by its pale coloration, by having only two cerata in each row, and by the small number of lateral denticulations on the teeth.

PHIDIANA LONGICIRRHA, n.sp. Pl. XIV, Fig. 12.

One specimen. Mr. Crossland's notes on the living animals are as follows:—

“Crawled out of stones dredged in shallow water off the north shore, Porto Grande. Body narrow, and foot pointed behind, but not forming a tail. Translucent white, with a few collections of white specks. Foot with expanded angles in front, but not tentaculiform, grooved, but groove widely open above to the mouth. Oral tentacles conspicuously long, and generally hooked back at the tips, but, on the whole, carried at right angles to the body. Rhinophores much shorter, but still long, brownish yellow in colour, perfoliated almost to the bases. Fairly conspicuous eyes just behind. The colourless liver diverticula all well seen, and behind is the heart beating. In the cerata the liver becomes darker in colour, but slender and drab brown, forming a thread of black distally.

“The median cerata are long and tapering, and the ends are carried bent over downwards; they are very mobile, and, probably in connection with this, are delicately ringed. They have a considerable amount of yellow pigment in the skin as well as in the liver diverticula; also some whitish specks.

“Their arrangement is in two sets as follows:—The back is bare in the middle, and the cerata are arranged in two sets, in a longitudinal band on each side. The first set begins just behind the rhinophores, with some laterally placed, small, straight cerata. The row is three or four deep further back, containing three of the long curved cerata in a longitudinal row in the middle, shorter nearly straight ones laterally, and very small quite straight ones outside. After a distinct bare space, a similar arrangement is repeated, but the longest cerata are shorter, and there are only two on each side. After this are small scattered cerata to within a short distance from the tip of the tail.

“The arrangement might also be described as sets of obliquely placed, transverse lines, becoming quite transverse in the second set. But there are no projections of the body to support the cerata.

“Another specimen from *Alcyonium*.”

Only one of the specimens preserved really belongs to this species, the others being *Spurilla neapolitana*, which have found their way into the bottle by mistake.

The single specimen agrees with the description as far as the characters can still be recognized. It is 9 mm. long and 3 broad, somewhat compressed laterally. The cerata are arranged as described, and still show traces of annulation (Fig. 12). The longest measure 6 mm., and are very thin; the outermost are mere tubercles. The liver-diverticula within them have a very irregular outline, and sometimes appear twisted. The cnido-sacs are large. The oral tentacles are stout and strong. The anterior end of the foot is rounded, as preserved, and the angles are not visible.

The jaws bear a single row of large distinct denticles. The radula is uniseriate, and consists of 22 teeth, which have a strong central cusp and 4-5 long, distinct, clear-cut lateral denticles. The denticles do not extend up the sides of the cusp.

No spine or hook was found on the verge.

This animal does not seem referable to any described species of *Æolid*, and the long annulated cerata form a remarkable character which will probably render its recognition easy. I refer it somewhat doubtfully to *Phidiana*, though it does not seem to possess the armature on the male genitalia which Bergh considers characteristic of the genus.

#### FACELINA DRUMMONDI (Thompson).

*Eolis Drummondi*, Thompson: Alder & Hancock, Brit. Nudibranch. Moll., Fam. 3, pl. xiii.

*Facelina Drummondi*, Bergh: Verhandl. zool.-botan. Wien, 1874, vol. xxiv, p. 400.

Four specimens. Mr. Crossland's notes on the first two are as follows:—

“*Æolids*, from the bottom of a big rowing boat.

“The larger specimen rather less than 1 inch long; proportionately broad, but tapering posteriorly. Body translucent, cream colour, with a few whitish opaque markings. Cerata rather small, of uniform thickness, coloured drab brown by liver, but end sac is transparent and colourless. The parts around the mouth, the penis (protruded in several), and the anterior groove of the foot, are pink. At the neck a crimson organ shows through. Two small black eyes. Rhinophores bright orange at base, dying out to light yellow in the deeply perfoliated part. Anterior tentacles long and mobile. The shorter rhinophores stand stiff and upright some little distance behind. Foot has a groove and notch, angles drawn out, but hardly tentacle-like. Sides of foot form delicate membranes, tail long and slender. This appears to be damaged more or less, or broken off in all but one specimen.

“Cerata arranged in groups on laterally placed swellings of body-wall.

“One specimen had five groups containing 11 . 9 . 8 . 6 . 6 cerata respectively, but some were lost posteriorly, and in any case were very small.”

Of the other two specimens he writes:—

“Porto Praya. Under a stone with Polyzoa. Cerata very dark drab brown, then dark red just below the whitish end sac. In one specimen the liver is much redder than in the other.”

The preserved specimens correspond with these descriptions as far as the characters are still recognizable, but are somewhat thicker and stouter, doubtless owing to contraction, the largest being 8 mm. long and 3.5 wide. The cerata are small and bent, the largest 2 mm. long, the smaller minute. They are very caducous, and appear to be set in curved lines on slight prominences. The rhinophores are thick, with deep perfoliations; the tentacles also thick and of moderate

length. The anterior angles of the foot are produced into straight, stout processes.

The jaws are white and thin, with a single row of large irregular denticles. The radula consists of a single series of 16-18 white teeth, of horseshoe shape, with 7-8 lateral denticles extending up the sides of the central cusp. The bases of these denticles overlap, which gives the impression that there is a row of small secondary denticles below the main projections. This, however, is not, as a rule, really the case, though such secondary denticles do occur, but rarely. The penis, of the form usual in the genus, is armed with spines which have thick bases and are not very much bent.

These specimens can, I think, be referred to *F. Drummondii*, which (including the forms registered by Bergh as synonyms) is recorded from Scandinavia to the Mediterranean.

*FAVORINUS CARNEUS?* (Alder & Hancock). Pl. XIV, Figs. 13, 14.

*Eolis carnea*, Alder & Hancock: Brit. Nudibranch. Moll., pt. vii, p. 50, and Appendix, p. ix; Bergh, Verhandl. zool.-botan. Wien, 1875, vol. xxv, p. 641, *Favorinus*; 1883, vol. xxxii, p. 38; Trinchese, *Æolid. del Porto di Genova*, pt. ii, p. 67, *Favorinus*.

Two specimens. Mr. Crossland's notes are as follows:—

"Purple *Æolids*. 2 fathoms, Porto Sal Rei, Boa Vista Island.

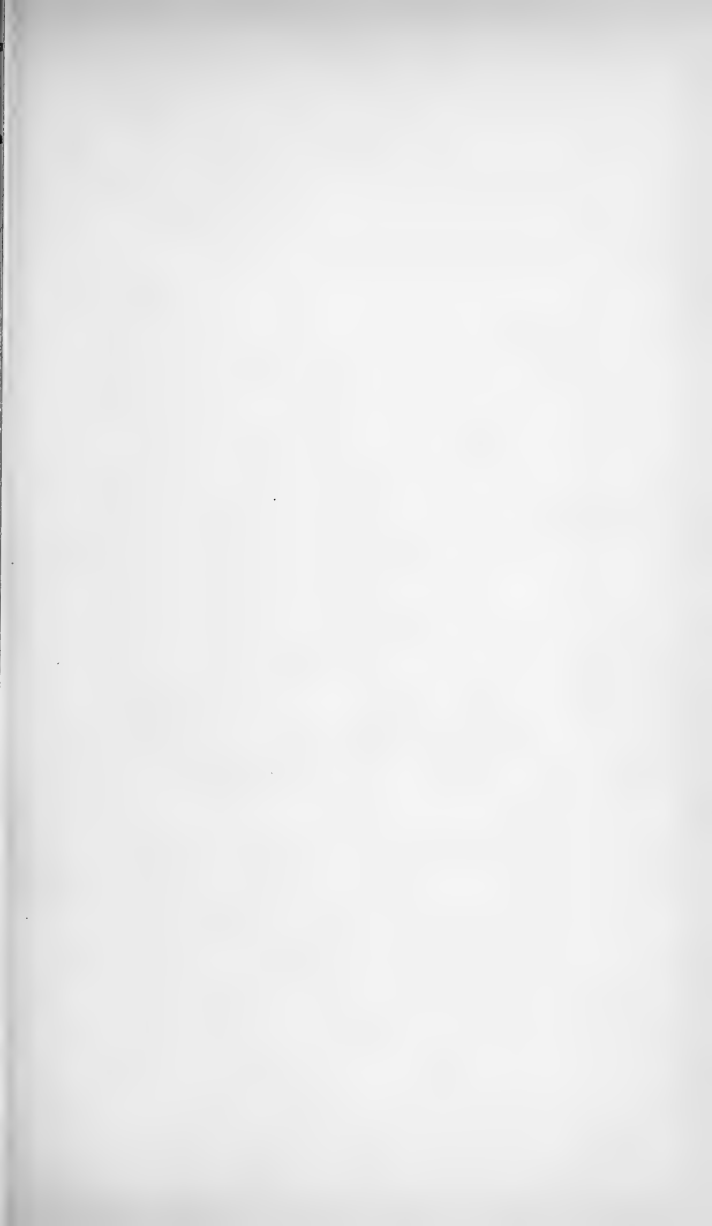
"Cerata of a rather light purple or violet colour; body white. Tentacles long, rhinophores fairly so, and contractile. Foot drawn into short tentacles in front, and into a short tail behind. The cerata are easily lost, e.g. in picking the beasts from the weed on which they were found. Both were found on the same piece of weed, and there seem to have been no hydroids in the vicinity.

"The rhinophores are much longer and more slender than in any species hitherto seen. Length about the same as the oral tentacles, but very contractile, smooth, but with two swellings distally as in the sketch. Both specimens are alike in this. The rhinophores are brown basally, white after the first swelling. There are opaque white specks on the body, a few on the cerata, and a white ring immediately below the base of the latter."

The largest of the preserved specimens is 8 mm. long and 3 broad. Both have lost all their cerata, but, from the marks remaining on the body, it would appear that they were set in four distinct horseshoes, on slight prominences, with a fifth less distinct group, or pair of groups, near the tail. The rhinophores are much contracted, but the peculiar conformation described (Fig. 13) can still be traced. The anterior margin of the foot is drawn out into two short tentaculiform processes.

The jaws bear a row of long filament-like denticles, and, at its base, two or three rows of much smaller denticles. The uniseriate radula consists of 18 quite smooth teeth, as in Trinchese's plates of *Favorinus versicolor* (*Æolid. Porto di Genova*, pt. ii, pl. xxxiii, fig. 1), but somewhat less bent, and with stronger bases (Fig. 14).

This is perhaps the *Eolis carnea* of Alder & Hancock, recorded from Salcombe Bay. It agrees fairly well with their description, in





3.



4.



6a

6b.

6c.



5b



1



7a.

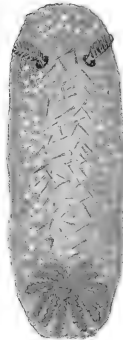
7b.

7c.

7d.

7e.

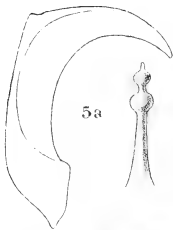
7f.



2



7g



5a

13



a

b



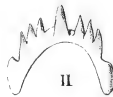
10.



10.



12



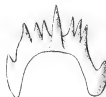
11



14



8.



11.



14.

C.C., C.E., & T. & E. del.

J. Green lith. et imp.

NUDIBRANCHIATA FROM THE CAPE VERD ISLANDS.

colour, dentition, the arrangement of the cerata, and in having the rhinophores and tentacles of the same length. As they observe, the bulbs may disappear in preserved specimens.

Perhaps the species is not really distinct from *F. versicolor*, A. Costa, 1866, but the name *carneus* has priority (1855).

#### FAVORINUS sp.

Mr. Crossland's notes are as follows:—

"Very small, and dead when found, so colour may have been deeper in life. All white, but cerata (liver) creamy, but brighter yellow in places. They are long in proportion to body. Rhinophores smooth, and longer than the oral tentacles. Corners of foot tentaculiform, but not very long. Eyes very distinct. Foot tapers behind, but is not a long tail.

"Among weed, 1 fathom."

The specimen is very badly preserved, greenish grey, and much compressed and flattened. It is 4 mm. in length. The cerata are long (2-2.5 mm.), thin, and apparently only 2-3 in each row, but the arrangement cannot be determined with certainty. The rhinophores are rather thick at the tips, but no bulb is visible, and it is not mentioned by Mr. Crossland. The teeth and jaws are much as in Trinchese's plates of *F. versicolor* (Æolid. Porto di Genova, pt. ii, pl. xxxiii). The radula consists of 16 thin teeth, showing no trace of denticulation.

#### EXPLANATION OF PLATE XIV.

- FIG.
1. *Tritonia mæsta*, Bergh, var. *pallescens*, n. var.
  2. *Staurodoris atypica*, n. sp.
  3. Labial armature of *Discodoris* sp.
  4. *Geitodoris reticulata*, n. sp. Branchiæ and part of back.
  - 5a. " " Tooth from near middle of half row.
  - 5b. " " End of row.
  - 6a-c. *Rostanga Evansi*, n. sp. a, tooth from near middle of row; b, from the bundle at end of row; c, one of the two or three outermost teeth.
  - 7a-f. *Cadlina Claræ*, von Ihering, juv. a, median tooth; b, first lateral; c-f, second to fifth lateral; g, lateral from middle of half row.
  8. *Plocamopherus Maderæ* (Lowe). Radula.
  - 9a-b. " " a, first tooth; b, fourth tooth.
  10. *Doto obscura*, n. sp. " Rhinophore sheaths in living animal.
  11. *Amphorina pallida*, n. sp. Teeth of radula.
  12. *Phidiana longicircha*, n. sp. One of the longer cerata in the living animal.
  13. *Favorinus carneus* (A. & H.). Rhinophore.
  14. " " Teeth of radula.

The figures are from drawings by C. Crossland, T. J. Evans, and C. Eliot.

NOTES ON INDIAN AND CEYLONESE SPECIES OF *GLESSULA*.

By Colonel R. H. BEDDOME, F.L.S.

Read 11th May, 1906.

## PLATE XV.

HAVING collected the subgenus *Glessula* very largely throughout South India (its headquarters) and Ceylon, and having recently compared my collection with the types in the late Dr. W. T. Blanford's collection, now bequeathed to the Natural History Museum, and with the Benson types in the Cambridge Museum, and the species in the Natural History Museum, I have drawn up the following notes which I think may be of interest to conchologists and aid towards a monograph.

It is an exceedingly difficult group, the species running very much one into another, and there are not many distinctive characters to lay hold of. The apical whorls and the sculpture are the chief, but the size of the adult generally, though not always, and the curvature of the columella are of some importance. The truncation of the latter I do not attach much importance to, as it is very similar in all the species. The number of whorls differs in individuals, but always within certain limits.

The earlier species were described as *Achatina*, *A. nitens* of Gray being the first in 1825. Pfeiffer described about 12, Benson 28, and Blanford 18, and a few have been described by Hanley, Lieut.-Col. Godwin-Austen, and G. Nevill, one each by H. Adams, Möllendorff, and Jousseume, and one from Ceylon by Mr. Sykes. The earlier authors probably never had access to each other's types, and I believe too many species have been made.

1. *GLESSULA TENUISPIRA* (Benson).

*Achatina tenuispira*, Benson: Journ. Asiat. Soc. Bengal, vol. v (1835), p. 353.

*Hab.*—Darjiling; Pegu; N. Canara; Khasia and Daffa Hills.

Reeve's figure is from a small or young shell. Full-grown ones collected in the Teesta Valley near Darjiling, and in N. Canara, measure 44 mm. in length, and have 14 whorls.

2. *GLESSULA BACULINA*, Blanford.

*Glessula baculina*, Blanford: Journ. Asiat. Soc. Bengal, vol. xl (1871), pl. ii, fig. 6.

*Hab.*—Khursiang, near Darjiling.

This is, I believe, only a more slender form of *tenuispira*, as I have specimens intermediate in breadth. As to any difference in the columella, some of my specimens of *tenuispira* have the lower part more bent than in any of the supposed *baculina*.

3. *GLESSULA PERTENUIS* (Blanford).

*Achatina pertenuis*, Blanford: Journ. Asiat. Soc. Bengal, vol. xxxiv (1865), p. 79.

*Hab.*—Assam; Arakan; Garo and Naga Hills; Burma.



Blanford's types, and all the specimens I have seen of this, are young shells, with fragile, unformed lips. They fit well with young of *tenuispira*. Blanford himself mentions that there are signs of a passage, and it would certainly not be advisable to consider it a good species without seeing specimens with adult lip.

#### 4. GLESSULA SHIPLAYI (Pfeiffer).

*Achatina Shiplayi*, Pfr.: Mon. Hel., vol. iv, p. 612.

*Hab.*—Nilgiris; Anamallays; Shevaroy's (South India).

Adults up to 36 mm. long, whorls 14. Hanley's figure is from quite a juvenile.

Full-grown specimens were very rarely found by me, though young, half-, and three-quarter grown ones are most abundant on the Nilgiris. This and some other species certainly breed before the shell attains full size or a hardened peristome, as I have taken eggs from such shells. The peristome differs much in mature specimens, sometimes being very thick and solid, sometimes quite thin, but, even then, firm, and not breaking or becoming jagged at the least touch, which is the sign that the shell has not finished its growth. Full-grown examples of *Shiplayi* are very like *tenuispira*, but smaller. It also runs *Nilagirica* very closely, but the latter has a stronger sculpture, and is broader at the base.

#### 5. GLESSULA NILAGIRICA (Benson), Reeve.

*Achatina Nilagirica* (Benson MSS.), Reeve; *Nilagirica*, var. *Kurnoolensis*, Nevill: Journ. Asiat. Soc. Bengal, vol. 1 (1880), p. 136.

The shell I take to be this species is the one described by Nevill. I collected it both on the Nilgiris and Nullaymallays (Kurnool). It is of the same length and has the same number of whorls as *Shiplayi*, and is very like the full-grown shell of that species, only it has a more prominent striation, and is considerably broader towards the base. The young shell is conical from a broad base, the young of *Shiplayi* being much more cylindrical. If Reeve's figure, copied by Nevill, is this species, it must be a small form of it. It is more probably *Perrotteti*.

#### 6. GLESSULA HEBES, Blanford.

*Glessula hebes*, Blanford: Journ. Asiat. Soc. Bengal, vol. xxxix (1870), p. 21, pl. iii, fig. 21.

*Hab.*—Poona; Shevaroy's (Blanford); Pulney Hills and Nilgiris (Nevill).

Ten specimens received from Blanford and Evizard, collected near Poona, are all young, with quite unformed lip; and all the types of *hebes* in Blanford's collection, and the specimens in the Natural History Museum and others that I have seen, are the same. If full-grown, or nearly so, it must be a much smaller species than *Shiplayi*. It runs the young of that species rather closely, but the apex is generally blunter. Specimens collected by me on the Shevaroy's are referred here by Blanford; they are, however, immature, and appear

rather to belong to *Fairbanki*, if that species is distinct, which I doubt. When collected I took them to be young of *Shiplayi*. Until *hebes* and *Fairbanki* are found with mature lips, they must, I think, remain doubtful species.

Hanley's figure of *hebes* has the tapering apex of young *Shiplayi*, and is unlike my types of *hebes*.

7. GLESSULA FAIRBANKI, BENSON.

*Achatina Fairbanki*, Benson: Ann. & Mag. Nat. Hist., vol. xv (1865), p. 14.

*Hab.*—Mahableshwar.

A type-specimen sent me from Mahableshwar by Mr. Fairbank, and a few other examples I have seen in the Benson Collection and elsewhere, are all young shells with unformed lips. It is smaller than *hebes*, but I cannot point out how it differs otherwise.

Hanley's figure well represents my specimen.

8. GLESSULA VADALICA (BENSON).

*Achatina Vadalica*, Benson: Ann. & Mag. Nat. Hist., vol. xv (1865), p. 15.

*Hab.*—Ahmednuggur.

Nearly allied to *Perrotteti*. I have not found it in the Madras Presidency.

9. GLESSULA TAMULICA (BLANFORD).

*Achatina Tamulica*, Blanford: Journ. Asiat. Soc. Bengal, vol. xxx (1861), p. 362.

*Hab.*—Near Trichinopoly.

Blanford's types, my own specimens received from him, and all other specimens that I have seen are not mature, the lip being quite fragile. It is very near *Vadalica*, and has all the appearance of being the young of that species.

10. GLESSULA PERROTTETI (PFEIFFER).

*Achatina Perrotteti*, Pfr.: Mon. Hel., vol. ii, p. 260.

*Hab.*—Nilgiris and Pulney Hills, about the foot of the mountains.

Hanley's figure, Conch. Ind., pl. xxxv, fig. 6, is very good.

11. GLESSULA PRÆLUSTRIS (BENSON).

*Achatina prælustris*, Benson: Ann. & Mag. Nat. Hist., vol. v (1860), p. 462.

*Hab.*—Common in the Orissa and Ganjam districts, east side of the Madras Presidency.

I have never taken it on the western side. My largest specimen measures 40 mm. in length. There is a small variety.

12. GLESSULA HÜGELI (PFEIFFER).

*Achatina Hügelii*, Pfr.: Mon. Hel., vol. ii, p. 259.

*Hab.*—Kashmir.

Near *Vadalica*.

## 13. GLESSULA BURRAILENSIS, G.-Austen.

*Glessula Burrailensis*, G.-Aust.: Journ. Asiat. Soc. Bengal, vol. xliv (1875), p. 3, pl. i, fig. 6.

*Hab.*—East Burrail range, 7,000 feet.

## 14. GLESSULA BUTLERI, G.-Austen.

*Glessula Butleri*, G.-Aust.: Journ. Asiat. Soc. Bengal, vol. xliv (1875), p. 4, pl. i, fig. 7.

*Hab.*—East Burrail range.

## 15. GLESSULA CHESSONI (Benson).

*Achatina Chessoni*, Benson: Ann. & Mag. Nat. Hist., vol. v (1860), p. 462.

*Hab.*—Mahableshwar; North Canara forests; near Sircee.

## 16. GLESSULA TORNENSIS, Blanford.

*Glessula Tornensis*, Blanf.: Journ. Asiat. Soc. Bengal, vol. xxxix (1870), p. 22, pl. iii, fig. 22.

*Hab.*—Torna Hill, near Poona; Anamallays; Tinnevelly; and Travancore Ghats.

My Travancore specimens were labelled *subtornensis* by Nevill, but I cannot see how they differ. I took a very beautiful, dark chocolate-coloured variety on the Calcad Hills in Tinnevelly.

## 17. GLESSULA TEXTILIS (Blanford).

*Achatina textilis*, Blanf.: Journ. Asiat. Soc. Bengal, 1866, p. 41.

*Hab.*—Anamallay Hills, 6,000 feet; Pulney Hills; Tinnevelly and Travancore Ghats.

Varies in diameter from 10 to 14 mm. I have specimens from the Tinnevelly Ghats in which the textile colouring is reduced to a single narrow band on each of the three lower whorls, or is entirely obsolete. Dr. Blanford has noticed that this species does not differ from *Tornensis*, except in the colouring.

## 18. GLESSULA SENATOR (Hanley).

*Achatina (Glessula) senator*, Hanley: Proc. Zool. Soc., 1875, p. 606; Conch. Ind., pl. clv, fig. 4.

*Hab.*—Peermede Hills, Travancore.

Only differs from the last two species in its beautiful coloration.

## 19. GLESSULA ISIS (Hanley).

*Achatina (Glessula) Isis*, Hanley: Proc. Zool. Soc., 1875, p. 606; Conch. Ind., pl. clv, fig. 5.

*Hab.*—Foot of the Pulney Hills.

Much the colouring of *textilis*, but the shell is very different in form, being elongated and narrow.

## 20. GLESSULA SUBPERROTTETI, n.sp. Pl. XV, Figs. 1, 1a.

Testa ovato-turrita, superne attenuata, nitidissima, leviter plicato-striata, fulvo-cornea; spira turrita, apicem versus obtusiusculum attenuata; sutura impressa, crenulata; anfractus 9, vix convexiusculi,

ultimus  $\frac{2}{3}$  testæ subæquans; apertura semi-ovalis; columella subrecta, albido-callosa, peristomate recto, tenui, marginibus callo albido junctis. Long. 28, diam. 9 mm.; apertura 10 mm. longa, 5 lata.

*Hab.*—Travancore Hills, above Calcad.

Intermediate between *Chessoni*, Bens., and *Perrotteti*, Pfr. The sculpture is much less prominent than in the former.

21. GLESSULA CANARICA, n.sp. Pl. XV, Figs. 4, 4a.

Testa turrato-oblonga, tenuiuscula, spira oblonga, apice obtuso, politissima, purpureo-fusca, distincte et confertim subcostulato-striata, sub lente confertim decussata, sutura impressa, anfractus 9, subplaniusculi, ultimus  $\frac{2}{3}$  longitudinis æquans; apertura verticalis, oblongo-semi-ovalis; peristoma tenue; columella valde arcuata, antice fere verticaliter truncata. Long. 25, diam. 9 mm.; aperture 8 mm. longa, 4 lata.

*Hab.*—South Canara Ghats (Kudra Mukh). Rare.

In its blunt, oblong spire it resembles the large form of *amentum* as figured by Hanley. It is a beautifully sculptured shell.

22. GLESSULA ANAMULLICA (Blanford).

*Achatina Anamullica*, Blanf.: Journ. Asiat. Soc. Bengal, vol. xxxv (1866), p. 37.

*Hab.*—Travancore Hills and Anamallays.

Though a good many of this fine dark chocolate-coloured species were taken, none of them had a firm lip, and though eggs were taken from some of them they are probably not full-grown. It is not very like any one species, the nearest to it being *Perrotteti*.

23. GLESSULA INORNATA (Pfeiffer).

*Achatina inornata*, Pfr.: Mon. Hel., vol. iii, p. 490.

Long. 30, diam. 12 mm.

*Hab.*—Ceylon; South Canara forests.

Var. *minor*. Long. 18–20 mm.

*Hab.*—Ceylon.

24. GLESSULA SUBINORNATA, n.sp. Pl. XV, Figs. 3, 3a.

Testa oblongo-turrata, solida, confertim striata, striis minutissimis obsolete spiralibus decussata, fulva, nitida, apice obtusiusculo, sutura leviter impressa, confertissime crenulata; anfractus 8 planiusculi, ultimus  $\frac{2}{3}$  longitudinis æquans, convexiusculus; spira elongato-turrata; columella arcuata, albo-callosa, oblique abrupte truncata; apertura triangulari-semiovata, intus albida; peristoma simplex, obtusum. Long. 26, diam. 8 mm.; apertura 10 mm. longa, 5 lata.

*Hab.*—Sispara Ghat, on the Nilgiris.

Allied to the Ceylonese *inornata* and *parabilis*. Smaller and narrower than the former; larger and with a more elongated spire than the latter.

Var. *minor*. Long. 21, diam. 7 mm.; apertura 8 mm. longa, 4 lata.

*Hab.*—Brumagherry Hills, Wynad.

Of a pale steel colour, otherwise only differing in size from the

type. Very near *parabilis*, but with a rather longer spire and smaller aperture.

25. GLESSULA BEDDOMEI (Blanford).

*Achatina Beddomei*, Blanf.: Journ. Asiat. Soc. Bengal, vol. xxxv (1866), p. 41.

*Hab.*—Anamallay Hills, 5–7000 feet; Ceylon.

The Ceylon specimens are slightly narrower, but do not otherwise differ.

Var. *pallens*.

*Hab.*—Ceylon.

Only differing from the type in being of a pale straw colour. There are numerous specimens of this in the Nevill Collection purchased by Messrs. Sowerby & Fulton, and a single specimen in the late Dr. Blanford's collection labelled *G. Skinneri*.

This is, I believe, *inornata*, var.  $\beta$ , Pfr., Mon. Hel., vol. iii, p. 490.

26. GLESSULA BOLUMPATTIANA (Bedd.), (Hanley).

*Achatina Bottampotana* (Beddome MSS.), Hanley: Conch. Ind., pl. clvi, fig. 1 (*Bottampotana* in error).

*Hab.*—Bollampatty Hills (5–6000 feet), above Palghat.

The decussation in the sculpture is much more prominent than in any other species. Hanley's figure is good, but does not show the sculpture.

27. GLESSULA CEYLANICA (Pfeiffer).

*Achatina Ceylanica*, Pfr.: Mon. Hel., vol. ii, p. 258.

*Hab.*—Ceylon.

28. GLESSULA PUNCTOGALLANA (Pfeiffer).

*Achatina punctogallana*, Pfr.: Mon. Hel., vol. iii, p. 493.

*Hab.*—Point de Galle, Ceylon.

I cannot distinguish this species satisfactorily from *Ceylanica*, except that the latter is generally larger. Nevill suspected they were one and the same. Pfeiffer says the spire of *punctogallana* is longer, and the last whorl shorter.

There are some very large specimens of *Ceylanica* in the Natural History Museum, much larger than I ever found in Ceylon, 30 mm. long by 14 in diam.

29. GLESSULA NITENS (Gray).

*Achatina nitens*, Gray: Ann. Philos., vol. ix (1825), p. 415.

*Hab.*—Ceylon.

30. GLESSULA PANÆTHA (Benson).

*Achatina panætha*, Bens.: Ann. & Mag. Nat. Hist., vol. v (1860), p. 384.

*Hab.*—Ceylon.

Benson's types of this species in the Cambridge Museum agree exactly with the numerous specimens of *nitens* in the Natural History

Museum, South Kensington. These latter must, I think, include Gray's types, as the Museum possesses his collection.

The four last species are very closely allied, and in my opinion only forms of one variable species. I should not even make varieties of them.

31. GLESSULA SERENA (Benson).

*Achatina serena*, Bens.: Ann. & Mag. Nat. Hist., vol. v (1860), p. 384.

*Hab.*—Ceylon.

Nearly allied to *Ceylanica*.

32. GLESSULA SUBSERENA, n.sp. Pl. XV, Figs. 7, 7a.

Testa ovato-turrita, solidiuscula, politissima, obsolete striatula, fulvo-cornea, pellucida; spira subturrita, apice obtusato; sutura impressa, marginata, crenulata; anfractus 7 planiusculi, ultimus  $\frac{1}{2}$  longitudinis vix æquans; apertura semi-ovalis; columella valde arcuata, albido-callosa, marginibus callo junctis, ad basin abrupta et oblique truncata. Long. 22, diam. 11 mm.; apertura 10 mm. longa, 5 lata.

*Hab.*—Peermede (Travancore) and Anamallays.

The last whorl is longer, and the spire less elevated than in the Ceylonese *serena*, and the whorls, especially the upper ones, are less convex.

33. GLESSULA DESHAYESI (Pfeiffer).

*Achatina Deshayesi*, Pfr.: Mon. Hel., vol. iii, p. 495.

*Hab.*—Ceylon.

Like a very small *nitens* with a shorter spire.

34. GLESSULA PACHYCHEILA (Benson).

*Achatina pachycheila*, Bens.: Ann. & Mag. Nat. Hist., vol. xii, (1853), p. 14.

*Hab.*—Ceylon.

According to Benson's types in the Cambridge Museum, this species is a narrower shell than the last. The two species are, however, closely allied, and often confused in collections.

35. GLESSULA PYRAMIS (Benson).

*Achatina pyramis*, Bens.: Ann. & Mag. Nat. Hist., vol. v (1860), p. 463.

*Hab.*—Khasia Hills.

36. GLESSULA LEPTOSPIRA (Benson).

*Achatina leptospira*, Bens.: Ann. & Mag. Nat. Hist., vol. xv (1865), p. 14.

*Hab.*—Someysur Hills.

37. GLESSULA NOTIGENA (Benson).

*Achatina notigena*, Bens.: Ann. & Mag. Nat. Hist., vol. v (1860), p. 462.

*Hab.*—Mahableshwar and Bombay Ghats; Cherra Poonjee (Sylhet).

All the numerous examples I have seen of this species, except one, are immature and in no way separable from *tenuispira* of the same size. Amongst Benson's five type-specimens there is, however, one which has the lip hardened, and nearly finished off. It is hardly more than a small form of *tenuispira*.

## 38. GLESSULA SARISSA (Benson).

*Achatina sarissa*, Bens.: Ann. & Mag. Nat. Hist., vol. v (1860), p. 463.

*Hab.*—Lower Bengal, banks of the Ganges.

I have a single specimen of a species allied to this from the Bombay Ghats, but it differs in being smoother, having a blunter apex and two whorls less, and in the penultimate and antepenultimate whorls being larger.

## 39. GLESSULA VERUINA (Benson).

*Achatina veruina*, Bens.: Ann. & Mag. Nat. Hist., vol. xii (1853), p. 94.

*Hab.*—Ceylon, at Norlande.

A rare and well-marked species. There is no specimen in the Benson Collection at Cambridge.

## 40. GLESSULA HASTULA (Benson).

*Achatina hastula*, Bens.: Ann. & Mag. Nat. Hist., vol. v (1860), p. 461.

*Hab.*—Darjiling.

## 41. GLESSULA CORROSULA (Pfeiffer).

*Achatina corrosula*, Pfr.: Proc. Zool. Soc., 1856, p. 35; Mon. Hel., vol. iv, p. 612.

*Hab.*—Nilgiris.

## 42. GLESSULA BENSONIANA (Pfeiffer).

*Achatina Bensoniana*, Pfr.: Mon. Hel., vol. iii, p. 494; Nevill, Journ. Asiat. Soc. Bengal, vol. 1, p. 137, pl. v, figs. 16, 16a.

*Hab.*—Nilgiris.

## 43. GLESSULA SUBFUSIFORMIS (Blanford).

*Achatina (Glessula) subfusiformis*, Blanf.: Proc. Zool. Soc., 1869, p. 449; Nevill, Journ. Asiat. Soc. Bengal, vol. 1, p. 138, pl. v, fig. 13.

*Hab.*—Ponsee, in Yunnan, 3,300 feet.

## 44. GLESSULA JEYPORENSIS, n.sp. Pl. XV, Figs. 6, 6a.

Testa oblongo-turrita, tenuis, striatula, nitida, luteo-cornea; spira subturrita, ad apicem obtusa; sutura impressa, crenulata; anfractus 8 subplaniusculi, ultimus  $\frac{2}{3}$  longitudinis fere æquans; columella valde arcuata, ad basim truncata; apertura semi-ovalis; peristoma simplex. Long. 18, diam. 6 mm.; apertura 5 mm. longa, 3 lata.

*Hab.*—Jeypore Hills, east coast of Madras Presidency.

Allied to *Bensoniana*, but with a shorter, blunter spire.

## 45. GLESSULA JERDONI (Benson), (Reeve).

*Achatina Jerdoni*, Benson MSS. : Reeve, Conch. Icon., vol. v, pl. xxi, fig. 80 ; Pfeiffer, Mon. Hel., vol. iii, p. 494.

*Hab.*—Nilgiris ; Anamallays ; Cherra Poonjee.

## 46. GLESSULA SINGHURENSIS, Blanford.

*Glessula Singhurensis*, Blanf. : Journ. Asiat. Soc. Bengal, vol. xxxix (1870), p. 19, pl. iii, fig. 17.

*Hab.*—Singhur, near Poona.

## 47. GLESSULA AMENTUM (Benson), (Reeve).

*Achatina amentum*, Bens. MSS. : Pfr., Mon. Hel., vol. iii, p. 499.

*Hab.*—Orissa and Ganjam.

I found the smaller variety very abundant on the top of the Myhendra Hill (Ganjam). The larger variety, found near Calcutta and in Central India, and well figured by Hanley, is a rare shell. It has a shorter and blunter apex and fewer whorls than *Vadalica*, but specimens of that species sometimes do duty for it in collections.

## 48. GLESSULA FACULA (Benson).

*Achatina facula*, Bens. : Ann. & Mag. Nat. Hist., vol. v (1860), p. 466.

*Hab.*—Nilgiris ; Pulney Hills ; Nullaymallays, Kurnool ; Jeypore Hills, east side of Madras.

Hanley's figure is not good.

## 49. GLESSULA ILLUSTRIS, Godwin-Austen.

*Glessula illustris*, G.-Aust. : Journ. Asiat. Soc. Bengal, vol. xlv (1875), p. 3, pl. i, fig. 5.

*Hab.*—North Cachar Hills, 7,000 feet ; Jaintia Hills, 1,000 feet.

I can distinguish this in no way from the last species (*facula*).

## 50. GLESSULA BOTELLUS (Benson).

*Achatina botellus*, Bens. : Ann. & Mag. Nat. Hist., vol. v (1860), p. 465.

*Hab.*—Nilgiris.

H. Nevill labelled my specimens from the foot of the Nilgiris *botellus*, var. *convexior*, but I do not see how they differ from the type. Hanley's figure (Conch. Ind.) is good.

## 51. GLESSULA OROPHILA (Benson), (Reeve).

*Achatina orophila*, Bens. MSS. : Reeve, Conch. Icon., vol. v, pl. xix, fig. 105.

*Hab.*—Anamallay Hills ; S. Canara ; Golcondah Hills, east side of Madras Presidency.

My Golcondah specimens were labelled by H. Nevill *G. subbrevis*, but I cannot see how they differ. Nevill, I think, only saw young examples. Reeve's figure, copied by Nevill, is good.

## 52. GLESSULA ARTHURII (Benson).

*Achatina Arthuri*, Bens. : Ann. & Mag. Nat. Hist., vol. xiii (1864), p. 209.

*Hab.*—Mahableshwar.

I cannot distinguish this shell from *orophila*, and I think it will have to be a synonym.



## 53. GLESSULA OREAS (Benson), (Reeve).

*Achatina oreas*, Bens. MSS. (not of Pfr.): Nevill, Journ. Asiat. Soc. Bengal, vol. 1 (1881), p. 135, pl. v, fig. 11.

*Hab.*—Tinnevely and Travancore Hills; South Canara Ghats; Nullaymallays, Kurnool.

*G. Paviei*, Morlet (J. de Conch., 1892, p. 321, pl. vii, figs. 4-4b), from Tonkin, is, I fear, a synonym. I cannot distinguish it from the Indian *oreas*.

## 54. GLESSULA PSEUDOREAS (Nevill).

*Stenogyra (Glessula) pseudoreas*, Nev.: Journ. Asiat. Soc. Bengal, vol. v (1881), p. 136; Pfeiffer, Mon. Hel., vol. iii, p. 495, as *oreas*.

*Hab.*—S. Canara Ghats; Nilgiris; Anamallays; Pulney Hills; Tinnevely Hills.

Nevill named the Anamallay and Pulney specimens var. *subdeshayesiana*. I have seen no Nilgiri specimens, but I cannot distinguish any variety amongst my copious specimens from the other hill-forests of South India.

## 55. GLESSULA CRASSILABRIS (Benson).

*Achatina crassilabris*, Bens.: Journ. Asiat. Soc. Bengal, vol. v (1836), p. 353.

*Hab.*—Khasia Hills; Darjiling.

Hanley's figure is good, but scarcely shows the striation, which is prominent.

## 56. GLESSULA OROBIA (Benson).

*Achatina orobia*, Bens.: Ann. & Mag. Nat. Hist., vol. v (1860), p. 461.

*Hab.*—Darjiling; Naga Hills.

## 57. GLESSULA SCRUTILLUS (Benson).

*Achatina scrutillus*, Bens.: Ann. & Mag. Nat. Hist., vol. v (1860), p. 463.

*Hab.*—Orissa and Central India; banks of the Narbudda.

## 58. GLESSULA GEMMA (Benson), (Reeve).

*Achatina gemma*, Benson MSS.: Reeve, Conch. Icon., vol. v, pl. xxii, fig. 123.

*Hab.*—Lower Bengal; Rajmahal; Chittagong, etc.; plains of Malabar and Bepur.

## 59. GLESSULA CRASSULA (Benson), (Reeve).

*Achatina crassula*, Benson MSS.: Reeve, Conch. Icon., vol. v, pl. xxii, fig. 120.

*Hab.*—Darjiling; Jaintia; Naga Hills.

## 60. GLESSULA PULLA, Blanford.

*Glessula pulla*, Blanf.: Journ. Asiat. Soc. Bengal, 1870, vol. xxxix, p. 21, pl. iii, fig. 20.

*Hab.*—Torna (Bombay Presidency).

## 61. GLESSULA PAUPERCULA, Blanford.

*Achatina paupercula*, Blanf.: Journ. Asiat. Soc. Bengal, vol. xxx (1861), p. 362, pl. i, fig. 16.

*Hab.*—Hills in Salem District; Anamallays; Tinnevely; Travancore Hills; Kurnool Hills.

This was largely distributed by me under Nevill's MS. name of *inconspicua*, but identified as this species from a single type-specimen in Dr. W. Blanford's collection.

Var. *nana*.

A shorter, more obtuse form, occurring occasionally with the type form, and very like *Sattaraensis*, but shorter.

## 62. GLESSULA SATTARAENSIS (H. Adams), (Hanley &amp; Theobald).

*Achatina (Electra) Sattaraensis*, H. Ad. MSS., for *fusca* (preoc.): Proc. Zool. Soc., 1868, p. 15, pl. iv, fig. 10.

*Hab.*—Sattara; Ceylon central provinces; Rambaddy Ghats.

## 63. GLESSULA CAPILLACEA (Pfeiffer).

*Achatina capillacea*, Pfr.: Proc. Zool. Soc., 1854, p. 294; Mon. Hel., vol. iv, p. 614.

*Hab.*—Ceylon.

I took two specimens on the Haycock Mountain. Length 9 to 11 mm.

## 64. GLESSULA COLLETTÆ, Sykes.

*Glessula Collettæ*, Sykes: Proc. Malac. Soc., vol. iii, p. 73, pl. v, fig. 1.

*Hab.*—Ceylon.

## 65. GLESSULA SUBJERDONI, n.sp. Pl. XV, Figs. 2, 2a.

Testa oblongo-turrita, tenuis, leviter striatula, nitida, subpellucida, fulvo-cornea; spira subturrita, ad apicem obtusiuscula; sutura impressa; anfractus 7-8, subplaniusculi, ultimus 4-7 longitudinis vix æquans, basi attenuatus; columella leviter arcuata, paulo supra basin aperturæ truncata; apertura verticalis, semi-ovalis; peristoma simplex, obtusiusculum. Long. 11, diam. 3.5 mm.; apertura 2.5 mm. longa, 2 lata.

*Hab.*—Jeypore and Golcondah Hills, east side of Madras Presidency.

A smaller and more slender shell than *Jerdoni*, and much larger than *paupercula*, of which it may be a large form.

## 66. GLESSULA GRACILIS, n.sp. Pl. XV, Figs. 9, 9a.

Testa parva, cylindrico-turrita, solidula, vix nitens, evidenter striatula; spira elongata, ad apicem obtusa; sutura impressa, crenulata; anfractus 8 planiusculi, ultimus  $\frac{1}{3}$  longitudinis vix æquans, basi parum attenuatus; columella parum obliqua, paulo supra basin aperturæ truncata; apertura verticalis, semi-ovalis; peristoma intus albidum, obtusum. Long. 11, diam. 2 mm.; apertura 2.5 mm. longa, 1.5 lata.

*Hab.*—Nilgiri Hills; Jeypore Hills, east coast of Madras.

The Jeypore specimens are slightly larger, the whorls rather more convex, and slightly angular close to the sutures.

## 67. GLESSULA PUSILLA, n.sp. Pl. XV, Figs. 5, 5a.

Testa turrito oblonga, tenuis, nitidula, luteo-cornea, leviter striatula; spira turrita, ad apicem obtusa; sutura crenulata; anfractus 6-6½, parum convexi, ultimus ⅔ longitudinis æquans; columella valde arcuata, basi antice fere verticaliter truncata; apertura semi-ovalis; peristoma rectum, albidum. Long. 5-5.5, diam. 1.75-2 mm.; apertura 1.5 mm. longa, 1 lata.

*Hab.*—Ceylon, Rambaddy Ghat; Anamallay Hills; Shevaroyes; Nilgiris (South India).

Much smaller than *Colletta*, its nearest ally, with weaker sculpture and paler colour.

## 68. GLESSULA MULLORUM (Blanford).

*Achatina mullorum*, Blanf.: Journ. Asiat. Soc. Bengal, vol. xxx (1861), p. 362, pl. i, fig. 17.

*Hab.*—Madras.

## 69. GLESSULA BLANFORDIANA (Nevill).

*Stenogyra (Glessula) blanfordiana*, G. Nevill: Journ. Asiat. Soc. Bengal, vol. 1 (1877), p. 138, pl. v, fig. 12; vol. 1 (1881), pt. 2, with fig.

*Hab.*—Ponsee, Yunnan, and at Bhamo.

I have seen no specimens.

## 70. GLESSULA PEGUENSIS (Blanford).

*Achatina Peguensis*, Blanf.: Journ. Asiat. Soc. Bengal, vol. xxxiv (1865), p. 78.

*Hab.*—Pegu.

Hanley's figure is not good.

## 71. GLESSULA BREVIS (Pfeiffer).

*Achatina brevis*, Pfr.: Proc. Zool. Soc., 1861, p. 387.

*Hab.*—Poona and Ahmednuggur; Jeypore Hills, east side of Madras Presidency.

Nevill named my Jeypore specimens *microsculpta*, MSS., but I cannot see how they differ from *brevis*. I do not think Nevill had full-grown specimens.

Hanley's figure is too broad towards the base, and does not show the sculpture, which is peculiar.

## 72. GLESSULA FILOSA, Blanford.

*Glessula filosa*, Blanf.: Journ. Asiat. Soc. Bengal, vol. xxxix (1870), p. 19, pl. iii, fig. 16.

*Hab.*—Travancore and Tinnevely Ghats.

## 73. GLESSULA SUBFILOSA, n.sp. Pl. XV, Figs. 8, 8a.

Testa elongato-turrita, tenuis, fulvo-cornea, distincte plicato-striata; spira elongata, ad apicem subobtusa, elongato-conica; sutura impressa, anfractus 10 planiusculi, ultimus subcarinatus ⅓ longitudinis totius vix æquans; apertura lunato-subovalis; peristoma tenue; columella valde arcuata, oblique abrupte truncata. Long. 16, diam. 5 mm. apertura 5 mm. longa, 3 lata.

*Hab.*—Sirumallay Hills, Dindigul.

The prominent sculpture is like that of *filosa*, but it is a very much smaller shell, with a much more elongated apex.

74. GLESSULA LYRATA, Blanford.

*Glessula lyrata*, Blanf. : Journ. Asiat. Soc. Bengal, vol. xxxix, p. 20, pl. iii, fig. 19.

*Hab.*—Mahableshtar.

Var.  $\beta$ , *Matharanica*, Blanf., l.c.

*Hab.*—Matheran.

Having seen Blanford's types, I should not be inclined to give it specific rank as Nevill has done.

75. GLESSULA RUGATA, Blanford.

*Glessula rugata*, Blanf., l.c. : p. 20, pl. iii, fig. 18.

*Hab.*—Singhur and Poorundhur, Bombay Presidency.

76. GLESSULA LATESTRIATA, Möllendorff.

*Glessula latestriata*, Müll. : Nachrichtsb. deutsch. Mal. Gesell., 1897, p. 166.

*Hab.*—Shan States. Not seen by me.

77. GLESSULA SIMONI, Jousseume.

*Glessula Simoni*, Jous. : Mém. Soc. Zool. France, vol. vii, p. 293, fig. 7.

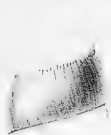
*Hab.*—Ceylon.

A very small species which I have not seen.

EXPLANATION OF PLATE XV.

FIGS. 1, 1a.	<i>Glessula subpervotteti</i> , n.sp.
„ 2, 2a.	„ <i>subjerdoni</i> , n.sp.
„ 3, 3a.	„ <i>subinornata</i> , n.sp.
„ 4, 4a.	„ <i>Canarica</i> , n.sp.
„ 5, 5a.	„ <i>pusilla</i> , n.sp.
„ 6, 6a.	„ <i>Jeyporensis</i> , n.sp.
„ 7, 7a.	„ <i>subserena</i> , n.sp.
„ 8, 8a.	„ <i>subfilosa</i> , n.sp.
„ 9, 9a.	„ <i>gracilis</i> , n.sp.

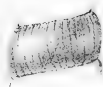
---



1a.



1.



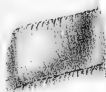
2a.



2.



3.



3a.



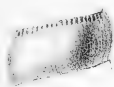
4.



4a.



5.



5a.



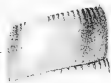
6.



7.



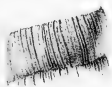
6.



6a.



8.



8a.



9.



9a.

A. H. Searle, del et lith.

Huth, imp.

NEW SPECIES OF GLESSULA.



ON THE MOLLUSCA PROCURED DURING THE "PORCUPINE"  
EXPEDITIONS, 1869-1870. SUPPLEMENTAL NOTES, PART III.<sup>1</sup>

By E. R. SYKES, B.A.

Read 8th June, 1906.

PLATE XVI.

THE review of the Pleurotomidæ found during the cruises has been a task of no little difficulty. Had the material been finally worked out when it was collected the work would have been comparatively simple, and a large majority of the forms would have proved new to science. Of late years so much attention has been given to the deep-sea forms, that the labour of identifying species, often described from fragmentary specimens, is considerable.

One point of interest will be gleaned from a study of the present list, namely, that a number of the forms obtained from a most prolific dredging in 1,095 fathoms off the coast of Portugal have proved identical with species described and only recorded from off the Azores.

The classification of the Pleurotomidæ is at present in a state of chaos; the recent system given by Dr. Kobelt<sup>2</sup> seems fairly convenient for the European forms, and has been, in general, adopted here.

As in previous papers, a number of dead and broken shells have been left unidentified.

ALICEIA ÆNIGMATICA, Dautzenberg & Fischer (?).

*Aliceia ænigmatica*, Dautz. & Fischer: Mém. Soc. Zool. France, vol. x,  
p. 182.

"Porcupine" Expedition, 1870, Station 17.

*Distribution*.—Off the Azores, in deep water.

Two very immature specimens, which I believe really belong here, though it would not be safe to regard the identification as certain.

HOMOTOMA EMENDATA (Monterosato).

*Pleurotoma emendatum*, Monterosato: Journ. Conchyl., vol xxii (1874),  
p. 278.

*Homotoma (Teretia) emendatum*, Monts.: Kobelt, p. 222.

*Pleurotoma Renieri*, Philippi, non Scacchi.

"Porcupine" Expedition, 1870, Stations 50, 56; Adventure Bank,  
92 fathoms.

*Distribution*.—Various localities in the Mediterranean. Also found fossil.

Compare a note under *H. Loprestiana*. Two boxes in the Museum bear a number of stations upon them.

<sup>1</sup> For Parts I and II, see Vol. VI, pp. 23, 322.

<sup>2</sup> Icon. Europ. Meeresconch., vol. iii. In the following pages this work is not quoted in full, only the author's name (Kobelt) being given.

## HOMOTOMA LOPRESTIANA (Calcare).

*Pleurotoma Loprestiana* (*Loprestiana*), Calcare: Monterosato, Journ. Conchyl., vol. xxii (1874), p. 278.

*Homotoma* (*Teretia*) *Loprestiana*, Calcare: Kobelt, p. 223.

*Pleurotoma crispatum*, Philippi, non Cristofori & Jan.

"Porcupine" Expedition, 1870, Stations 16, 24, 50, 56; off Cape Mondego, 100 fathoms (live); Adventure Bank, 92 fathoms.

*Distribution*.—Mediterranean, and in deep water in the southern portion of the North Atlantic.

Jeffreys gives the following notes on the animal of a specimen from off Cape Mondego, taken in muddy sand:—

"Body white. Pallial or siphonal tube rather long. Tentacles cylindrical, short, rather close together; the part above the eye-stalk is very small and bulbous. Eyes small, black, placed nearly on the top of stalks, which are united with the tentacles. Foot broad and slender, double-edged in front, with triangular corners or auricles, rounded behind."

If my identification be correct, this form and *H. emendatum* may be readily severed by an examination of the protoconch. In *H. Loprestiana* this portion of the shell is brown, pointed, and the early sculpture is longitudinal costæ; while in the other species it is almost white, blunt, and button-shaped, and the early sculpture is spiral in nature.

## HOMOTOMA TERES (Forbes).

*Pleurotoma teres*, Forbes: Rep. Brit. Assoc., 1843 [1844], pp. 139, 190 [nom. sol.]; Ann. Nat. Hist., vol. xiv (1844), p. 412; Reeve, Conch. Icon., *Pleurotoma*, sp. 161 [Jan., 1844; bad!].

*Homotoma anceps*, Eichwald: Kobelt, p. 221 (*vide* references cited and synonymy).

"Porcupine" Expedition, 1869, Station 65; 1870, Stations 17, 50, 56; Adventure Bank, 92 fathoms.

*Distribution*.—Norway to the Mediterranean. A Tertiary fossil.

Jeffreys, in his MS., strongly disagrees with the identification of *P. teres* and *P. anceps*, stating that the description and figures given by Eichwald<sup>1</sup> do not agree with Forbes' species; Dr. Kobelt and most other authors have considered them identical. I have followed Jeffreys, but am unable to express any opinion on the point, as the fossil is unknown to me. Reeve's figure is, as Jeffreys very pertinently points out, scarcely recognisable; indeed, some authors have doubted whether it be taken from Forbes' species. Probably, however, since he appears to have received his shells from Forbes, it is due to a failure on the part of the artist.

## DRILLIA MARAVIGNÆ (Bivona).

*Pleurotoma Maravignæ*, Bivona: Generi posth., 1838, p. 13.

*Drillia* (*Crassopleura*) *Maravignæ*, Bivona: Kobelt, p. 225.

<sup>1</sup> Naturh. Leth., p. 225 (1830); Leth. Rossica, vol. iii, p. 186, pl. viii.



"Porcupine" Expedition, 1870, Station 50; Adventure Bank, 92 fathoms.

*Distribution*.—Mediterranean, and in the warmer water of the Atlantic (e.g. Spain and Canaries). A Miocene and Pliocene fossil.

TYPHLOMANGELIA NIVALIS (Lovén).

*Pleurotoma nivale*, Lovén: Index Moll. Scand., p. 14.

*Typhlomangelia nivalis*, Lovén: Kobelt, p. 232.

"Porcupine" Expedition, 1869 and 1870 (see notes below); 1870, Station 3.

*Distribution*.—Seas of Northern Europe to Spain, etc., always in fairly deep water.

There are two boxes in the Museum, one labelled "No. 84, 155f, 1869, No. 78," and the other, in which the specimens are live, bearing several numbers apparently relating to the cruise of 1870, but probably really being attributable to the cruise of 1869. Jeffreys in his MS. notes refers to the cruise of 1869 only, but gives no station number. Under these circumstances the details cannot be given with certainty.

BELA CINEREA (Möller).

*Defrancia cinerea*, Möller: Ind. Moll. Grönl., 1842, p. 13.

*Bela cinerea*, Möller: Kobelt, p. 250.

"Porcupine" Expedition, 1869, Station 78.

*Distribution*.—Greenland and Norway.

A single dead shell, which I have compared with specimens sent by the author to the British Museum.

BELA DECLIVIS (Lovén).

*Tritonium declive*, Lovén: Ofv. Vet. Ak. Forh., 1846, p. 85.

*Bela cancellata*, var. *declivis*, Lovén: Kobelt, p. 246.

"Porcupine" Expedition, 1869, Station 65.

*Distribution*.—From Arctic seas to deep water north of the British Isles.

Bearing in mind the diverse views which have been expressed as to the specific value of this form (cf. Jeffreys, Ann. Nat. Hist., ser. iv, vol. xix, p. 331; also Friele, Norske Norhavs-Exped. Moll., part ii, p. 9), it may be of interest to cite the following notes from Jeffreys' MS.: "Types (two specimens, one adult and the other half-grown) sent me by Professor Lovén. Compared specimens with description, which is correct, but not sufficiently explicit. Both are dead shells and solid. Two apical whorls twisted and nearly smooth; the 3rd has two indistinct spiral striæ; the 4th, 5th, and 6th have each strong spiral striæ, which do not cross or intersect the longitudinal ribs; these ribs do not quite extend to the base of the shell, where the spiral striæ are stronger and much more conspicuous, being crowded at the lowest point; the last whorl has about 16 spiral striæ, of which four only occupy the upper half of the whorl."

One box in the Museum bears several station numbers, and another is labelled "No. 77, 500 fms., 1869": if we read 500 as a slip for

560, this agrees with Station 77, but there was no dredging there, only a sounding (cf. Proc. Roy. Soc., vol. xviii, p. 447).

BELA DECUSSATA (Couthouy).

*Pleurotoma decussata*, Couthouy: Boston Journ. Nat. Hist., vol. ii (1839), p. 183.

*Bela decussata*, Couthouy: Kobelt, p. 252.

"Porcupine" Expedition, 1869, Stations 23a, 62, 77.

*Distribution*.—Arctic seas and both sides of the North Atlantic. A Post-Tertiary fossil at Bridlington and near Belfast (Jeffreys).

Jeffreys points out that the *Pleurotoma decussata* of Lamarck has priority, and suggests the use of the name *conoidea*, Sars, for the present shell. I am not sufficiently versed in the literature of the numerous Arctic species of *Bela* to determine what name should be adopted.

BELA EXARATA (Möller).

*Defrancia exarata*, Möller: Index Moll. Grönland, p. 12.

*Bela turricula*, var. *exarata*, Möller: Kobelt, p. 236, pl. xxxii, fig. 3.

"Porcupine" Expedition, 1869, Stations 17, 25; 1870, Station 30.

*Distribution*.—Arctic seas and both sides of the North Atlantic. Fossil in the English Red Crag (Jeffreys) and in Post-Tertiary deposits.

The specimens from Station 17 are only fragments. In the identification of the northern forms of *Bela* I have, as a rule, followed Gwyn Jeffreys.

The following notes by Jeffreys on the 'type' of *Pleurotoma mitrula*, Lovén, may find a place here: "Compared specimen with description, which is correct. The first and second (apical) whorls are nearly smooth, and obliquely twisted; the third and fourth whorls have each two rows of prominent spiral striæ, which are nodulous at the points of intersection by the longitudinal ribs. The shell has a remarkably turreted appearance, and the mouth is shorter in proportion to the length of the spire than in most species of the section *Bela*. It is a very elegant and solid shell. Its relations are with *B. Trevelyana*; but the sculpture is much stronger, and the cancellation more remote." Jeffreys refers to a drawing of this specimen by Mr. Sowerby, but I am unable to trace the drawing, or whether it has appeared in any work.

BELA (?) MACRA (Watson).

*Pleurotoma (Mangelia) macra*, Watson: Journ. Linn. Soc., vol. xv, p. 437; "Challenger" Rep., Gasteropoda, p. 345, pl. xxiii, fig. 6.

Dautzenberg & Fischer: Mém. Soc. Zool. France, vol. ix, p. 421, pl. xvi, fig. 13.

"Porcupine" Expedition, 1870, Station 17.

*Distribution*.—Off the Azores, in deep water.

Compared with the Rev. R. B. Watson's type; one specimen fairly typical, the other apparently belonging to a variety. I am in some difficulty as to the relationship between this form and *Defrancia nodulosa*, Jeff. The latter form was described from the Mediterranean, and in the original reference the author refers also to specimens from

the "Porcupine" off Portugal in 795-994 fathoms. The three specimens from the locality so labelled I attribute to *macra*, Watson. There is also a specimen labelled "No. 55, 1870," which I take to be the Mediterranean specimen to which Jeffreys refers, and which appears to be distinct from *macra*; this latter I accept as *nodulosa*, Jeff., and it is so catalogued in the present paper. The type of this latter species is, however, inaccessible to me. Jeffreys in his MS. also notes *nodulosa* from the "Travailleur" and "Talisman" Expeditions, but I have not been able to trace the form with any certainty in Locard's work; may it be *Bela holomera*, Loc.?

BELA OVALIS (Friele).

*Pleurotoma (Bela) ovalis*, Friele: Nyt. Mag. Naturv., xxiii, No. ii, p. 9.

*Bela decussata*, var. *ovalis*, Friele: Kobelt, p. 258, pl. lxxxiv, figs. 15, 16.

"Porcupine" Expedition, 1869, Station 23a (one apparently live); 1870, Station 17.

*Distribution*.—Deep water on both sides of the North Atlantic.

The specimens from the latter station are much more strongly sculptured. I have followed the identification of Jeffreys and Mr. Marshall.

BELA RECONDITA (Tiberi), Locard.

*Bela recondita* (Tiberi), Locard: Expéd. Scient. Trav. Talisman, vol. i (1897), p. 248; Kobelt, p. 274.

*Pleurotoma torquata*, auct., non Philippi.

"Porcupine" Expedition, 1870, Adventure Bank, 92 fathoms.

*Distribution*.—Various localities in the Mediterranean; also the Azores.

According to the authorities cited, as also the Marquis de Monterosato, the present shell has been erroneously attributed by most workers to Philippi's species.

BELA RETICULATA (BROWN).

*Pleurotoma reticulata*, Brown: Ill. Conch. Gt. Brit., 1827, Expl. pl. xlviii.

*Pleurotoma Trevelianum*, Turton: Mag. Nat. Hist., vol. vii (July, 1834), p. 351.

*Bela Trevelyana*, Turton: Kobelt, p. 266.

"Porcupine" Expedition (see note below).

*Distribution*.—Arctic seas and both sides of the North Atlantic.

Known also as a Tertiary(?) and Post-Tertiary fossil. In the Museum as from "89 fathoms, North Atlantic," but I am unable to supply the correct cruise or station number. As has been pointed out by Jeffreys and others, the *Pl. reticulata* of Brown has priority.

BELA TURRICULA (MONTAGU).

*Murex turricula*, Montagu: Test. Brit., p. 262.

*Bela turricula*, Montagu: Kobelt, p. 234.

"Porcupine" Expedition, 1869, Lough Foyle, 10 fathoms.

*Distribution*.—Arctic seas and both sides of the North Atlantic. A Tertiary and Post-Tertiary fossil in the British Isles.

Var. SCALARIS, Möller.

“Porcupine” Expedition, 1869, Station 65.

Var. RUGULATA, Möller.

“Porcupine” Expedition, 1870, Station 26.

I am not clear if the locality for the last-named variety be really correct. *Pleurotoma brevisrostris*, Jeff. MS., seems to me only a form of *turricula*, while *P. delicata*, Jeff. MS., seems synonymous with the variety *rugulata*.

BELA sp. ?

Two specimens from the cruise of 1870, Station 17, deserve a note. They are very small, turreted, and well keeled, and the sub-sutural area is smooth, save for weak radiating lines of growth. The sculpture of the rest of the shell consists in distant, well-marked, longitudinals, and numerous close-set spirals. Mons. Dautzenberg very kindly examined them, but was unable to identify them. I have not described them, as there are only two dead shells, not in good condition.

BELA sp.

A single specimen, apparently live, from the cruise of 1869, Station 38, bearing the MS. name of *pinguis*, Jeff., is in the Museum collection. It appears not to belong to the species described under this name by Locard (Exped. Trav. Talisman, vol. i, p. 211), but is a true *Bela*. I have been unable to satisfactorily identify the shell, but the variation in these forms is great, and I have therefore left the unique specimen unnamed.

PLEUROTOMELLA (?) BULLIOIDES, n.sp. Pl. XVI, Figs. 1, 1a.

Shell ovate fusiform, spire rather depressed. Colour white, with a chestnut-brown protoconch. Whorls 6, somewhat convex, suture well marked. Protoconch composed of four whorls, the first minutely punctate, the second and third being decussated by arcuate riblets, while the fourth whorl has this decussation on its lower half, but one series of riblets has become obsolete on the upper half. The residue of the shell is, in some specimens, marked by three or four incised lines, the only other sculpture being the lines of growth, which are sinuous and more noticeable just below the suture. The last whorl is large and inflated; the mouth ovate; columella slightly curved; lip thin and arcuate, with a deep sinus at its upper margin. Long. 4, lat. 2·8 mm.

“Porcupine” Expedition, 1870, Station 17.

Ten specimens; the details of the protoconch are taken from a younger shell than the type.

Belonging to the group of *T. Dalmasi*, Daut. & Fischer, but a smaller and more ovate shell, the spire not being so elevated. It is the *obesa*, Jeff. MS., which name has been used three times in the Pleurotomidæ.

I have forms apparently belonging to several distinct species of this group from the same dredging, but we know so little of their

variation, and whether they be adult or not, that I deem it wiser not to describe them.

PLEUROTOMELLA CALLEMBRYON (Dautzenberg & Fischer).

*Pleurotoma callembrion*, Dautz. & Fischer: Mém. Soc. Zool. France, vol. ix, p. 428, pl. xv, fig. 15.

"Porcupine" Expedition, 1870, Station 17.

*Distribution*.—Off the Azores, in deep water.

Mr. Marshall separated four diverse forms, which M. Dautzenberg considers to be all variations of this species. They certainly show considerable variation, and may eventually prove to be worthy of distinct names, but so little is known of these deep-sea forms that, for the present, I have left them under this denomination.

PLEUROTOMELLA CÆLORHAPHE (Dautzenberg & Fischer).

*Pleurotoma cælorhappe*, Dautz. & Fischer: Mém. Soc. Zool. France, vol. ix, p. 425, pl. xv, fig. 13.

"Porcupine" Expedition, 1870, Section 17.

*Distribution*.—Off the Azores, in deep water.

Identified by M. Dautzenberg.

PLEUROTOMELLA DALMASI (Dautzenberg & Fischer).

*Pleurotoma Dalmasi*, Dautz. & Fischer: Mém. Soc. Zool. France, vol. x (1897), p. 153, pl. iii, fig. 4.

"Porcupine" Expedition, 1870, Station 17.

*Distribution*.—Previously recorded from deep water off the Azores.

PLEUROTOMELLA EURYBROCHA (Dautzenberg & Fischer).

*Pleurotoma eurybrocha*, Dautz. & Fischer: Mém. Soc. Zool. France, vol. ix, p. 427, pl. xv, fig. 13.

"Porcupine" Expedition, 1870, Station 17.

*Distribution*.—Off the Azores, in deep water.

Identified by M. Dautzenberg.

PLEUROTOMELLA FORMOSA (Jeffreys).

*Defrancia formosa*, Jeffreys: Proc. Zool. Soc., 1883, p. 397, pl. xlv, fig. 9.

*Pleurotomella Packardi*, var. *formosa*, Jeff.: Kobelt, p. 282.

"Porcupine" Expedition, 1869, Stations 14, 23a, 65; 1870, Station 17.

*Distribution*.—Deep water in the Atlantic, south to Azores (?); also if it be a variety of *P. Packardi*, on the American coast.

The following notes are due to Mr. Marshall: "There is some confusion as to the identity of this species. Jeffreys in his description says that the 'apical or top whorls are reticulated,' and that the 'point is usually sharp, but sometimes blunt and button-shaped,' although his figure of the shell, as well as the magnified view of the apex, does not exhibit any reticulation. The Rev. R. Boog Watson (Challenger Gasterop., p. 350) demurs to this part of Jeffreys' description, and says he has 'seen nothing like such a variety of form [of the apex] in any specimens of this species, nor in any shells of the whole *Clathurella* group.' He describes the embryonic section

as consisting of four whorls, sharp and narrow, the three lower ones scored 'with the characteristic markings of *Clathurella*, and the extreme tip indistinctly and closely dotted with tubercles somewhat linearly arranged.' This must have been taken from some other shell than *C. formosa*, Jeffr., for it does not apply to that species. The apical whorls of the latter are three only, broad, and brown in colour, the first is smooth and button-shaped, the second conical and very finely obliquely striated, and the third nearly flat-sided, obliquely striated like the second, but with much coarser crinkley striæ. Gwyn Jeffreys' figures show this oblique striation and flattened apex, but they err in depicting four whorls instead of three, and the sculpture of the third should be much coarser than that of the second. I suspect that when Gwyn Jeffreys described his shell he had two species before him, and further that Mr. Boog Watson must have had one of these species in his hands, because the real apex of *C. formosa* is exactly depicted in the figure of *C. cala*, Watson (*Challenger Gasterop.*, pl. xxvi, fig. 11), which latter he says has the apical whorls 'scored with excessively fine threadlets which are straight and longitudinal,' whereas the figure differs from this description. He also says that *C. cala* is 'very much larger,' but the dimensions he gives of .55 in. by .3 in. indicate very little difference by those of Jeffreys—5 in. by .25 in. Mr. Watson's figure of *C. cala* is not *formosa* (though the apical whorls are exact), as the longitudinals of the latter are more oblique and the spirals much more numerous."

The above remarks led me to examine the "Challenger" specimens. I feel convinced that the shells recorded by Mr. Watson as *C. formosa* are not that species; on the other hand, *C. cala* seems to be close to the true *formosa*. At present so little material has been collected that it is uncertain how far variation may exist in these forms, but it may well be that *C. cala* will prove only to be a variety. Jeffreys' "Porcupine" collection contains at least four species grouped under the name of *formosa*, and very possibly Mr. Watson saw one of these, and not the true species.

I am unable to verify the relationship of *formosa* and *Packardi*, Verrill, and have catalogued the shells under Jeffreys' specific name, so that it may be clear to what form the present notes refer.

PLEUROTOMELLA GREGARIA, n.sp. Pl. XVI, Figs. 2, 2a.

Shell somewhat thin, with a well-elevated spire, white, the protoconch stained with brown. Whorls 6, four being apical. The apical whorls (worn) are reticulate, and the residue of the shell is sculptured with longitudinal costæ, which fade out on the lower half of the whorls; there are also numerous rounded spirals cutting the costæ. Below the suture there is an excavated area, showing spirals and also arcuate striæ, more numerous than the costæ. Columella fairly straight; mouth ovate. Long. 4.5, lat. 2 mm.

"Porcupine" Expedition, 1870, Station 17.

A puzzling form of the group of *P. subaraneosa*, Dautz. & Fischer. From this species it differs in sculpture, the spirals being much more numerous and rounded; from *P. Watsoni*, Dautz. & Fischer, it differs

in the excavated area below the suture; it may be the form referred<sup>1</sup> by these authors to *Jeffreysi*, Verrill, from which it appears to me to differ in the shape of the whorls, length of canal, and, from Verrill's figure, in the longitudinal sculpture. It is the *spinulosa*, Jeffreys MS.

PLEUROTOMELLA IMPLICISULPTA (Sturany).

*Defrancia implicisulpta*, Sturany: Mollusken gesamm. Pola, 1890-4, p. 12, pl. i, figs. 10-12 (1896).

*Pleurotomella implicisulpta*, Sturany: Kobelt, p. 388.

*Defrancia gibbera*, Jeffreys: Rep. Brit. Assoc., 1873, p. 113 [nom. sol.].

*Pleurotoma gibbera*, Jeffreys: Monterosato, Nuova Revista, 1875, p. 44; Enum. e Sinon., 1878, p. 47; Bull. Soc. Mal. Ital., 1880, p. 77 [nom. sol.].

*Leufroyia gibbera*, Jeffreys: Monterosato, Nat. Sicil., 1890, p. 27 [nom. sol.].

"Porcupine" Expedition, 1870, Stations 30, 50, 56; Adventure Bank, 92 fathoms.

*Distribution*.—Palermo, Santo Vito, etc. (Monterosato); deep water off Alexandria (Sturany).

I have to thank the Marquis de Monterosato for the bibliographical details, as also for the clue to the above identification. No description of the name *gibbera* has ever appeared.

PLEUROTOMELLA (?) LUSITANICA, n.sp. Pl. XVI, Figs. 3, 3a.

Shell moderately elongate, somewhat fusiform in shape, the spire well raised. Colour white, the protoconch stained with chestnut. Whorls about 7, rather flattened, with a well-marked suture. Apical whorls 3, the first being almost smooth and the others decussated by arcuate riblets. The remaining whorls are sculptured spirally by numerous flat, broad riblets, which (under a lens) are seen to be about twice as wide as their interstices, and to be crossed by lines of growth, which give them a roughened or scabrous appearance. The last whorl is large; the aperture being somewhat squared at the base, and with no noticeable sinus; the outer lip thin and regularly arcuate. The columella is fairly straight above, a trifle twisted at the base, and has a light callus on its lower portion. Long. 6, lat. 3 mm.

"Porcupine" Expedition, Station 17.

Seven specimens of varying ages: the above diagnosis is 'composite,' as the protoconch in the type is rather worn and a little injured. One specimen (broken) is larger than the dimensions given.

Nearly related to *Blanchardi*, Dautz. & Fischer, but, from their figure, the present shell is more slender and the mouth is not so broad; also the interstices of the spirals are not nearly equal in breadth to the spirals themselves.

It is also akin to *Dalmasi*, Dautz. & Fischer, which was found with it. From that species it may be severed by the form being less elongate, the base not being so pointed, but squarer, with a corresponding difference in the shape of the mouth. The spiral sculpture is of a different nature in the present shell, and the zone below the

<sup>1</sup> Mém. Soc. Zool. France, vol. ix, p. 411.

suture in *Dalmasi*, marked by arcuate striæ, is lacking in *P. lusitanica*. In form the shell recalls *Daphnella pompholyx*, Dall, but differs apparently in the spirals, judging from his figure.

PLEUROTOMELLA MEGALEMBRYON (Dautzenberg & Fischer).

*Pleurotoma megalembryon*, Dautz. & Fischer: Mém. Soc. Zool. France, vol. ix, p. 420, pl. xvii, fig. 14.

“Porcupine” Expedition, 1870, Station 17 (five specimens).

*Distribution*.—Off the Azores, in deep water.

I have to thank Mons. Dautzenberg for the identification.

PLEUROTOMELLA (?) NODULOSA (Jeffreys).

*Defrancia nodulosa*, Jeffreys: Ann. Nat. Hist., ser. v, vol. x, p. 32.

“Porcupine” Expedition, 1870, Station 55, 1,456 fathoms.

*Distribution*.—Deep water in the Mediterranean.

See notes under *Pleurotoma macra*, Watson.

PLEUROTOMELLA (?) OBTUSUM [(Jeffreys) Locard].

*Pleurotoma obtusum*, Jeffreys: Locard, Expéd. Scient. Trav. Talisman, vol. i, p. 202, pl. ix, figs. 12–16; Kobelt, p. 318.

“Porcupine” Expedition, 1870, Stations 24 and 30.

*Distribution*.—Deep water to the south and west of Portugal.

PLEUROTOMELLA (?) SERGA (Dall).

*Pleurotoma serga*, Dall: Bull. Mus. Comp. Zool., vol. ix, p. 65; vol. xii, pl. ix, fig. 4; vol. xviii, p. 114.

*Mangilia serga*, Dall: Locard, Expéd. Scient. Trav. Talisman, Moll., vol. i, p. 233.

*Pleurotoma acanthodes*, Watson: Challenger Rep., Gasteropoda, p. 342, pl. xxiii, fig. 3.

“Porcupine” Expedition, 1870 (see below).

*Distribution*.—Both sides of the Mid-Atlantic in deep water, also off the Azores.

Two lots in the Museum, which I attribute to this species, bear several station numbers whose accuracy is uncertain. I have also the earlier whorls of a specimen from Station 17, and similar fragments from Stations 30 and 56.

PLEUROTOMELLA SUBARANEOSA (Dautzenberg & Fischer).

*Pleurotoma subaraneosa*, Dautz. & Fischer: Mém. Soc. Zool. France, vol. ix, p. 422, pl. xvi, figs. 11, 12.

“Porcupine” Expedition, 1870, Station 17.

*Distribution*.—Off the Azores, in deep water.

A long series of this handsome shell; it is the *Pleurotoma exquisita*, Jeffreys MS.

PLEUROTOMELLA THAUMASTOPSIS (Dautzenberg & Fischer).

*Pleurotoma thaumastopsis*, Dautz. & Fischer: Mém. Soc. Zool. France, vol. ix, p. 426, pl. xvi, fig. 14.

“Porcupine” Expedition, 1870, Station 17.

*Distribution*.—Off the Azores, in deep water.

Two very young specimens.



## PLEUROTOMELLA ? n.sp.

Two specimens from the cruise of 1870, Station 17, seem worthy of being noticed. They are very young apparently, and belong to the group of *P. subaraneosa*, Dautz. & Fischer, but they differ from all other forms of this group known to me in the fact that the spirals are almost obsolete and only traces of them are seen. So little is yet known of the variation in this group that I have not endowed them with a specific name.

## SPIROTROPIS CLYTOTROPIS, n.sp. Pl. XVI, Figs. 4, 4a.

Shell elongate fusiform, pale brownish white (dead), spire well produced. Whorls 5, angulated and convex. Protoconch of two whorls, large, glassy, and bulbous, smooth save for indistinct traces of microscopic spirals. The remaining whorls are strongly angulated and carinated at the periphery, this carina appears on the later whorls as if duplex; below this carina is a second, smaller one, and two more are obscurely indicated below. The mouth is strongly angled, and the canal is spout-like and slightly twisted. Long. 8, lat. vix 4 mm.

"Porcupine" Expedition, 1870, Station 17.

Eleven specimens, all, except the type, being very young. Akin to the well-known *S. modiola*, Jan, but slightly broader in proportion to the length. Further, the present shell may be distinguished by the additional spirals below the carina, which are not present in *S. modiola*, Jan; the canal is also more produced in *S. clytotropis*.

We may compare the sculpture with that of *S. monotropis*, Dautz. & Fischer, which appears to be a more elongate shell, with a small and pointed protoconch.

## SPIROTROPIS (?) MEGALACME, n.sp. Pl. XVI, Figs. 5, 5a.

Shell small, conical-fusiform, spire well raised, fairly solid. Colour (dead) whitish-brown, with a white protoconch. Whorls 6, turreted, regularly increasing. Protoconch large, white, the first whorl and a half smooth, then closely-set longitudinal riblets are seen, and the whorl becomes carinate. The remaining whorls are acutely carinate, with an area below the suture, either smooth or with arcuate striæ: below the carina appear numerous longitudinal riblets, decussated by spiral carinations, giving the shell a somewhat prickly or nodulous appearance. The mouth is small, with a well-marked sinuation above; columella vertical, a little twisted at the base. Long. 5, lat. 2.5 mm.

"Porcupine" Expedition, 1870, Station 17.

Four specimens, three being immature. The details as to the protoconch are taken from a younger specimen than the type.

## SPIROTROPIS (?) MELVILLI, n.sp. Pl. XVI, Figs. 6, 6a.

Shell small, elongate, spire well raised, varying a good deal in the relative proportions of length and breadth; colour hyaline white. Whorls 6, turreted, carinated, regularly but slowly increasing, suture well marked, with a small strap-like rim below it. Protoconch large, white, smooth, elevated. The remaining whorls are marked by a strong spiral keel, which is either smooth or bears acute nodules;

lines of growth well marked, aperture fairly broad, the columella twisted at the base. Long. 6, lat. 2.6 mm.

“Porcupine” Expedition, Station 17.

A long series. Recalling in shape the well-known *S. modiolus*, Jan, but differing in sculpture. I have to thank M. Dautzenberg for examining this shell, together with the bulk of the forms now described.

SPIROTROPIS MODIOLUS (Jan).

*Fusus modiolus*, Jan: Cat. Conch. Foss., 1832, p. 10.

*Pleurotoma carinatum*, Bivona, 1838.

*Pleurotoma acuta*, Bellardi.

*Pleurotoma scalaris*, Partsch, 1837.

*Spirotropis modiola*, Jan: Kobelt, p. 297 (*vide* references cited).

“Porcupine” Expedition, 1869, Stations 1, 23a (live), 65; 1870, Stations 16, 24, 30, 50, 56; Adventure Bank, 92 fathoms; off Cape Sagres, 45–58 fathoms.

*Distribution*.—From the Lofoten Islands to West Africa, and in the Mediterranean; generally in fairly deep water. Fossil in the Miocene and Pliocene of South Europe.

A good series of this form, not usually of common occurrence.

SPIROTROPIS MONTEROSATOI (Locard).

*Pleurotoma Monterosatoi*, Locard: Expéd. Scient. Trav. Talisman, vol. i, p. 209, pl. ix, figs. 22–26.

“Porcupine” Expedition, 1870, Station 17.

*Distribution*.—Deep water, off Morocco (Locard).

Three very young specimens, in poor condition, which I refer here with some slight doubt.

THESBIA (?) MONOCEROS (Watson).

*Pleurotoma (Thesbia?) monoceros*, Watson: Trans. Linn. Soc., vol. xv, p. 449; Challenger Rep., Gasteropoda, p. 365, pl. xx, fig. 1.

“Porcupine” Expedition, 1870, Station 17.

*Distribution*.—Off Sierra Leone, in 2,500 fathoms.

Several young specimens and fragments, the identification of which with Mr. Watson's form was suggested, with a query, by Mr. J. T. Marshall. The unique type has lost its protoconch, and, while these specimens may belong to the same form, it is impossible to speak with certainty.

TARANIS MÖRCHI (Malm).

*Trophon Mörchi*, Malm: Gotenborg Vet. Handl., 1863, p. 130.

*Pleurotoma cirrata*, Brugnone: Pleur. foss. Palermo, 1862, p. 17.

Non *Pleurotoma cirrata*, Bellardi: Mem. Acc. Torino, ser. II, vol. ix (1847), p. 575.

*Taranis cirrata*, Brugnone: Kobelt, p. 323.

“Porcupine” Expedition, 1870, Stations 3, 16, 17, 30; Adventure Bank, 92 fathoms.

*Distribution*.—From Norway to the Mediterranean and in deep water in the Atlantic. I am not clear if the North American records are to be relied upon. A Pliocene fossil in Southern Europe.

The specimens from Station 6 are only fragments of the earlier whorls.

*HÆDROPLEURA RUFÆ* (Montagu).

*Murex rufus*, Montagu : Test. Brit., p. 263.

*Hædropleura rufa*, Montagu : Kobelt, p. 328.

"Porcupine" Expedition, 1869, Lough Foyle, 10 fathoms; also a young, very dead shell from "W. Ireland, 73 fath."

*Distribution*.—Finmark to the British and French coasts. A Tertiary fossil.

*HÆDROPLEURA SEPTANGULARIS* (Montagu).

*Murex septangularis*, Montagu : Test. Brit., 1803, p. 268, pl. ix, fig. 5.

*Hædropleura septangularis*, Montagu : Kobelt, p. 326.

"Porcupine" Expedition, 1870, Adventure Bank, 92 fathoms.

*Distribution*.—From Bergen to the Mediterranean, also Madeira and Canaries (Jeffreys). A Tertiary fossil of Southern Europe.

According to Jeffreys the *Pleurotoma Ægeensis* of Forbes is, "ex typ," a synonym, while *Mangelia rigida* (Forbes), Reeve, is a variety.

*SURCULA UNDATIRUGA* (Bivona).

*Pleurotoma undatiruga*, Bivona : Gen. Posth., p. 7.

*Surcula undatiruga*, Bivona : Kobelt, p. 330.

"Porcupine" Expedition, 1870, Station 50; off Cape Sagres, 45–58 fathoms.

*Distribution*.—Various localities in the Western Mediterranean, especially off the Algerian coast; also off N.W. Africa and to the Canaries. A Pliocene fossil.

One specimen (young) in the Museum has met with an accident, causing the animal to form a new mouth at an angle to the old one, and from the back view to resemble a *Vertagus*.

*MANGELIA COSTATA* (Donovan).

*Murex costatus*, Donovan : Brit. Shells, vol. iii, pl. xci.

*Mangelia costata*, Donovan : Kobelt, p. 343.

"Porcupine" Expedition, 1869, off Lerwick, 10–66 fathoms (var. *coarctata*); 1870, Station 50 (and var. *coarctata*); Vigo Bay, 20 fathoms (and var. *coarctata*); Tangier Bay, 35 fathoms; Adventure Bank, 92 fathoms (with var. *coarctata* and a white var.).

*Distribution*.—Finmark to the Mediterranean and Tenerife. European Tertiary fossil.

*MANGELIA RUGULOSA* (Philippi).

*Pleurotoma rugulosum*, Philippi : Enum. Moll. Sicil., vol. ii, p. 169.

*Mangelia rugulosa*, Philippi : Kobelt, p. 336.

"Porcupine" Expedition, 1870, Station 50; Adventure Bank, 92 fathoms.

*Distribution*.—From the British Isles to the Mediterranean. A Tertiary fossil.

*BELLARDIELLA GRACILIS* (Montagu).

*Murex gracilis*, Montagu : Test. Brit., 1803, p. 207.

*Bellardiella gracilis*, Montagu : Kobelt, p. 348.

“Porcupine” Expedition, 1870, Station 50; Benzert Road, 40–65 fathoms; Adventure Bank, 92 fathoms.

*Distribution*.—British Isles to Madeira and Canaries; also in the Mediterranean. A well-known Pliocene fossil.

Several localities appear on the Museum boxes, but none are sufficiently certain to cite.

CLATHURELLA CLATHRATA (de Serres).

*Pleurotoma clathrata*, de Serres: Geogn. midi France, 1829, p. 113, pl. ii, figs. 7, 8.

*Clathurella (Clathromangelia) clathrata*, de Serres: Kobelt, p. 369.

“Porcupine” Expedition, 1870, Adventure Bank, 92 fathoms.

*Distribution*.—Mediterranean: A Tertiary fossil.

I have followed the traditional identification, but if the recent species be distinct, as has been suggested, it should bear the name of *granum*, Phil.

CLATHURELLA LEUFROYI (Michaud).

*Pleurotoma Leufroyi*, Michaud: Bull. Soc. Linn. Bordeaux, vol. xi (1828), p. 121.

*Clathurella (Leufroyia) Leufroyi*, Michaud: Kobelt, p. 365.

“Porcupine” Expedition, 1869, Station 36; Little Minch, 45–50 fathoms; 1870, Adventure Bank, 92 fathoms.

*Distribution*.—Norway to the Mediterranean; Canary Islands. Fossil in European Tertiaries.

Jeffreys notes that the animal “is sometimes of a pea-green colour, which is perceptible through the shell”: so far as my own observation, of Guernsey and Herm specimens, has gone, the colour has varied from very pale fleshy to white.

CLATHURELLA LINEARIS (Montagu).

*Murex linearis*, Montagu: Test. Brit., vol. i, p. 261.

*Clathurella (Cyrillia) linearis*, Montagu: Kobelt, p. 367.

“Porcupine” Expedition, 1869, Lough Foyle, 10 fathoms; 1870, Stations 13, 50; Adventure Bank, 92 fathoms.

*Distribution*.—Finmark to the Mediterranean and Canaries. A Pliocene and Post-Tertiary fossil from many European localities.

I am unable to decide as to the priority between this name and the *Murex elegans* of Donovan.

CLATHURELLA MARSHALLI, n.sp. Pl. XVI, Figs. 7, 7a.

Shell elongate-fusiform, fairly solid, spire well drawn out. Colour (dead) whitish-brown. Whorls  $7\frac{1}{2}$ , convex, regularly increasing. Protoconch pointed, well exerted, of about  $3\frac{1}{2}$  whorls, worn and polished but bearing traces of the regular ‘*Clathurella*-sculpture.’ Residue of the shell bearing rounded longitudinal riblets of fair size, crossed by a number of spiral threads (about 6 on the penultimate whorl), and showing traces of a smoother area below the suture. Aperture of fair size, with a short, slightly recurved, canal. Long. 4.5, lat. 1.8 mm.

“Porcupine” Expedition, 1870, Station 17.

Closely related to many forms of *Clathurella*, but I am unable to exactly identify it. Mr. Marshall notes "nearest to *C. linearis*, var. *æqualis*, but more oblong, sculpture finer, with infrasutural area."

CLATHURELLA NIVEA (Monterosato). Pl. XVI, Figs. 8, 8a.

*Defrancia reticulata*, var. *nivea*, Monterosato: Atti Acc. Palerm., 1875, No. i, p. 44.

*Pleurotoma (Homotoma) nivea*, Monterosato: Enum. e Sinon., 1878, p. 46.

"Porcupine" Expedition, 1870, Station 56.

*Distribution*.—Mediterranean.

Recorded from specimens identified by the author. Mr. Marshall writes: "This species resembles *C. reticulata* in size, sculpture, and outlines, but while *C. reticulata* has a slender and acute apex of four whorls, *C. nivea* has a broad twisted apex (*apex revolutus*) of two whorls only, somewhat similar to that of *Trophon* and *Murex*, so that when either of these species are found minus the upper whorls, there is some doubt in determining the species. The same remarks apply to dwarf forms of *C. purpurea* in relation to *C. bicolor*, *C. gemmata*, and *C. gracillima*."

CLATHURELLA PSEUDOHYSTRIX, n.n.

*Defrancia hystrix*, Jan: Jeffreys, Ann. Nat. Hist., ser. iv, vol. vi, p. 82.

? *Peratotoma hystrix*, Jan: Sacco, Moll. Terz. Piemonte, pt. xxx, p. 52, pl. xiii, fig. 37.

*Clathurella (Cordieria) hystrix*, Jan: Kobelt, p. 357, pl. xcvi, fig. 20.

*Pleurotoma (Clathurella) hystrix*, Jan: Watson, Journ. Linn. Soc., Zool., vol. xxvi, p. 304.

Non *Pleurotoma hystrix*, Jan: Cat. Conch., 1832, p. 10.

Non *Raphitoma hystrix*, Jan: Bellardi, Mem. Acc. Torino, ser. II, vol. ix, p. 613, pl. iv, fig. 14.

Non *Homotoma hystrix*, Jan: Bellardi, Moll. Terz. Piemonte, pt. ii, p. 267.

"Porcupine" Expedition, 1870, Station 50; Adventure Bank, 92 fathoms (with a white variety in both cases).

*Distribution*.—Several localities in the Mediterranean; also Madeira (Watson).

I have set out the above references in detail, as I am unable to agree with the identification of the recent specimens with the older Tertiary form. Nothing can be gleaned from Jan's original reference, and the species really rests on Bellardi's diagnosis and figure, which were, as I understand it, taken from a specimen sent to him by Jan. Further references may be obtained from the works cited.

As the Marquis de Monterosato, who kindly suggested the above name to me, points out, the fossil form has a pointed protoconch, composed of three or four whorls; while the recent shell, in the character of its protoconch, rather resembles *Trophon*. Precisely where the fossil form disappeared and was replaced by the present shell, I am unable to determine, but the two appear to be distinct.

## CLATHURELLA PURPUREA (Montagu).

*Murex purpureus*, Montagu: Test. Brit., p. 260, pl. ix, fig. 2.

*Clathurella purpurea*, Montagu: Kobelt, p. 359.

"Porcupine" Expedition, 1870, Stations 35, 50, Gibraltar Bay, 3 fathoms.

*Distribution.*—Atlantic seas from Norway to South England; occasionally in the Mediterranean. A Tertiary fossil.

The specimens from the two first-mentioned stations were identified by Mr. J. T. Marshall as belonging to his variety *minor*.

## CLATHURELLA RETICULATA (Renier).

*Murex reticulatus*, Renier: Tavola Alf., 1804, p. ix.

*Clathurella reticulata*, Renier: Kobelt, p. 351.

"Porcupine" Expedition, 1870, Stations 51, 56; Rasel Amoush, 45 fathoms; Adventure Bank, 92 fathoms (with var. *hispida*, Monts.).

*Distribution.*—From England south to the Mediterranean. A Tertiary fossil.

## RAPHITOMA ATTENUATA (Montagu).

*Murex attenuatus*, Montagu: Test. Brit., vol. i, p. 266.

*Raphitoma (Villiersiella) attenuatum*, Montagu: Kobelt, p. 380.

"Porcupine" Expedition, 1870, Station 50; Vigo Bay, 20 fathoms; Rasel Amoush, 45 fathoms; Adventure Bank, 92 fathoms.

*Distribution.*—Jutland and Sweden to the Mediterranean, also Teneriffe. A Pliocene fossil.

It may be convenient to mention here some specimens from Station 17 of the cruise of 1870. They are very close to *attenuata*, and may prove to be identical, but the protoconch is different, being dome-shaped rather than cylindrical, and they show other minor variations. Their condition is not good, and I have therefore not named them.

## RAPHITOMA BRACHYSTOMA (Philippi).

*Pleurotoma brachystomum*, Philippi: Enum. Moll. Sicil., vol. ii, p. 169, pl. xxvi, fig. 10.

*Raphitoma (Ginnania) brachystomum*, Phil.: Kobelt, p. 378.

"Porcupine" Expedition, 1870, Station 50; Vigo Bay, 20 fathoms; Adventure Bank, 92 fathoms.

*Distribution.*—From Norway to the Mediterranean and Ægean. A Tertiary fossil.

Jeffreys notes in his manuscripts that *Pleurotoma cycladense* (Forbes), Reeve, is a synonym; it is given specific rank by Dr. Kobelt. The form is not in the British Museum, and I am unable to throw any light on the question.

## RAPHITOMA LÆVIGATA (Philippi).

*Pleurotoma lævigatum*, Philippi: Moll. Sicil., vol. i, p. 199, pl. xi, fig. 17.

*Raphitoma nebula*, var. *lævigata*: Kobelt, p. 376.

"Porcupine" Expedition, 1869, Lough Swilly, 3 fathoms (the

small form known as var. *minor*, Jeff., alive); 1870, Algeciras Bay, 1-15 fathoms.

*Distribution*.—Mediterranean to the British coasts; also Belgium (Jeffreys MSS.).

The animal of the live specimen above-mentioned is thus described by Jeffreys. "Body milk-white, with minute and irregular specks of flake white; mouth thick; pallial tube long and cylindrical; tentacles thread-shaped, short, extremely thin above the eye-stalks; eyes black, conspicuous, placed on the top of long stalks which are three times as thick as the tentacles; foot long, equal in breadth for two-thirds of its length and narrowing behind; it is squarish or slightly bilobed and double-edged in front, notched or indented behind."

I am unable to decide as to the correct specific name for this shell. Sowerby described a *Pleurotoma lavigata* in 1823 (Min. Conch., vol. iv, pl. 387), as noted by Jeffreys in his MS., and the latter proposed to adopt the name *nigra* of Pot. & Mich. (Gal. Douai, vol. ii, p. 446). According to Tryon (Man. Conch., vol. vi, p. 224) the latter is, however, identical with Montagu's *rufa*, and I am not in a position to settle the question. Jeffreys further suggests that *P. atrata*, O. G. Costa (1839), may be identical with the present species. There is also a *Pleurotoma lavigata* of Nyst (1838).

#### RAPHITOMA NEBULA (Montagu).

*Murex nebula*, Montagu: Test. Brit., p. 267, pl. xv, fig. 6.

*Raphitoma (Ginnania) nebula*, Mont.: Kobelt, p. 374.

"Porcupine" Expedition, 1869, Station 68 (var. *fusiformis*, Marshall); Lough Swilly, 3-13 fathoms; 1870, Station 50 (with var. *abbreviata*, Jeff.); Tangier Bay, 35 fathoms (a live, young, nearly white form); Gibraltar Bay, 3 fathoms; Adventure Bank, 92 fathoms (var. *abbreviata*, Jeff.).

*Distribution*.—Atlantic coast of Europe, also Mediterranean, Canaries, and Madeira. A Tertiary and Post-Tertiary fossil of the British Isles and the Continent.

#### RAPHITOMA NUPERRIMA (Tiberi).

*Pleurotoma nuperrimum*, Tiberi: Descr. nuovi Testacei Medit., 1855, p. 14, pl. ii, figs. 7-9.

*Raphitoma* (?) *nuperrimum*, Tiberi: Kobelt, p. 385.

"Porcupine" Expedition, 1870, Stations 6, 8, 9, 24, 50; Cartagena Bay, 60-84 fathoms; Benzert Road, 40-65 fathoms; Adventure Bank, 92 fathoms.

*Distribution*.—Various localities in the Mediterranean and from Arcaçon (Locard).

This shell is better known under the name of *hispidula*, Jan; which form appears not to have been described by that author, but by Bellardi in 1848. From the figures given, the recent shell appears to be very closely allied to the fossil, if not identical, but I have followed Dr. Kobelt in their separation, since Jeffreys says, "Not *Raphitoma hispidula*, Jan, in Foresti's collection from Bologna; but in other notes I have regarded the fossil and recent species as the same."

Jeffreys also places *P. lyciacum* (Forbes), Reeve, in the synonymy; Dr. Kobelt, however, gives it specific rank, but, judging from Reeve's figure, I concur with Jeffreys.

RAPHITOMA STRIOLATA (Scacchi).

*Pleurotoma striolatum*, Scacchi: Cat. Moll. Regn. Napoli, p. 12.

*Raphitoma* (*Smithiella*) *costulatum*, var. *striolatum*, Scacchi: Kobelt, p. 383.

"Porcupine" Expedition, 1870, Station 50; Tangiers Bay, 35 fathoms; Adventure Bank, 92 fathoms. [Specimens also in the Museum from Station 9; query which cruise.]

*Distribution*.—Norway to the Mediterranean, and Canaries. A Pliocene fossil.

The correct name for this species seems to be an exceedingly difficult problem (see Kobelt, loc. cit.). There is a prior *Mangelia striolata* of Risso, which seems distinct, as I gather both from his figure and description that the spirals do not cross the longitudinal ribs. Whether it be the *Pleurotoma costulata* of Blainville I am not clear. Various other possible names may be suggested, but perhaps the simplest course at present is to follow Jeffreys, who, quoting the shell as "*striolata* (Scacchi), Philippi," adds, "in this state of uncertainty caused by the multiplicity of names perhaps it is best to use that name which is indisputably appropriate and recognized."

RAPHITOMA TURGIDA (Forbes).

*Pleurotoma turgida*, Forbes: Rep. Brit. Assoc., 1843 (1844), p. 139.

*Raphitoma* (?) *turgidum*, Forbes: Kobelt, p. 386, pl. xviii, figs. 19, 20.

*Pleurotoma nana*, Scacchi, 1839, non Deshayes, 1832.

"Porcupine" Expedition, 1870, off Cape Sagres, 45–58 fathoms; Benzert Road, 40–65 fathoms.

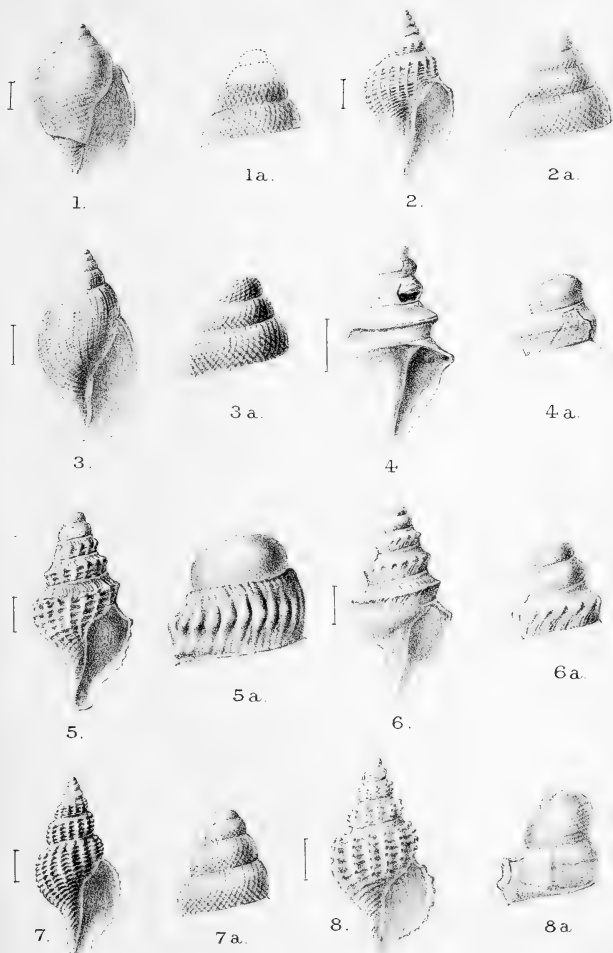
*Distribution*.—Various localities in the Mediterranean. Fossil in the South European Tertiary.

From the first-mentioned locality come two specimens, so named by Jeffreys; one of them (a very dead shell) is correct, but I refer the other rather to *laevigata*.

EXPLANATION OF PLATE XVI.

FIGS. 1, 1a.	<i>Pleurotomella</i> (?) <i>bullioides</i> , n.sp.
" 2, 2a.	" <i>gregaria</i> , n.sp.
" 3, 3a.	" (?) <i>lusitanica</i> , n.sp.
" 4, 4a.	<i>Spirotropis clytotropis</i> , n.sp.
" 5, 5a.	" (?) <i>megalucme</i> , n.sp.
" 6, 6a.	" (?) <i>Melvilli</i> , n.sp.
" 7, 7a.	<i>Clathurella Marshalli</i> , n.sp.
" 8, 8a.	" <i>nivea</i> (Monterosato).





A.H. Searle, del et lith.

Huth, imp.

SHELLS FROM THE "PORCUPINE" EXPEDITIONS.



## ON THE DATES OF PUBLICATION OF SOWERBY'S "MINERAL CONCHOLOGY" AND "GENERA OF RECENT AND FOSSIL SHELLS."

By E. R. SYKES, B.A.

*Read 8th June, 1906.*

RECENTLY Mr. Reynell has lent me a little volume containing the back covers of parts 1-108 of the "Mineral Conchology," and since these covers give details of the contents and date of publication of each part it appears that a list might prove of use. One such list has been given by Mons. Renevier,<sup>1</sup> but it is somewhat difficult of access and does not go so fully into detail as I have been enabled to do. I was somewhat puzzled to find that Mr. Reynell's set of covers ceased with that of No. 108, but an inspection of a copy of vol. vii, bound in the parts and lent by Mr. R. B. Newton, readily explains the matter, for after the cover of No. 108 the residue give no details as to the contents of the part.

I desire to thank Mr. Sherborn for his help, and regret that at present I have not found time to utilize his notes on the dates of issue of the foreign editions of the work.

## VOL. I.

PART.	PLATES.	PAGES.	DATE.
1	1-3	i-vii, 9-16	June 1, 1812
2	4-9	17-32	Aug. 1, 1812
3	10-15	33-48	Feb. 1, 1813
4	16-21	49-60	April 1, 1813
5	22-27	61-72	June 1, 1813
6	28-33	73*-76*, 73-84	Aug. 1, 1813
7	33 <sup>2</sup> -38	73 <sup>2</sup> -84	Oct. 1, 1813
8	39-44	85-96	Dec. 1, 1813
9	45-50	97-108	Feb. 1, 1814
10	51-56	109-124	April 1, 1814
11	57-62	125-140	June 1, 1814
12	63-67	141-152	Aug. 1, 1814
13	68-73	153-168	Oct. 1, 1814
14	74-78	169-178	Dec. 1, 1814
15	79-84	179-194	Feb. 1, 1815
16	85-90	195-202	April 1, 1815
17	91-96	203-218	June 1, 1815
18	97-102	219-234,	April 1, 1815

and index to vol. i.

Supplementary Index to vol. i, published October 1, 1815.

## VOL. II.

PART.	PLATES.	PAGES.	DATE.
19	103-108	1-12	Oct. 1, 1815
20	109-114	13-28	Dec. 1, 1815
21	115-120	29-44	Feb. 1, 1816
22	121-126	45-60	April 1, 1816
23	127-132	61-72	June 1, 1816
24	133-138	73-84 <sup>3</sup>	Aug. 1, 1816
25	139-144	85-100	Oct. 1, 1816
26	145-150	101-116	Dec. 1, 1816

<sup>1</sup> Bull. Soc. Vaud., 1855.<sup>2</sup> Should be 33 *bis* (*Emarginula*) and pp. 73\*\*--84\*\* (cf. Suppl. Index).<sup>3</sup> Paged as 77-88, but should be as above (cf. index to vol. ii).

PART.	PLATES.	PAGES.	DATE.
27	151-156	117-128	Feb. 1, 1817
28	157-162	129-140	April 1, 1817
29	163-168	141-154	June 1, 1817
30	169-174	155-166	Aug. 1, 1817
31	175-180	167-178	Oct. 1, 1817
32	A, 181-186	179-194	Dec. 1, 1817
33	187-192	195-210	Feb. 1, 1818
34	193-198	211-224	April 1, 1818
35	199-203	225-235,	June 1, 1818

and index to vol. ii.

Stratigraphical Index (pp. 240-251) appeared in No. 38 (December 1, 1818).

### VOL. III.

PART.	PLATES.	PAGES.	DATE.
36	204-209	1-16	Aug. 1, 1818
37	210-215	17-28	Oct. 1, 1818
38	216-221	29-40	Dec. 1, 1818
39	222-227	41-48	Feb. 1, 1819
40	228-233	49-58	April 1, 1819
41	234-239	59-68	June 1, 1819
42	240-245	69-80	Aug. 1, 1819
43	246-248	81-88	Oct. 1, 1819
44	249-253	89-98	Dec. 1, 1819
45	254-259	99-106	Feb. 1, 1820
46	260-265	107-118	April 1, 1820
47	266-271	119-126	May 1, 1820
48	272-277	127-138	May 1, 1821
49	278-283	139-150	June 1, 1821
50	284-289	151-162	July 1, 1821
51	290-294	163-170, 166*, 167*, 168-170	Aug. 1, 1821
52	295-300	171-178	Sept. 1, 1821
53	301-306	179-184,	Oct. 1, 1821

and Alphabetical Index.

Supplementary Index published in No. 61 (June 1, 1822).

### VOL. IV.

PART.	PLATES.	PAGES.	DATE.
54	307-312	1-8	Sept. 1, 1821
55	313-318	9-16	Dec. 1, 1821
56	319-324	17-24	Jan. 1, 1822
57	325-330	25-32	Feb. 1, 1822
58	331-336	33-44	March 1, 1822
59	337-342	45-56	April 1, 1822
60	343-348	57-68	May 1, 1822
61	349-354	69-76	June 1, 1822
62	355-359	77-82	July 1, 1822
63	360-365	83-90	Aug. 1, 1822
64	366-371	89, <sup>1</sup> 91-96	Sept. 1, 1822
65	372-377	97-104	Oct. 1, 1822
66	378-383	105-114	Nov. 1, 1822
67	384-388	115-122	Jan. 1, 1823
68	389-394	123-130	Feb. 1, 1823
69	395-400	131-138	April 1, 1823
70	401-407	139-148,	May 1, 1823

and index to vol. iv.

Supplementary Index, really published August 1, 1823, although noted on cover of No. 71 as published in June.

<sup>1</sup> This second page numbered 89 is text for *Bulimus*, pl. 366.

VOL. V.

PART.	PLATES.	PAGES.	DATE.
71	408-413	1-12	June 1, 1823
72	414-419	13-20	July 1, 1823
73	420-425	21-32	Aug. 1, 1823
74	426-431	33-40	Sept. 1, 1823
75	432-437	41-48	Nov. 1, 1823
76	438-443	49-64	Dec. 1, 1823
77	445-450	65-72	Jan. 1, 1824
78	444, 451-455	63*, 64*, 73-78	March 1, 1824
79	456-461	79-90	April 1, 1824
80	462-467	91-98	May 1, 1824
81	468-473	99-114	Aug. 1, 1824
82	474-479	115-130	Sept. 1, 1824
83	480-485	131-138	Dec. 1, 1824
84	486-491	139-144	March 1, 1825
85	492-497	145-152	May 1, 1825
86	498-503	153-168,	Sept. 1, 1825

and index to vol. v.

VOL. VI.

PART.	PLATES.	PAGES.	DATE.
87	504-509	1-12	Feb. 1, 1826
88	510-515	13-28	March 1, 1826
89	516-521	29-36	April 1, 1826
90	522-527	37-44	May 1, 1826
91	528-533	45-50 <sup>1</sup>	July 1, 1826
92	534-539	51-76	Sept. 1, 1826
93	540-545	77-86	Nov. 1, 1826
94	546-551	87-96	Jan. 1, 1827
95	552-557	97-108	March 1, 1827
96	558-562	109-120	May 1, 1827
97	563-568	121-132	Aug. 1, 1827
98	569-574	133-140	Sept. 1, 1827
99	575-580	141-156	Nov. 1, 1827
100	581-586	157-164	Jan. 1, 1828
101	587-591	165-184	June 1, 1828
102	592-597	185-200	Aug. 1, 1828
103	598-603	201-214	Jan. 1, 1829
104	604-609	215-230	July 1, 1829
105	—	portrait, preface, and Systematic Index, vols. i-vi.	Aug. 1, 1835

Title and Index, July 1, 1829; Alphabetical Index to vols. i-vi, March, 1840.

VOL. VII.

PART.	PLATES.	PAGES.	DATE.
106	610-613	—	March, 1840
107	614-618	1-8	Oct., 1840
108	619-623	9-16	March, 1841
109	624-628	17-24	Feb., 1843
110	629-633	25-40	Jan., 1844
111	634-638	41-48	March, 1844
112	639-643	49-56	Nov., 1844
113	644-648	57-80	Jan., 1846

<sup>1</sup> pp. 51 and 52 are noted on covers of both parts 91 and 92 as being there included; probably the latter is correct.

The following notes are taken from the respective covers mentioned: Cover of No. 2, Corrigenda, p. 11, l. 19, for South read North. Cover of No. 34, "The name *similis* having accidentally been given to two distinct species of *Trochus*, tab. 142 and tab. 181, fig. 2, I would wish to name the first of them, t. 142, *T. Anglicus*, to distinguish it from a French one nearly like it." [Reappears in Index, but is earlier here.] Cover of No. 37 corrects 'termination' to Pectens on pls. 204, 205, to *corneus*, *obscurus*, *laminatus*, *arcuatus*, and *rigidus*.

Further, there appear on some of these covers dates, etc., of publication of parts of the "Genera of Recent and Fossil Shells," and I take this opportunity of publishing those given as a supplement to the valuable notes by Mr. Sherborn.<sup>1</sup>

These details are of interest in two respects; firstly, where they can be collated with the dates extracted by him from the Linnean Society's Donation-book, they show the accuracy of that work; secondly, they give dates for certain early parts which he was unable to trace.

In dealing with the following list some notes may be useful. Part ix is stated to have appeared on diverse dates on the covers of Nos. 65 and 66: probably the latter is correct, and the earlier date is that on which it was intended to appear. Part xiii has "Dec. 28" given as the date of issue; this appears to be a slip for Jan. 28. The dates in square brackets are those of the parts of the "Mineral Conchology" to which reference is made.

MINERAL CONCH.		GENERA OF RECENT AND FOSSIL SHELLS.		DATE.
NO. OF PART.		NO. OF PART.		
57	...	I	...	Dec. 31, 1821
58	...	III	...	"Last day of Feb.," 1822
59	...	IV	...	March 30, 1822
60	...	V	...	April 30, 1822
61	...	VI	...	May 31, 1822
62	...	VII	...	June 29, 1822
64	...	VIII	...	Aug. 31, 1822
65	...	IX	...	Sept. 30, 1822
66	...	IX	...	Oct. 31, 1822
67	...	X	...	Dec. 31, 1822
68	...	XIII	...	Dec. 28, 1822
69	...	XIV	...	March 31, 1823
71	...	XV	...	May 31, 1823
73	...	XVI	...	July 31, 1823
74	...	XVII	...	"Just published" [Sept. 1, 1823]
75	...	XVIII	...	Sept. 30, 1823
76	...	XX	...	Nov. 29, 1823
77	...	XXI	...	Dec. 31, 1823
79	...	XXII	...	March 31, 1824
85	...	XXV	...	"Just published" [May 1, 1825]
91	...	XXVIII	...	"Just published" [July 1, 1826]
93	...	XXIX	...	"Shortly to appear" [Nov. 1, 1826]

<sup>1</sup> Ann. Nat. Hist., ser. vi, vol. xiii, pp. 370 and 371 (1894).

NOTE ON A NEW VARIETY (VAR. *LONGISPIRA*) OF *OLIVA*  
*ISPIDULA*.

By F. G. BRIDGMAN.

Read 8th June, 1906.

I HAVE for some time had in my collection some specimens of *Oliva* which I think should be regarded as a variety of the well-known *O. ispidula*, although at first sight they look almost specifically distinct. They differ considerably from the type in form, being decidedly narrower in proportion to the length, and also in having a much longer and more gradually tapering spire.



Their ground-colour is yellowish or yellowish-brown, and is reticulated with an irregular network of brown lines, and often exhibits more or less numerous scattered spots and dots of a much darker tint. The interior of the aperture is chocolate brown, becoming a little paler anteriorly. The suture is narrowly but distinctly channelled, and bordered above with a collar-like callus of a slaty-brown colour. Length of largest specimen 30, diam. 10·5 mm.; length of spire above the aperture, 9 mm.

The locality of my specimens is unknown, but there are three examples in the British Museum, from the 'Cuming' Collection, which are labelled "Pasacao, province of Albay, Island of Luzon, sandy mud, low water." They are a little lighter in colour than my shells, but in other respects quite similar.

This seems also a fitting opportunity of recording the occurrence of this species at the Cape Verd Islands, the British Museum having last year received a series of six specimens collected at that locality by Mr. R. Murchland.

They are of the normal typical form, but variable in colour. Some are fawn-colour, with blue-black dottings, as figured by Sowerby in the *Thesaurus Conch.*, vol. iv, pl. cccxliii, fig. 250, and two of them have a dark-coloured, clearly defined band at the upper part of the body-whorl, as in fig. 251.

The occurrence of this common East Indian shell so far north in the Atlantic is very remarkable, although it has been recorded from South Africa.

ON *CHLORITIS HETEROMPHALUS*, PILSBRY.

By Prof. HENRY A. PILSBRY, Sc.D., etc.

Read 8th June, 1906.

IN the Manual of Conchology, vol. vi, pl. li, figs. 60-62, a *Chloritis* was figured which, by some oversight, was not described in the text, though the name appeared in the explanation of plates, p. 320. No other reference to the shell has come to my knowledge, and the species was apparently forgotten until Mr. G. K. Gude, in a recent letter, directed my attention to it. A description is offered below, with new figures, more correct in outline than those originally published.



Shell planorboid, rather openly umbilicate, the umbilicus contained about  $6\frac{1}{2}$  times in the diameter of the shell; yellowish-brown, with a tinge of flesh-colour, paler and whitish around the umbilicus, and with a faint pale band along the summit of the last whorl. Sculpture of indistinct growth-lines, and faint, close, and very fine spiral striæ, more distinct below than above. Spire moderately concave. Whorls 5, convex, at first very slowly widening, then, at the later half of the penultimate whorl, more rapidly so, the last whorl unusually wide, rounded peripherally, its last fifth slowly descending to the aperture. The aperture is very broadly crescentic, and quite oblique. The peristome is well expanded, the basal margin narrowly reflexed. The upper and outer margins are more arcuate than the basal, which is dilated at its insertion. The parietal callus is thin and transparent. The umbilicus is well-like, contracting slowly within. Alt. 12.7 mm.; greater diam. 26.5, lesser 21.8 mm.

*Hab.*—New Guinea. Type No. 58,217 A.N.S.P., presented by Dr. T. B. Wilson; collector unknown.

A much smaller specimen, with the lip partly broken, is with the type. It would, if perfect, measure only about 19 mm., yet agrees so closely with the type that I do not doubt that the two are specifically identical.

This species evidently belongs to the group of *C. circumdata*, and is nearest, I think, to *C. Maforensis*, Tapp.-Can., which differs by having a much more narrowly lunate aperture, and a coloration somewhat different. There can be no doubt that the type of *C. heteromphalus* is much faded, yet it certainly was never multifasciate, like *Maforensis* or *micromphalus*.

The upper part of the last two whorls, near the suture, is very weakly plicate radially. The pale band along the upper convexity of the last whorl is so faint as to be hardly noticeable unless closely looked for.



ON *BURTOA NILOTICA* (PFEIFFER) AND ITS RELATIONSHIP TO *ACHATINA*, ETC.

By ALEXANDER REYNELL.

Read 8th June, 1906.

## PLATE XVII.

IN the early part of last March Mr. E. A. Smith kindly offered me the opportunity, which I was pleased to be able to accept, of examining the anatomy of the above animal, which is, as far as he or I can learn, unknown.

The specimens, three in number, came from Bumako Island, situated in the northern part of the Victoria Nyanza, west of Entebbe, which is on the north coast. They were preserved in alcohol, in very good condition, but unfortunately two of them, owing to the quantity of eggs they contained, could not be extracted entire. The third one, received later, was fortunately extracted by Mr. Smith almost entire, and contained no eggs. The general anatomy bears a very strong resemblance to that of *Achatina*, but it seems very possible that the functional condition of the organs must have some effect on their apparent shape and position to a greater or lesser extent. Too much attention should not be paid to the shape of such parts as the spermatheca, oviduct, etc., for comparative purposes, unless one has the supposed different genera and species in more or less identical functional condition.

Externally, the visible soft parts of *Burtoa*, in the contracted condition as I had them, are similar to *Achatina*. The animal contracts in the same manner, the foot being folded together longitudinally. The top of the foot is distinctly flattened by the weight of the shell, more so than in the specimens of *Achatina* which I have had the opportunity of examining, viz. *Kraussi*.

This flattening varies considerably in the three specimens above mentioned. In one case it is particularly noticeable for a distance of 21 mm. from the hinder edge of the collar, the surface rugosities being very much obliterated; but whether this area is specialized to the same extent as has been noticed in *Archachatina*, mentioned by Pilsbry (Man. Conch., vol. xvii, p. xii), I am unable to state, not having had the opportunity of examining any of the species belonging to this group.

The lung (Fig. 1), as in *Achatina*, is short, very richly veined on both sides of the pulmonary vein (Fig. 1, *P.V.*), which has no large branches. This veining varies very considerably in different animals, as is apparent from the three I examined. The kidney (Fig. 1, *Ne.*) is a long tongue-shaped organ, having its anterior end rounded, and being twice the length of the pericardium.

The ureter (Fig. 1, *Ur.*, *U.1*) takes the usual course as in *Achatina*, and is closed throughout practically its whole length; but in the cloaca, at the point where the rectum opens into it, there is a large delta-shaped muscular fold on its upper side (Fig. 1 A, *M.F.*), which must direct the discharge from the kidney, on leaving the ureter, more or less into the grooves (Fig. 1 A, *F.1*, *F.11*) formed by it and the walls of the chambers.

The interior, quite of the last portion of the rectum, is provided with several longitudinal folds which appear to project from the inner surface of the lining at this point (Fig. 1 A, *R.F.*).

The genital system is simple, without accessory organs, and similar to *Achatina*, but the penis (Fig. 2 A, *P.*) is provided with a true retractor (Fig. 2, *R.M.*), terminal, and inserted distally on the diaphragm. The penis is enclosed in a glossy muscular sheath, and when freed is seen to be rather a slender organ. The vas deferens (Fig. 2, *V.D.*) enters through the wall of the sheath, having attached to it a strong muscular band (Fig. 2 B, *M.B.*), the other end of which is fixed to the base of the penis. This muscular band appears to be, though contained by the sheath, practically free from it, as far as attachments are concerned. The penis is directed to the left, the terminal retractor passing over the buccal mass just in front of the points of entry of the ducts of the salivary glands, its distal end being inserted on the very front edge of the floor of the lung-chamber, close to its junction with the mantle, at a point about in line with the left tentacle, thus conforming to *Limicolaria Vanattæ* and *Cochlitoma Crawfordi*, in the terminal penis retractor being inserted on the lung-floor, and mentioned by Pilsbry (Man. Conch., vol. xvii, p. viii), though no mention is made of the position of insertion in the area of the floor. After leaving the muscular sheath enveloping the penis, the vas deferens is free till it joins the prostate gland (Fig. 2 C, *Pr.*) at the base of the uterus (Fig. 2 C, *Ut.*). The male portion of the generative canal runs as a separate tube, enveloped by the membrane of the uterus.

The vagina (Fig. 2 C, *Vg.*) is short and stout, 10–15 mm. in length in the different specimens examined, somewhat swollen at the point of insertion of the spermatheca-duct, which is about 15 mm. in length. The spermatheca itself varied very considerably in shape in the specimens containing eggs, compared with the specimen that did not. In the former case it appeared as a more or less roughly triangular, or pear-shaped, somewhat flattened sac, with the duct inserted at one side, some distance from the base (Fig. 2 C, *Sp.*), whereas, in the non-pregnant or but recently pregnant animal, this organ might be called almost fusiform, the duct, it is true, being inserted a little to the side (Fig. 2 D), the only sign of a possible capability for swelling at the base being seen in some slight corrugations on the lower part just above the point of insertion of the duct. The organ was about the same length as its duct, viz. 15 mm. The free oviduct (Fig. 2 C, *F.Od.*) is about the same length as the duct of the spermatheca. The oviduct proper is of the usual form in the specimen in which no eggs were contained; in the other two cases it was much distended, with almost transparent walls. The eggs, all of which were contained in a calcareous shell, varied in size from 4 mm. in length and 2.75 mm. in breadth to 8.5 mm. in length and 6.5 mm. in breadth. There were no free embryos. From the two specimens I counted 154 eggs. The albuminiparous gland (Fig. 2 A, *A.Gl.*) is very similar to that usually found among most of the groups of pulmonates, as far as I know. The duct of the ovotestis, which is

provided with a cæcum (Fig. 2 A, *Ce.*) close to its junction with the albuminiparous gland, has the common folding, the ovotestis itself (Fig. 2 A, *Ot.*) being made up of six or more lobes of varying sizes, and more or less free from one another, and distinct. This gland is easily visible on account of its dark purple-black colour. Both the gland and its duct are enveloped in connective tissue, quite free from the liver, and in consequence there is no difficulty in their isolation.

But little could be made of the embryos contained in the shells, many of the largest of which I examined in the hope of finding some in a fairly advanced state, but in each case the podocyst enveloped practically the whole. In the more advanced specimens the first coils, amounting to from a turn to a turn and a half, were distinct, owing to their being covered with a very thin, pale-green chitinous shell, situated at the apex. In some other cases the first coils were devoid of visible covering, though well formed and situated some distance below the apex, and protruding through the enveloping podocyst. Just under the shell, and exterior to it, are two papillæ which may be the rudiments of tentacles. Under these, again, is a distinct transverse slit, a possible oral opening. The action of the spirit had caused the embryos to become quite opaque and very brittle, thus adding to the difficulty of examination.

Jaw (Fig. 3 A) more compressed laterally and not so arcuate as in *Achatina*, with three or four coarse ribs in the centre, more or less finely striated vertically over the rest of the surface.

Radula (Fig. 3 B) having about 62-1-62 teeth in a row in the widest part. Centrals narrow (Fig. 3 C), without cusps; laterals 1-34 (Figs. 3 C and D) on each side, tricuspid, at first distinctly, the entocone gradually becoming reduced till the 34th tooth is reached, after which it ceases to exist as a cusp in most rows, but in some it disappears somewhat earlier. The last 25 teeth in the row degenerate very rapidly, both the mesocone and ectocone becoming smaller and smaller till the margins are reached. The mesocones overlap the bases of the teeth in front of them, but this does not apply to about the 25 outermost teeth on each side.

*Remarks.*—Without taking into account the shell characters, the anatomy of *Burtoa Nilotica* shows its undoubted alliance with the Achatininae, as might be expected from its geographical range. It agrees with *Archachatina*, *Cochlitoma*, *Achatina*, *Limicolaria*, and *Atopocochlis* in the median teeth of the radula being narrow, and with *Cochlitoma*, *Achatina*, and *Atopocochlis* in the laterals being more or less tricuspid, though in *Cochlitoma Crawfordi*, examined by H. A. Pilsbry, the inner pair of laterals had entocones without well-developed cutting-points.

The jaw seems to vary too much in all the genera that have been examined to form much basis for classification at the present time.

The most important peculiarity is, without doubt, the point of insertion of the penis retractor. *Limicolaria* is nearest in agreement in this, but I have not been able to find the actual place of insertion in the lung-floor mentioned in any of the works consulted. In *Cochlitoma Crawfordi* Pilsbry found the penis retractor attached

distally to the diaphragm near its right border. In all the other Achatininae examined the penis retractor seems to be a branch of the right ocular retractor.

The following genera, *Pseudachatina*, *Columna*, *Metachatina*, and *Perideriopsis*, are, according to Pilsbry, still unknown anatomically, as is also *Callistopepla*, with the exception of the radula, which was worked out by Adolf d'Ailly (Moll. terr. et d'eau douce de Kameroun). In the present state of our knowledge the genus *Burtoa*, as exemplified by *Nilotica*, seems to fit in very nicely where it is, between *Achatina* and *Limicolaria*.

In concluding, I must offer my thanks to Mr. E. A. Smith, Mr. E. R. Sykes, and Mr. R. H. Burne for kindly assistance with literature and advice.

## REFERENCES.

- D. de Férussac et G. P. Deshayes: Histoire Naturelle Générale et Particulière des Mollusques Terrestres et Fluviales, etc., Paris, 1820-51.  
 M. J. R. Bourguignat: Mollusques de l'Afrique Equatoriale de Moquedouchou, etc., Paris, 1889.  
 H. A. Pilsbry: Manual of Conchology, vols. xvi and xvii, October 6th, 1903 - June, 1905.

## EXPLANATION OF PLATE XVII.

- FIG. 1.—General view of pallial organs with the pericardium laid open.  
 ,, 1 A.—Cloaca and lower portions of the rectum and ureter of another specimen laid open to show their relative positions. Also the thick muscular fold and furrows leading to ureter.  
 ,, 2.—General view of the genital system with the organs in their natural position. The final portion of the albuminiparous gland was missing, and is approximately shown by dotted lines. The ovotestis and its duct were missing, but the cæcum is there.  
 ,, 2 A.—Albuminiparous gland with the ovotestis and its duct and cæcum from an unimpregnated or recently impregnated animal.  
 ,, 2 B.—Penis divested of the muscular sheath, showing muscle attached to vas deferens.  
 ,, 2 C.—Lower portion of the reproductive system of another impregnated animal, laid out.  
 ,, 2 D.—Spermatheca from an unimpregnated or recently impregnated animal.  
 ,, 3 A.—Jaw.  
 ,, 3 B.—Radula.  
 ,, 3 C.—Median and first lateral teeth of radula.  
 ,, 3 D.—Two lateral teeth from half-way between centre and margin of radula.

<i>A.</i> Anus.	<i>P.</i> Penis.
<i>A.Gl.</i> Albuminiparous gland.	<i>Pr.</i> Prostate.
<i>Ce.</i> Cæcum.	<i>P.V.</i> Pulmonary vein.
<i>F. I, F. II.</i> Grooves leaving ureter in the cloaca.	<i>Re.</i> Rectum.
<i>F.Od.</i> Free oviduct.	<i>R.F.</i> Longitudinal folds on inner surface of rectum close to the vent.
<i>H.</i> Heart.	<i>R.M.</i> Penis retractor.
<i>M.B.</i> Muscular band.	<i>Sp.</i> Spermatheca.
<i>M.F.</i> Muscular fold in cloaca.	<i>Sp.D.</i> Spermatheca duct.
<i>M.S.</i> Muscular sheath of penis.	<i>Ur., Ur. I, Ur. II.</i> Ureter.
<i>Ne.</i> Kidney.	<i>Ut.</i> Uterus.
<i>Ot.</i> Ovotestis.	<i>V.D.</i> Vas deferens.
<i>Ot.D.</i> Duct of ovotestis.	<i>Vg.</i> Vagina.

Fig. 2.

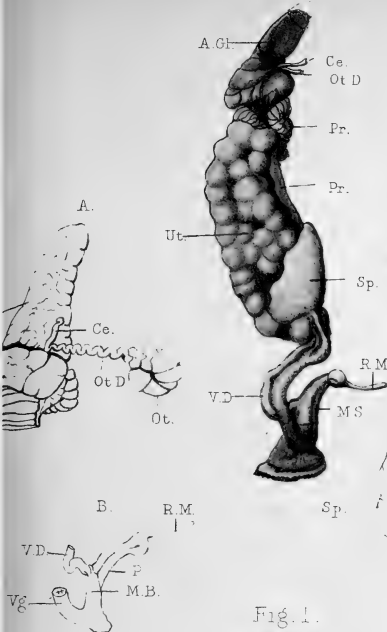


Fig. 3.

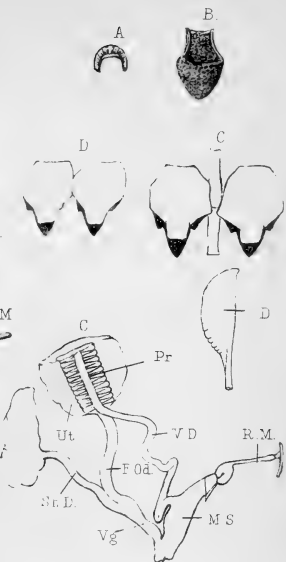
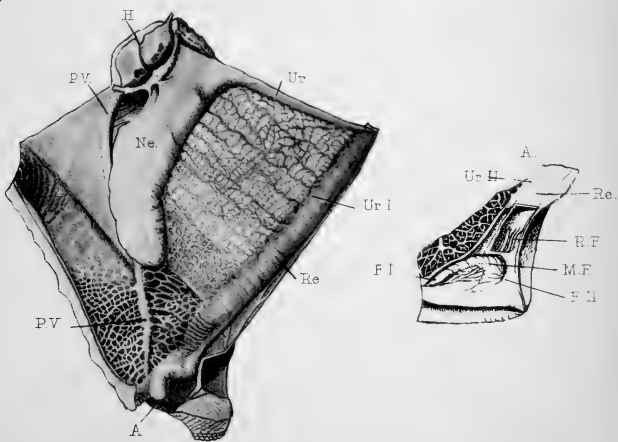
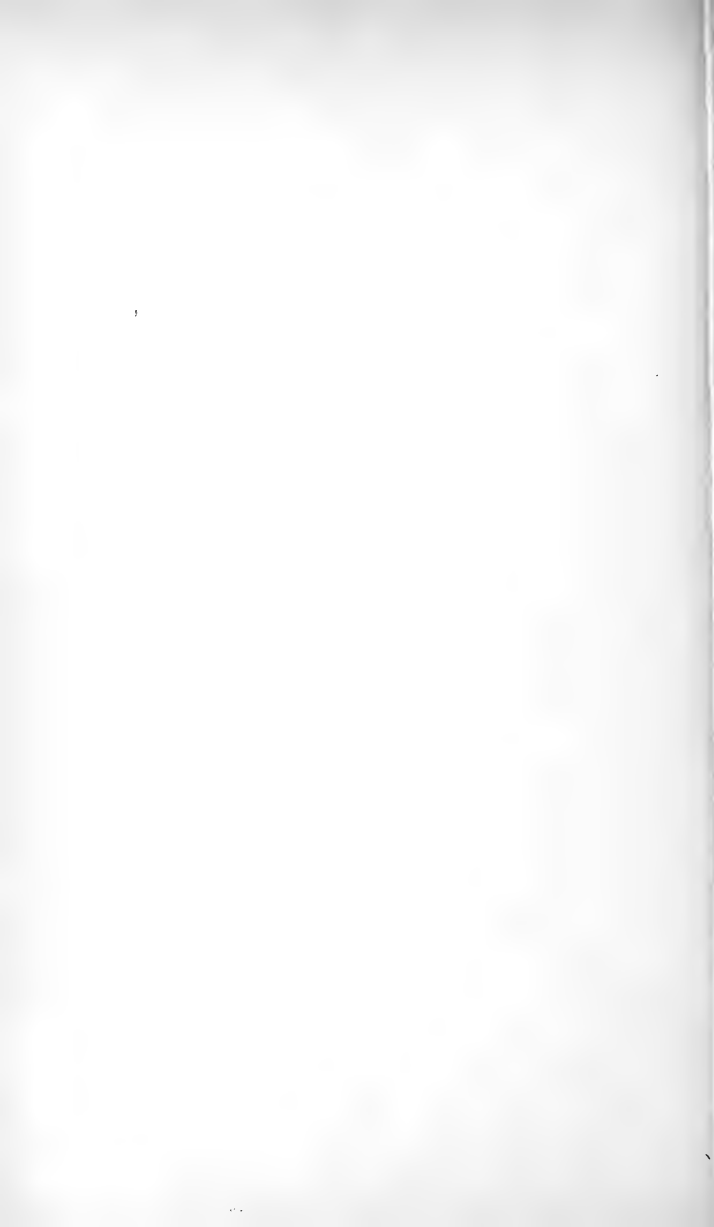


Fig. 1.



l. del ad. nat.

London Stereoscopic Co. imp



## ORDINARY MEETING.

FRIDAY, 9TH NOVEMBER, 1906.

E. R. SYKES, B.A., President, in the Chair.

The following communications were read:—

1. "Description of a new species of *Calliostoma* from South Formosa." By E. A. Smith, I.S.O.
2. "Description of a new subgenus and species of *Alycaeus* from Ke-lan-tan." By H. B. Preston, F.Z.S.
3. "Descriptions of six new species of shells and of *Leptomya lintea*, Hutton, from New Zealand." By Henry Suter.
4. "Descriptions of some Tertiary Shells from New Zealand." By Henry Suter.

Mr. E. A. Smith exhibited specimens of *Paludestrina* from water-pipes in South London, also fresh specimens of *Paludestrina similis* from Oulton Broad.

Mr. J. Cosmo Melvill exhibited a new species of *Latirus* and a shell doubtfully referable to the genus *Alaba*.

Mr. B. B. Woodward exhibited local varieties of *Acavus phœnix* from Ceylon.

Mr. F. G. Bridgman exhibited specimens of *Oliva* and *Olivella*, including a dark variety of *O. elegans*, and examples of *O. truncata*, *O. violacea*, and *O. Caribbeensis*.

Mr. A. S. Kennard (on behalf of Mr. R. Standen) exhibited some heavy shells of *Helix nemoralis* and *H. aspersa* from Dog's Bay, Galway.

Mr. E. R. Sykes exhibited a photographic facsimile of Renier's "Tavola alfabetica delle Conchiglie Adriatiche," etc., 1807.

## ORDINARY MEETING.

FRIDAY, 14TH DECEMBER, 1906.

E. R. SYKES, B.A., President, in the Chair.

Miss A. Collins, Mr. T. Iredale, and Mr. Hans Schlesch were elected members of the Society.

The following communications were read:—

1. "Description of a new species of *Latirus*." By J. Cosmo Melvill, M.A., F.L.S.
2. "On the Anatomy of *Tagelus gibbus* and *T. divisus*." By H. H. Bloomer.

3. "Descriptions of two new species of Helicoid Land Shells from German New Guinea." By J. H. Ponsonby, F.Z.S.

Mr. H. B. Preston (on behalf of Mr. E. A. Smith) exhibited a specimen of *Fistulana mumia* perforating a valve of *Dosinia*; also an abnormal specimen of *Fistulana*, showing a peculiar reparation of injury.

Mr. E. R. Sykes exhibited some living specimens of *Helix Evandaleiana*, Pfr., sent from Clare, South Australia, by Mr. Matthews. He also showed a segment of a card catalogue of the generic names of Mollusca.

Mr. R. H. Burne exhibited a specimen of *Ephippodonta McDougalli*.

#### ORDINARY MEETING.

FRIDAY, 11TH JANUARY, 1907.

B. B. WOODWARD, F.L.S., Vice-President, in the Chair.

Dr. Henry Woodward and Mr. H. B. Preston were appointed auditors for the accounts of the previous year.

The following communications were read:—

1. "Descriptions of seven new species of *Achatina* from the Congo Free State." By S. I. Da Costa.

2. "Further contributions to our knowledge of the genus *Chloritis*, with descriptions of eleven new species." By G. K. Gude, F.Z.S.

3. "Description of a new species of *Papuina*, and illustrations of some hitherto unfigured shells." By G. K. Gude, F.Z.S.

4. "Descriptions of new non-marine Shells from New Zealand." By Henry Suter.

Mr. A. S. Kennard exhibited an extremely small adult specimen of *Helix nemoralis* from county Donegal, and examples of *H. hortensis* from Cattle Island, Mass. This species is apparently the only representative of the genus indigenous in America.

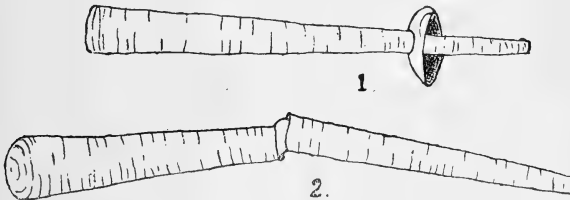
Mr. A. Reynell exhibited a specimen of *Lima excavata* dredged in 444 fathoms in the Bay of Biscay, and specimens of *Litorium giganteum* dredged in 240 fathoms.

Mr. R. H. Burne (on behalf of Professor C. Stewart, F.R.S.) exhibited a model of part of the sepistaire of *Sepia officinalis*, showing the structure of the 'float.'



## NOTES.

NOTE ON *FISTULANA MUMIA* PERFORATING A VALVE OF A *DOSINIA*. (Read 14th December, 1906.)—In the fifth volume of these "Proceedings" (p. 345) Messrs. Sowerby and Fulton gave a brief notice of a specimen of this species, which was shown to have bored its way through a *Mitra*. Another instance of the perforating power of the *Fistulana* has for many years been in the British Museum. A small valve of a species of *Dosinia*, 15 mm. in length, has been bored through by a *Fistulana* (Fig. 1), and is firmly attached to the tube about three-quarters of an inch from the posterior



end. The specimen was purchased at the sale of Captain Belcher's collection in 1851. No locality accompanies it, but it was probably obtained somewhere in the China Sea, where he collected so largely. The *Dosinia* may be the young of *D. excisa*, Chemn., as it has the very large superficial lunule so characteristic of that species.

A curious reparation of a tube after being broken is shown in Fig. 2. The specimen, now in the Museum, came from Siugapore, and formed part of the collection of the late Surgeon-Colonel Samuel Archer.

E. A. SMITH.

NOTE ON *PALUDESTRINA JENKINSI*. (Read 9th November, 1906.)—The British Museum received from Mr. H. F. Fermor last October about 200 specimens of this species which had been taken from water-pipes in South London. They seemed, at first, so unlike the typical form of the species that I was inclined to regard them specifically distinct. On comparing them, however, with specimens from the North of Ireland, received from Mr. R. Welch, certain individuals were met with which appeared to link these shells with *P. Jenkinsi*. The specimens were found in a 4 inch main in Grummant Road, Peckham, a district of South London. These pipes have been laid down between thirty and forty years, but we do not know how long the shells have existed in them or how they got into such a position. The water is drawn from the Thames at Hampton, and there passed through the sand filter-beds, thence is conveyed to the Nunhead reservoirs, and then pumped into the service-mains. The service is on the continuous supply system, so that the pressure in the pipes would be about 40 pounds to the inch. There would probably not be a great flow of water through this particular main, as it was closed at

one end of the street, and connected at the other with a 12 inch main in Peckham Road. No specimens have been observed in the latter or any other pipes, which is very curious.

All the specimens, without exception, are in perfectly clean condition, showing that there was very little mineral or vegetable deposit in the water, although evidently sufficient vegetable matter upon the pipes for the animals to feed upon.

The species is viviparous, according to Mr. Charles Oldham, who collected many specimens in Cheshire containing "large numbers of fry ready for exclusion" (Journ. of Conch., vol. x, p. 42), and Messrs. Jackson and Taylor also observe that the acute-spined species of this genus are viviparous (op. cit., vol. xi, p. 11). It therefore becomes quite certain that the species was not introduced into the pipes in the ova-state, but that either young or more adult shells had by some means found an entrance. It is well known that the species apparently increases at an enormous rate, for localities have been described as "taken over" by it in myriads where the previous year not one was seen (Stubbs, op. cit., vol. x, p. 284). It is therefore quite probable that the species has not long existed in this subterranean locality.

These shells differ from typical specimens in being more graceful and slender, and in having the spire longer and the aperture smaller. Length 4.5, diameter 2.25 mm.; length of a typical specimen 5 mm., diameter 3 mm. A small variety of the species was observed by Mr. A. Mayfield last Autumn in Oulton Broad, Suffolk, "in countless thousands." Specimens kindly presented by him to the British Museum measure only about 3.75 mm. in length and 2 in breadth.

Some specimens similar to those from the water-pipes were sent in 1905 to the Museum by the London Hydraulic Power Company, having been found in an open tank upon the top of a building in Blomfield Street, E.C. Some shorter examples, much coated with a rusty deposit, were submitted by the same company. These occurred in a high-pressure water-meter at Middleton's Wharf, Wapping. All the specimens received were dead shells.

E. A. SMITH.

#### GLESSULA PARABILIS (Benson).

*Achatina parabilis*, Benson, Ann. Mag. Nat. Hist., 1856, vol. xviii, p. 96.

*Glessula fusca*, H. Adams, Proc. Zool. Soc., 1868, p. 15, pl. iv, figs. 10, 10a.

*Hab.*—Ceylon.

This species was accidentally omitted from my paper in the last part of the "Proceedings." Its position in the series is between Nos. 26 and 27 on p. 165.

R. H. BEDDOME.

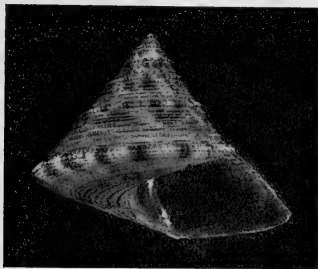
DESCRIPTION OF A NEW SPECIES OF *CALLIOSTOMA* FROM SOUTH FORMOSA.

By EDGAR A. SMITH, I.S.O.

*Read 9th November, 1906.**CALLIOSTOMA FORMOSENSIS.*

Testa elate et acute conica, ad peripheriam acute angulata, seriebus pluribus granulorum spiralibus (duobus supra suturam cæteris majoribus) ornata, alba, rufo maculata; spira alta, fere concave conica; anfractus circiter 9 plani, ultimus infra planiusculus, concentricè tenuiter granulato-liratus, circa regionem umbilicalem impressam callo albo marginatus; apertura rhomboidalis; columella incrassata, albo-margaritacea, obliqua; labrum tenue, intus tenuiter sulcatum. Diam. maj. 42, min. 35 mm.; alt. 35 mm.

A very beautiful species, well characterized by the style of sculpture, its form, and coloration. It does not compare at all closely with any other species. The series of granules on the body-whorl above the periphery are alternately larger and smaller, the



latter upon the preceding whorl becoming merely fine liræ without granulation. There are about ten rows upon the last whorl besides the two more prominent rows at the periphery which form a conspicuous belt above the suture. This is marked with reddish blotches which are rather equidistant, and the rest of the surface of the spire is also more faintly stained with red, but chiefly upon the rows of granules, and not in the interstices. The blotches upon the periphery are also visible on the underside of the whorl, which is whitish, excepting some of the series of granules around the central part, which are reddish. These are farther apart and more coarsely granose than those towards the circumference. Altogether there are about twenty rows. There is a faint umbilical depression bordered by a thickish white ridge. The outer lip is thin, oblique above, and shallowly sinuated at the base. The lines of growth are more conspicuous upon the base than upon the spire.

DESCRIPTION OF A NEW SUBGENUS AND SPECIES OF *ALYCÆUS*  
FROM KE-LAN-TAN.

By H. B. PRESTON, F.Z.S.

Read 9th November, 1906.

AMONG a number of shells from Ke-lan-tan which recently came into my possession there was included a species which I at first thought belonged to the genus *Alycæus*, but, upon careful examination of the operculum, I found that it bore characters totally different from those of the hitherto described typical species of that genus, and which appeared to make it quite worthy of subgeneric rank. I therefore now propose the new subgeneric name *Pincerna* for the shell in question, and venture to describe it as below.

*PINCERNA*, nov. subgen.

Shell Alycæiform; operculum horny, convex below, concave above, bearing in the centre of the upper surface a hollow protuberance in the form of a circular cup, the margin of which is slightly reflexed outwards.

*PINCERNA LIRATULA*, n.sp.

Shell conical, pale yellowish horn colour; whorls  $4\frac{1}{2}$ , convex; the first whorl and a half smooth, the remaining whorls sculptured with fine spiral liræ, and somewhat coarse transverse ribs which are much more numerous and closely set on the body-whorl; last whorl constricted about two and a half millimeters from the aperture and destitute of transverse ribs in the constricted area; suture deeply impressed; aperture circular; peristome continuous, double, and



reflexed outwards; umbilicus narrow and deep, partly concealed by the reflexed peristome, which, owing to a notch or depression at this point, is expanded outwards and downwards; operculum horny, convex below, concave above, bearing in the centre of the upper surface a hollow cup-shaped protuberance, the margin of which is slightly reflexed outwards. Alt. 5.5 mm.; diam. maj. 4.5 mm.; aperture, diam. 2 mm.

*Hab.*—Ke-lan-tan.

## DESCRIPTIONS OF SOME TERTIARY SHELLS FROM NEW ZEALAND.

By HENRY SUTER.

Read 9th November, 1906.

## PLATE XVIII.

A FEW years back a number of fossil shells were kindly given me for description by Professor James Park, F.G.S., Director of the School of Mines, Dunedin, and the following is the result of my investigations, most kindly assisted by Dr. W. H. Dall, of Washington.

## LAPPARIA PARKI, n.sp. Pl. XVIII, Figs. 1, 2.

Shell fusiform, with large caricelloid protoconch, costate lower whorls, and 5 oblique plaits on the pillar. Sculpture: one of the specimens shows distinct marks of spiral striation on the last whorl of the protoconch, but on the succeeding whorls hardly a trace of it is visible. The axial sculpture consists of sharp, slightly flexuous ribs, 14 on the fifth whorl, extending over the whole height of the whorls; interstices with numerous, close, feebly marked incremental lines. Spire conical, a little shorter than the aperture. Protoconch consisting of  $2\frac{1}{2}$  to 3 whorls with impressed suture, the apex lateral, raised, and pointed; the first two whorls convex, slightly higher than the last whorl, which is also less rounded. Whorls slightly straightened below the suture, thence flatly convex. Suture superficial, undulated by the axial costation. Aperture long and narrow, margins subparallel. Columella nearly straight, slightly concave at the base, with 5 sub-equidistant oblique and slender plaits. Inner lip spreading as a very thin callus over the pillar and on to part of the body. Height 23, breadth 7.5 mm. (immature shell).

*Locality.*—Lower Gorge of Pareora River, Canterbury, New Zealand (Professor J. Park).

*Formation.*—Labelled "Oamaru Series, Oligocene." However, since I received the specimens Professor Park has published a paper on the "Marine Tertiaries of Otago and Canterbury," in which he estimates the Oamaru Series as belonging to the Miocene.<sup>1</sup>

Type in my collection. All the fossils under consideration I sent to Dr. W. H. Dall for examination, and he expressed the opinion that these New Zealand fossils recall the North American Eocene more than the Oligocene. On this particular species Dr. Dall kindly wrote to me: "I am much interested in your specimen, which, as you say, recalls the *Caricella* type of nucleus strikingly. It is, however, in some respects intermediate between the typical *Caricella* and the shell named by Conrad *Lapparia*, which is closely allied to *Caricella*. Both, without a doubt, belong to the group with a membranous protoconch. I am glad to see it, since it shows the course of

<sup>1</sup> Trans. N. Zeal. Inst., vol. xxxvii (1905), pp. 503, 550.

evolution was analogous in both hemispheres, while Mr. M. Cossmann (speaking, I am sure, on insufficient evidence) has claimed that this was not the case. The fossil is quite immature, but I incline to the belief that the adult would show a form not very far removed from *Psephæa concinna*, Brod."

The species differs from the typical *Lapparia*, and partly also from *Caricella*, by the almost complete absence of spiral sculpture and the presence of five columellar plaits, and it therefore becomes questionable whether it should not form a new subgenus or section of one of the two genera. I have classed it under *Lapparia* because I think it shows more affinities with that genus than with *Caricella*. Both genera are recorded from the Eocene and not from newer formations, and it therefore is open to question whether or not part of the Oamaru Series should be relegated to the Oligocene period.

An interesting fact was pointed out by the late Captain F. W. Hutton in his "Index Faunæ Novæ-Zelandiæ" (p. 17): Several genera of marine mollusca appear in the Eocene of Australia, but did not reach New Zealand until the Miocene and Pliocene periods. I am not sufficiently well acquainted with the Australian Eocene Volutidæ to say whether forms are known which might be considered the ancestors of our species.

The species is named in honour of Professor James Park, our distinguished geologist.

PLEUROTOMA PAREORAENSIS, n.sp. Pl. XVIII, Fig. 3.

Shell fusiform, thin and fragile, height of aperture less than that of the spire, upper whorls nodulous, body-whorl finely spirally grooved. The sculpture consists of small oblique nodules on the upper three whorls below the nucleus, but faintly indicated on the following volutions. On the fourth and following whorls shallow, close, spiral grooves adorn the lower half; on the body-whorl a fine spiral groove below the suture is present, and from below the sinus-area subequidistant, somewhat deeper, spiral grooves occur down to the base. Spire high, turreted. Protoconch lost. Whorls about 8 to 9, flatly shouldered, convex below the periphery, body-whorl convex, contracted towards the base. Suture distinct, but shallow. Aperture oblong, shorter than the spire, produced into a prominent, slightly flexuous canal, truncated at the base. Outer lip rather sharp and thin. Columella slightly sinuous and covered by a thin and narrow callus. Sinus distinctly marked by growth periods, broadly rounded, not deep, situate between the suture and periphery. Height about 20-22, breadth 6 mm.

*Locality*.—White Rock, Pareora River, Canterbury, New Zealand (Professor J. Park).

*Formation*.—Labelled "Oamaru Series, Oligocene." Miocene (Professor J. Park, 1905).

Type in my collection. In outline and sculpture this species stands nearest to *Drillia Buchanani*, Hutton, which, however, is a more solid shell, much more distinctly shouldered, and with the axial costæ persisting on all the whorls.

*EXILIA DALLI*, n.sp. Pl. XVIII, Figs. 4, 5.

Shell slender, fusiform, longitudinally costate and spirally striate, with a narrow aperture and long, straight canal. The sculpture consists of longitudinal, close, oblique, and slightly flexuous ribs, about 20 on the penultimate whorl; they are rounded and of the same width as the interstices. Spiral sculpture formed by close-set narrow grooves, extending over the ribs, and absent over a short space below the suture from the eighth whorl downwards. Spire subulate, higher than the aperture. Protoconch small, formed by two smooth, shining, and rounded whorls. Whorls 10 on the immature specimen before me, flatly convex, regularly increasing in size, the body-whorl very little expanded, prolonged into a straight and long canal. The lower part of this is broken off. Suture impressed, distinct. Aperture narrow, pyriform. Outer lip, which is broken off, no doubt slightly flexuous. Columella with a slight elevation in the middle, two inconspicuous and slender plaits juts below the suture, which may easily be overlooked. The inner lip spreading as a thin narrow glaze over the pillar. Height about 20, breadth 5 mm.

*Locality*.—White Rock, Pareora River, Canterbury, New Zealand (Professor J. Park).

*Formation*.—Labelled "Oamaru Series, Oligocene." Miocene (J. Park, 1905).

Type in my collection. Dr. W. H. Dall's comment on this species is: "Immature shell, related to, if not identical with, my *Plicifusus*. We have a recent species, *P. rectirostris*, Carpenter, very much like this, though larger; we have in our Eocene a number of species very similar to your fossil, and for them Conrad proposed the genus *Exilia* (which does not have plaits on the pillar, as stated by Cossmann). It is quite possible that the name should be retained, as there are some characters which seem to divide the Eocene and Oligocene forms from our similar, but always larger and coarser, *Plicifusus* of the recent fauna."

As stated in the diagnosis, my specimen has two columellar plaits. However, I must confess that I might not have seen them if I had not especially looked for them in consequence of Cossmann's statement.<sup>1</sup>

I have much pleasure in uniting Dr. W. H. Dall's name with the species as a mark of my deep-felt gratitude for the very liberal and always most valuable help he has accorded me in my conchological studies. Those who have access to large collections and extensive libraries have no idea what such kind help means to a worker in New Zealand, where a scientist has not these facilities.

*CARDIUM* (TRACHYCARDIUM) WAITAKIENSE, n.sp. Pl. XVIII, Fig. 6.

There being only the central part of a right valve in my possession, the description must, for the present, remain fragmentary.

Shell solid, ventricose, radiately very finely ribbed; the ribs number

<sup>1</sup> Essais de Paléoconchologie Comparée, livr. iv (1901), p. 26.

about 60, they are flat, smooth, the sulci slightly narrower than the ribs. A few concentric low ridges are visible on the posterior part of the shell, forming low nodules on crossing the ribs. This seems to imply that towards the margin the ribs may have been granulate, squamose, or spinous. Umbo elevated, incurved, and slightly prosogyrate. The hinge-plate is rounded, elevated, and bent over towards the rather long and straight nympha, forming a deep groove for the insertion of the ligament. There are two smooth cardinals reaching as high as the top of the umbo; the posterior tooth is stouter, conical, united on the outside with the smaller anterior tooth, leaving a deep socket between them. Part of a posterior lateral tooth is present.

The anterior part of the shell is most likely much shorter than the posterior, and the length of the valve may have been between 40 and 50 mm.

*Locality.*—Waitaki Valley, North Otago, New Zealand (Professor J. Park).

*Formation.*—Warekuri Greensands. Labelled "Oamaru Series, Oligocene." Miocene (J. Park, 1905).

Type in my collection. Dr. W. H. Dall wrote about this species: "A *Cardium*, belonging to the section *Trachycardium*, and related to *C. gigas*, Defr., of the Paris basin Eocene."

Professor Park also sent me a fragment of a carditoid shell, near *Venericardia*, which, however, is quite insufficient for description.



DESCRIPTIONS OF SIX NEW SPECIES OF SHELLS AND OF  
*LEPTOMYA LINTEA*, HUTTON, FROM NEW ZEALAND.

By HENRY SUTER.

Read 9th November, 1906.

PLATE XVIII.

*CORNEOCYCLAS AUCKLANDICA*, n.sp. Pl. XVIII, Figs. 7-7c.

Shell small, inequilateral, oval, and somewhat inflated. Beaks not prominent, rounded, situate at the posterior third; prodissoconch smooth, convex, passing without strong demarcation into the adult valves. Anterior end convex, dorsal margin nearly straight, slightly descending. Posterior end much shorter, regularly rounded. Basal margin broadly convex. Sculpture consists of very fine concentric striae. Colour light yellow; interior slightly whitish. Hinge-plate narrow. Right valve with paired anterior and posterior laterals, two cardinals, the anterior slender, broadly V-shaped, the posterior stouter, elongately triangular, situate partly below and behind the anterior cardinal. Left valve with single anterior and posterior laterals, two cardinals, one in front of the other, the anterior tooth stouter, hook-shaped, and the posterior very slender, directed backwards. Ligament small, inset. Length 3.5, height 2.75, diam. 2 mm. (One of the largest specimens.)

*Hab.*—The specimens used as type were collected many years back by Mr. Musson in a pond at Parnell, Auckland. Other localities are: Ohaupo (C. Musson); Otaki Gorge (H. B. Preston); Heathcote Estuary, near Christchurch, in slightly brackish water (H. S.).

Type in my collection. This species never attains the size of *C. Novæ-zelandiæ*. From young specimens of the latter it may be distinguished by being more inflated and by having the beaks more posteriorly. From *C. Hodgkini* it is separated by the somewhat larger size, the more oval form, and by being more inequilateral.

Most of the specimens have above and behind a ferruginous coating.

*VENERICARDIA (PLEUROMERIS) BOLLONSI*, n.sp. Pl. XVIII, Figs. 8-8b.

Shell small, ovate, solid, slightly inequilateral, and with nodulous radiate ribs. Beaks approximate, but little anterior, high and erect, prosogyrate, incurved; protoconch very small, pointed and smooth. Anterior end with the dorsal margin descending and slightly concave, thence subangularly rounded; posterior end sharply convex, dorsal margin descending, long, and a little convex, basal margin regularly and broadly rounded. Lunule subcordate, finely striate. Escutcheon lanceolate, long and narrow, minutely striate, bounded by a carina. Sculpture: 14 strong radial beaded ribs with slightly broader interspaces; numerous concentric ridges, more prominent distally and on the base. Colour brown, much lighter towards the beaks. Interior white, porcellanous, margins strongly fluted. Hinge solid, right valve with a stout triangular central cardinal, which is laterally microscopically striate, anterior and posterior cardinals not well developed, the anterior lateral tooth is distinct, the posterior very

feeble; left valve with two divergent cardinals, the anterior stouter and triangular; a large lamelliform and marginal lateral tooth is present, which is connected above with the posterior cardinal, the anterior lateral much less distinct, elongated and distant. Ligament very short. The adductor scars are oval, distinct, the anterior deeper. Pallial line simple and entire. Length 9, height 8, diam. 4.5 mm.

*Hab.*—A number of valves were obtained by Captain J. Bollons in 18 fathoms, Port Pegasus, Stewart Island. A few valves were also gathered by Mr. A. Hamilton when dredging off Otago Heads.

Type in my collection. This species is nearest related to our *V. corbis*, Phil., and *V. lutea*, Hutton. The former is usually much smaller, shorter and more triangular, with 10 to 11 costæ, broader than the interspaces. *V. lutea* is sometimes found twice as large, but by comparing specimens of the same size it proves to be more oval, the ribs finer or more numerous, about 16, interspaces narrower than the ribs, inside brown.

It gives me great pleasure to unite the name of Captain J. Bollons with the species. It is to his great interest in conchology and his indefatigable energy that we owe so many interesting discoveries, and his liberality and readiness in procuring specimens for study are really inexhaustible.

TELLINA (ANGULUS) SPENCERI, n.sp. Pl. XVIII, Figs. 9-9b.

Shell elongately oval, thin, compressed, rostrate and but slightly flexuous posteriorly, subequilateral, with fine concentric striæ. Beaks small, approximate, sharply pointed, smooth and shining, a little anterior. Anterior end regularly rounded, nearly straight dorsally, with a slight fold from the beaks to a little above the middle. Posterior end rostrate, with a distinctly raised fold from the beaks towards the posterior angle, slightly flexed to the right; the dorsal margin excavate below the ligament, descending straight to the rostrum, and slightly sinuate below it. Basal margin broadly rounded, somewhat straightened in the middle. Sculpture consists of close and fine concentric striæ with distinct periods of rest; the striæ are more distinct and slightly raised on both ends, inconspicuous in the centre. Very faint and distant radiate lines are visible under a good lens. Epidermis very thin, light yellowish, easily rubbed off. Colour yellowish-white, darker on and above the posterior fold. Interior of valves white, porcellanous; margins smooth. Hinge: right valve with a central triangular and bifid cardinal, a second in front of it, which is a little smaller and oblique; close and parallel to it is a distinct lateral tooth; a trace of a posterior lateral is mostly present, situate behind the nymphæ, the latter being rather short. Left valve with a posterior, thin and very oblique, and a central, trigonal, bifid cardinal. The ligament is rather short and high. Anterior adductor scars oval, posterior scars almost round and larger. Pallial sinus large, broadly triangular, the highest point near the middle of the antero-posterior axis, thence descending to within a short distance of the anterior adductor scar; the ventral part coalescent with the pallial line, which is parallel to the ventral

margin. A radial line passes from the beaks towards the margin behind the anterior adductor scar, and two posteriorly, all of which, however, are not very conspicuous. Length 45, height 25, diameter 10 mm.

*Hab.*—The species was discovered by Mr. Charles Spencer, of Auckland, on the beach at Opotiki, east coast of the North Island. Later on I found it washed up on New Brighton beach, near Christchurch, dredged it in 6 fathoms in Akaroa harbour, and lately Captain J. Bollons found specimens washed up after a gale at Hicks Bay, north-west of East Cape.

Type in my collection. Named, in compliance with the wish of the late Captain F. W. Hutton, in honour of Mr. C. Spencer, a keen collector and observer of molluscan life, who also very kindly supplied a photograph of the species for reproduction.

LEPTOMYA LINTEA (Hutton). Pl. XVIII, Figs. 10–10c.

*Tellina decussata*, Lamk.: Hutton, Cat. Mar. Moll. N. Zeal., 1873, p. 67, *non* Lamk.

*Tellina linteata*, Hutton, l.c., p. 67.

*Tellina subovata*, Sow.: Hutton, l.c., p. 67; Journ. de Conch., 1878, p. 47; Man. N. Zeal. Moll., 1880, p. 144; P.L.S. N.S. Wales, vol. ix, p. 521, *non* Sowerby.

*Tellina Strangei*, Desh.: Hutton, Journ. de Conch., 1878, p. 47; Man. N. Zeal. Moll., 1880, p. 144; Plioc. Moll. N. Zeal. in Macleay Mem. Vol., 1893, p. 80; Index Faunæ Novæ Zealandiæ, 1904, p. 91, *non* Deshayes.

*Tellina retiararia*, Hutton: Trans. N. Zeal. Inst., vol. xvii, 1885, p. 322.

Hutton's diagnosis runs as follows:—"Oval, thin, pellucid, very finely concentrically and transversely striated; anterior end rounded, posterior end longer, sub-angular, scarcely folded; right valve with two and left valve with one cardinal tooth; lateral teeth obsolete. White. Height .6; length .82 (= 15.5 × 21 mm.). Stewart's Island."

The following emendations are here offered:—The shell is more or less inequilateral, the beaks anterior. Sculpture consists of fine, subequidistant concentric striæ with better marked periods of rest, sometimes lamellar on the posterior end, where a distinct fold runs down from the beaks; this concentric sculpture is reticulated by exceedingly fine and close-set radiate striæ. Escutcheon clearly defined, lanceolate, with oblique sublamellar folds, devoid of radiate sculpture. Epidermis easily rubbed off, thin and light yellowish. Colour mostly white, sometimes inconspicuously irregularly concentrically banded with darker and lighter yellowish-brown. The interior is white, porcellanous, the margins smooth. Hinge-plate narrow and short; the right valve with two simple, slightly triangular cardinals, the anterior oblique, posteriorly a narrow and very oblique resilium. Left valve with a stout, bifid or trifid cardinal, in front of which is sometimes, but not always, a small lateral tooth. Ligament short, with very slender nymphæ. The anterior adductor scar is oblong, not very distinct, the posterior scar round or oval and

well impressed. Pallial sinus deep and broad, rounded in front, not coalescent at the base with the pallial line.

*Dimensions*.—Auckland specimen: length 14, height 11, diameter 6 mm. Elongated specimen from Stewart Island: length 25, height 17, diameter 10 mm.

*Hab.*—Stewart Island (type). There are also specimens in my collection from Auckland Harbour; 25 fathoms near Channel Island, Hauraki Gulf; Manukan Harbour; and Petane Harbour.

Type in the Colonial Museum, Wellington. To the synonyms mentioned by Hutton in his Pliocene Mollusca *T. decussata* has to be added, as there are specimens of *L. linteæ* in the Colonial Museum labelled with Lamarck's name by Hutton. The specific name *Stangeri*, Desh., used for our species up to a few years back, had to be abandoned since Mr. Hedley kindly told me that Mr. E. A. Smith in his Marine Mollusca of the Maldive and Laccadive Archipelagoes (p. 627) had reduced *T. Stangeri* to a synonym of *T. carnicolor*, Hanley. The tracing of the figure of the latter, also sent by Mr. Hedley, at once convinced me that our *linthea* is quite a different species. About two years ago I sent a few specimens of our shell to Mr. E. A. Smith, of the British Museum, asking him to be good enough and tell me whether they were the same as *T. subovata*, Sow., and I am indebted to him for the following information:—"The bivalve is not a *Tellina* and quite distinct from *T. Stangeri*, Desh., and *subovata*, Sow. It has a different dentition and internal ligament which is not found in *Tellina*. It is near the genus *Leptomya*, A. Adams."

I had full confidence in Hutton's classification, and had never closely examined the hinge, or I should have seen that it is not a *Tellina*.

The shell is variable in length and colour, but the chief characters are constant in all specimens I have seen. The yellowish-brown and elongate form I know only from Stewart Island; specimens from the North Island are always white and nearly equilateral. This variability may no doubt account for the many names adopted for this species, but a worker in New Zealand may well be excused making a mistake now and again, for reasons pointed out by me in several places. Notwithstanding some unavoidable errors, conchologists will agree with me when I express the opinion that the work done by the late Captain F. W. Hutton was good and accurate. Few men could have done better under the prevailing circumstances.

#### DENTALIUM (EPISIPHON) ARENARIUM, n.sp. Pl. XVIII, Fig. 11.

Shell arcuate, tapering, thin and shining, with a yellowish tinge. At the apex 10 equidistant rounded longitudinal ribs, which may increase to 12 or more towards the anterior end; interspaces distinctly longitudinally grooved, the number of these grooves being 5 to 7, with minute, fine, somewhat irregular growth-rings. When the aperture has been damaged the new growth of the shell may show but traces of the costæ, being minutely reticulate. Posterior and anterior section of shell circular. Apex with a central small tube inserted in the partly

closed orifice, with a slight dorsal direction. Length 19 mm.; diam. of aperture 2.5, diam. of apex .75 mm.; tube, length 1, diam. .4 mm.

*Hab.*—Dredged in 18 fathoms, Port Pegasus, Stewart Island, by Captain J. Bollons.

Type in my collection. My largest specimen has a length of 28 mm. This is a very interesting addition to the fauna of New Zealand. A species belonging to the same subgenus (*D. virgula*) was described by Hedley in 1903,<sup>1</sup> the specimens being obtained in 41 to 75 fathoms off the coast of New South Wales.

*D. arenarium* is, as far as I can ascertain, the first species of the subgenus known to possess well-pronounced longitudinal ribs. The little apical tube is present in all the eight specimens collected.

*MOPALIA AUSTRALIS*, n.sp. Pl. XVIII, Figs. 12–12a.

Shell very small, elongately oval, with a blackish leathery girdle and sutural tufts. Anterior valve with 8 slits, teeth smooth. Intermediate valves with a rounded central posterior projection, insertion plates with one slit. Posterior valve depressed, with an oblique slit on each side and bisinuate in the middle behind. Girdle narrow, leathery, slightly broader on the sides, with a few sutural spicules. Colour probably ash-grey with a few longitudinal brown stripes on the jugum; inside bluish grey with a posterior brown margin. On the intermediate valves the tegmentum forms a narrow band by passing beyond the articulation. Sinus broad and slightly pectinate, the sutural plates narrowly rounded. The valve callus is quite distinct. Length 9, breadth 5.5 mm.; divergence 120°.

*Hab.*—I am indebted to Captain J. Bollons for two specimens he collected at the Snares Islands (south of Stewart Island).

Type in my collection. Both examples are so much corroded that it is impossible to recognize the sculpture. The side-slits of the posterior valve leave no doubt about its generic position. This species is, as far as I know, the first of the genus recorded from the southern hemisphere.

*EUSPIRA VENUSTA*, n.sp. Pl. XVIII, Fig. 13.

Shell large, globose, white, imperforate, with two low spiral ribs round the umbilical region. Sculpture consists of close, unequal, slightly wavy lines, which are crossed by subequidistant fine growth-lines, interspersed with distant strong and flexuous radial folds, very likely marking periods of rest. Colour light bluish white, porcellanous. Spire conoidal, about one-fourth the height of the shell. Protoconch depressedly globose, formed by 2½ smooth and convex whorls. Whorls 5½, first slowly, then rapidly increasing, convex, the last whorl very large and rounded, base convex; two low and broadly rounded ribs encircling the umbilical region, the outer rib beginning at the lower third of the penultimate whorl and terminating at the junction of the outer with the basal lip. Suture not deep, on the last 1½ whorls with a milk-white broad inferior band. Mouth large, broadly ovate below,

<sup>1</sup> Mem. Austral. Mus., vol. iv, p. 328.

much excavated above by the penultimate whorl. Outer lip broadly rounded, thin and sharp, inner lip spreading as a thin and broad callus over the body-whorl, but forming a thick, white, and shining callus on the concave columella. Basal lip narrowly rounded, not produced. The columellar border is regularly S-shaped. Height 40, diam. 37 mm.

*Hab.*—This unique specimen was found by a fisherman near Cape Farewell, and came into Captain J. Bollons' possession. He most kindly presented it to me.

Type in my collection. This shell shows a peculiarity which I do not remember ever having seen in any other shell. Looking up from the base, there is visible inside the columellar border a perforation right up to the apex of the shell, having a diameter of about 3 mm. at the base; the columella does not form a vertical solid pillar, but is wound up in a spiral, leaving a free space in the centre. I use the generic name *Euspira*, Desor & Agassiz, 1837, as proposed by Harris in his *Cat. Tert. Moll. Brit. Mus.*, pt. i, p. 264.

This species is very nearly allied to the Pliocene shell *Sigaretus* (?) *Drewi*, Murdoch,<sup>1</sup> and has almost the same size, but is distinguished from it by being more globose, the periphery not flattened, the columella more concave, and the presence of two umbilical ridges.

The Rev. Mr. Webster first announced the occurrence of the genus as recent in New Zealand waters by enumerating amongst shells to be added to the fauna list *Sigaretus undulatus*, Hutton, from Cape Maria van Diemen.<sup>2</sup> I have not seen his specimen, but it seems to be very different from the species now described. It is a highly interesting fact that New Zealand has two species still living, while the only other known recent species, *E. fluctuata*, Sow., inhabits the Philippines.

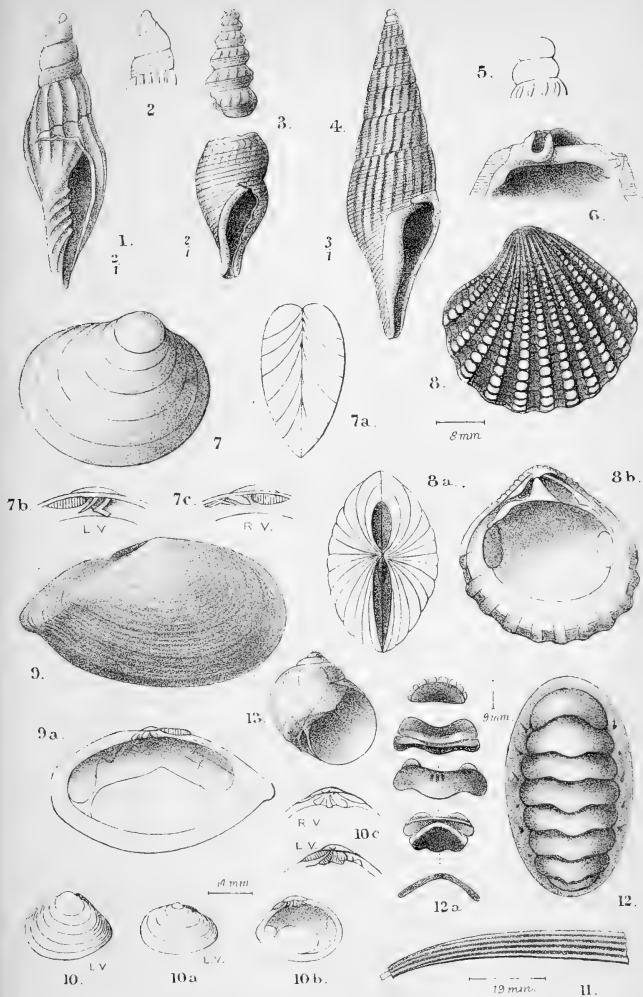
As my specimen is an empty shell, we remain for the present in ignorance with regard to operculum and animal.

#### EXPLANATION OF PLATE XVIII.

- FIG. 1. *Lapparia Parki*, n.sp. × 2.  
 ,, 2. ,, ,, Back view of protoconch, magnified.  
 ,, 3. *Pleurotoma Pareoraensis*, n.sp. × 2.  
 ,, 4. *Exilia Dalli*, n.sp. × 3.  
 ,, 5. ,, ,, Protoconch, magnified.  
 ,, 6. *Cardium Waitakiense*, n.sp. Hinge. Nat. size.  
 FIGS. 7, 7a. *Corneoicyclis Aucklandica*, n.sp. Shell, magnified.  
 ,, 7b, 7c. ,, ,, Cardinals of valves.  
 ,, 8, 8a. *Venericardia Bollonsi*, n.sp. Shell, magnified.  
 FIG. 8b. ,, ,, Interior of right valve.  
 ,, 9. *Tellina Spenceri*, n.sp. Shell. Nat. size.  
 ,, 9a, 9b. ,, ,, Interior of right valve.  
 ,, 10. *Leptomya linteae*, Hutton. Shell, magnified.  
 ,, 10a. ,, ,, ,, Elongated form, nat. size.  
 ,, 10b. ,, ,, ,, Interior of left valve.  
 ,, 10c. ,, ,, ,, Hinges of the two valves.  
 ,, 11. *Dentalium arenarium*, n.sp. Magnified.  
 ,, 12. *Mopalia australis*, n.sp. Much magnified.  
 ,, 12a. ,, ,, Valves, much magnified.  
 ,, 13. *Euspira venusta*, n.sp. Nat. size.

<sup>1</sup> Proc. Malac. Soc., vol. iii, p. 320.

<sup>2</sup> Trans. N. Zeal. Inst., vol. xxxvii, p. 281.







DESCRIPTION OF A NEW SPECIES OF *LATIRUS*.

By JAMES COSMO MELVILL, M.A., F.L.S.

Read 14th December, 1906.

*LATIRUS* (*PERISTERNIA*) *SOWERBYI*, n.sp.

*L. testa mediocri, fusiformi, utrinque attenuata, solida, anfractibus 7, apice parvo, lævi, cæteris ad suturas paullum impressis, quatuor supernis (apicali escluso) gradatim multum attenuantibus, ultimo cæteris exsuperante, apud basim attenuante, undique costis crassiusculis decoratis, nigro-brunneis vel (in uno specimine) castaneis, spiraliter crassiliratis, liris irregulariter hic illic nitide albopustulatis, præsertim prope basim, apertura lactea vel violascente, pyriformi, subtus elongata, canali producto, columella nitida, obscure triplicata. Long. 19, lat. 8 mm.*

*Hab.*—Galapagos Isles (?).



A remarkable little *Peristernia*, much attenuate at either extremity. The thickened, dark or chestnut-coloured longitudinal ribs, and white shining scattered pustules, more gregarious near the base of the body-whorl, are likewise characteristic, as is the pyriform aperture, much narrowed basally, the canal being somewhat prolonged. Four examples, supposed to be from the Galapagos Islands, but a slight element of uncertainty exists as to this. I am much indebted to Mr. G. B. Sowerby for handing me this interesting species with a view to description, and it gives me pleasure to connect his name with it. The type has been placed in the British Museum (Natural History).

ON THE ANATOMY OF *TAGELUS GIBBUS* AND *T. DIVISUS*.

By H. H. BLOOMER.

Read 14th December, 1906.

## PLATE XIX.

I DESIRE first of all to thank Professor W. H. Dall, of the United States National Museum, for so kindly allowing me to examine the following specimens:—

*TAGELUS GIBBUS* (Spengler).

*External Characters.*—The animal measures from the anterior side of the anterior adductor muscle to the posterior side of the posterior adductor muscle 48 mm. and is 19 mm. deep. It curves a little dorsally along the dorsal surface, and laterally is slightly constricted. Separately the mantle-lobes (Fig. 1, *M.L.*) project a little dorso-anteriorly from the anterior adductor muscle, and passing around the mantle edges it is observed that they are curved anteriorly, and there is no concrescence of the apposed surfaces until a position directly ventral to the posterior adductor muscle is reached, which also marks the great extent of the pedal aperture. Between this point of concrescence and the posterior adductor muscle the mantle edges are not again concresced. At the junction of the mantle-lobes, ventrally to the posterior adductor muscle, is the musculus cruciformis (Fig. 1, *M.C.*), the terminations of which are on each side, situated equally, though some distance, apart. The proximal portion of the siphon (Fig. 1, *Ex.S.* and *In.S.*) commences close to the posterior adductor muscle, but soon takes a deep bend inwardly, so that the central part lies ventrally to the retractor pedis posterior muscle. It then returns and ends above the musculus cruciformis. Along the antero-lateral margin the siphon is coalesced with the inside walls of the mantle-lobes, thereby completely enclosing the posterior part of the pallial cavity, with the exception of the siphonal apertures. The mantle-lobes extend a considerable distance posterior to their fusion with the proximal portion of the siphon, and are capable of enveloping the greater part of the free siphonal tubes (Fig. 1, *P.L.P.*). The latter are long and separate, the exhalent (Fig. 1, *Ex.S'*) being longer than the inhalent one (Fig. 1, *In.S'*). They have thick walls and are very muscular. Internally they are ribbed longitudinally and transversely, the transverse ribbings being very close together. The retractor siphonal muscles (Fig. 1, *S.R.M.*) are short and thick, and soon spread out into an oblong-ovate-shaped body, and from a large surface adhere to the valves of the shell.

When contrasted with *Tagelus rufus*<sup>1</sup> it will be observed that in

<sup>1</sup> "The Anatomy of *Pharella orientalis*, Dunker, and *Tagelus rufus*, Spengler": Journ. Malac., vol. x (1903), p. 114.

*Tagelus gibbus* the mantle-lobes are much more muscular, while those portions of them posterior to the posterior adductor muscle are not so deep; the free siphonal tubes, though larger and more muscular, are shorter, and the central part of the proximal portion of the siphon is situated more posteriorly; the posterior part of the anterior adductor muscle is comparatively larger, but both portions of the muscle are of the same depth. In *T. rufus* the anterior is deeper than the posterior part, but the division by the ventral integument passing between the two parts is not so marked; the posterior adductor muscle is smaller; the foot is more muscular; the free portion of the pedis retractor posterior muscle is shorter and thicker, and the distal ends of its bifurcations rest on the antero-dorsal surface of the posterior adductor muscle instead of being united with the anterior side as they are in *T. rufus*.

Compared with *Solecurtus Dombeyi* (Lam.),<sup>1</sup> it will be seen that in *T. gibbus* the mantle-lobes, anterior to the siphon, are about as muscular, whilst the proximal portion of the siphon is not nearly so muscular, and the free portions of it do not appear to possess the power of inversion like those of *S. Dombeyi*; the depth of the anterior adductor muscle is not so great, nevertheless the posterior portion is larger; the foot is not nearly as large or as muscular; the free portion of the pedis retractor posterior muscle is much longer, and the posterior part of the animal is also much longer.

It will thus be inferred from the foregoing that *T. gibbus* possesses some of the characters of both *T. rufus* and of *S. Dombeyi*, but anatomically lies nearer the latter than the former species.

*Pallial Muscles.*—The muscles of the pallial edge commence at the anterior adductor muscle as a deep band and gradually diminish in depth as they proceed posteriorly.

The anterior adductor muscle (Fig. 1, *A.A.*) is a muscle of even depth, being about three times as long as deep, with the anterior part slightly curved ventrally. The smaller posterior part is separated from the anterior by the ventral muscular integument passing between them. The muscle is connected anteriorly with the mantle-lobes, and posteriorly with the body-covering and retractor pedis anterior muscles.

The posterior adductor muscle (Fig. 1, *P.A.*) is an ovate-shaped muscle connected anteriorly with the body-covering and the bifurcated ends of the retractor pedis posterior muscle, and posteriorly with proximal portions of the siphon and mantle-lobes.

The musculus cruciformis (Fig. 1, *M.C.*), as before stated, is situated ventrally to the posterior adductor muscle. The united portion is thick and short, with the four distal ends of nearly equal length.

The branchial retractor muscles are present, but less prominent and not so well developed as those of *Solecurtus strigillatus*.

*Pedal Muscles.*—The foot (Fig. 1, *F.*) is deep, short, and very muscular. The general appearance shows it to consist of numerous

<sup>1</sup> "On the Anatomy of certain Species of Solenidae": op. cit., vol. xii (1905), p. 78.

bundles of longitudinal muscles with a large number of transverse ones, the whole encased in a muscular integument.

The retractor pedis anterior muscle is not very long or bifurcated, and on reaching the proximal portion of the foot its fibres run chiefly posteriorly and internally to the longitudinal muscles.

The retractor pedis posterior muscle is very long, and the distal ends of the bifurcated portions rest on the antero-dorsal surface of the posterior adductor muscle.

The protractor pedis muscles are very short, and lie close to the retractor pedis anterior muscles.

There is some slight indication of the presence of weakly developed elevator pedis muscles.

*Alimentary Canal.*—The wide mouth (Figs. 2 and 3, *M.*) points anteriorly with the lips (Figs. 2 and 3, *A.L.* and *P.L.*), projecting forwards. The œsophagus (Figs. 2 and 3, *Oe.*) is very short, and quickly opens into the stomach. The stomach is comparatively large, the posterior being larger than the anterior portion. The division of it into distinct parts is well defined on the left side, but on the right side is only traceable with difficulty. On the left side, the œsophageal division (Fig. 2, *Oe.St.*) is small, and separated from the central (Fig. 2, *C.D.*) and cardiac (Fig. 2, *C.St.*) divisions by muscular ridges. Posterior to the œsophageal division lies the central division, and above the central division is the cardiac division, the latter being very small. The dorsal ridge of the central division is developed into a muscular papilla, the continuation of it extending nearly across the stomach (Figs. 2 and 3, *M.P.*). From the dorsal side of the papilla runs another muscular ridge separating the cardiac from the posterior division. The pyloric division (Figs. 2 and 3, *P.St.*) occupies the remaining, and larger, portion of the stomach. Where the cæcum of the crystalline style (Figs. 1, 2, and 3, *C.C.*) leaves the pyloric division on its ventral side it is very large, but soon tapers to a diminished size, and then passes with a curve to the dorsal part of the pedal cavity about the centre of the foot. At the junction of the cæcum of the crystalline style and the stomach is a raised muscular ridge. The crystalline style itself extends all along the cæcum and the centre of the stomach to the anterior part. The intestinal wall (Fig. 3, *In.*) is fused with that of the cæcum of the crystalline style, and appears as a groove on the right side of the latter, but near the distal end of the cæcum is quite entire (Fig. 1, *In.*). The intestine afterwards returns along the right lateral side of the cæcum for some distance, when, becoming free, proceeds with a curve to the posterior side of the pyloric division, where it forms a large number of folds, and, bending posteriorly, passes over the posterior adductor muscle into the exhalent siphonal chamber (Fig. 1, *A.*). The liver (Fig. 1, *L.*) covers the stomach with the exception of the dorsal surface at the anterior end.

*Nervous System.*—The cerebro-pleural ganglia are situated on each side, a little anterior to the mouth, and are connected by a commissure passing in front of it.

The visceroparietal ganglia are situated underneath the bifurcated

parts of the retractor pedis posterior muscle, a position anterior to the posterior adductor muscle. The branchial nerve takes a deep bend anteriorly before reaching the gills.

The pedal ganglia are situated between the transverse pedal muscles close to the cæcum of the crystalline style, but some little distance anterior to the distal end of it.

#### *TAGELUS DIVISUS* (Spengler).

The animal measures from the anterior side of the anterior adductor muscle to the posterior side of the posterior adductor muscle 25 mm., and is 11 mm. deep. Dorsally it is curved outwardly, but along the ventral surface is nearly straight. The mantle-lobes (Fig. 4, *M.L.*) are connected with the anterior side of the anterior adductor muscle, whence they first outline a large anterior curve, and afterwards pass posteriorly in nearly a direct course, until a position almost ventral to the posterior adductor muscle is reached before the marginal parts are joined together, thus denoting the great extent of the pedal aperture. The foot (Fig. 4, *F'*) is comparatively larger, deeper, and more muscular. In the single specimen under examination it lies in an antero-ventral direction, but whether this is its natural resting position is doubtful, as there is some indication of more than normal tension of the muscles in and near the anterior region of the proximal portion of the foot; however, the fact that the range of the pedal aperture extends so far posteriorly in the different species of *Tagelus* and the presence and situation of certain pedal muscles point to the use of the foot in a ventral as well as an anterior plane of movement.

The proximal portion of the siphon (Fig. 4, *Ex.S.* and *In.S.*) is situated between the mantle-lobes, a little antero-ventrally to the posterior adductor muscle, whilst laterally it is united with the inside surface of each mantle-lobe, thus quite enclosing the posterior portion of the pallial cavity with the exception of the siphonal apertures. Behind this coalesced line the mantle-lobes (Fig. 4, *P.L.P.*) extend separately some distance posteriorly, so enabling them, when necessary, to completely envelop the free siphonal tubes (Fig. 4, *Ex.S'* and *In.S'*). The latter are separate from each other with the distal ends pointing dorsally, and, though somewhat contracted, they are relatively shorter than those of allied species. Anteriorly the proximal portion of the siphon continues on each side of the animal as a siphonal retractor muscle (Fig. 4, *S.R.M.*), which is short, thick, and rounded, but soon spreads out into an ovate-shaped body, and from the external surface adheres to the adjacent valve of the shell.

When contrasted with the other species of *Tagelus* it will be seen that *T. divisus* possesses quite distinctive characters. Its resemblance to *Solecurtus Dombeyi* is noticeable in the muscular mantle-lobes, the strongly developed muscular foot, the diminished length of the free siphonal tubes, and the power of the posterior parts of the mantle-lobes to completely envelop them, when necessary; but it differs from this and the other species in its greater depth, in the comparative largeness of the anterior and posterior muscles and of the musculus cruciformis, in the length of the retractor pedis posterior

muscle (which is much longer than that of *S. Dombeyi*, but shorter than that of either *T. rufus* or *T. gibbus*), and, as far as I have been able to ascertain from the specimens submitted to me for examination, in the possession of elevator pedis and protractor pedis muscles.

*Pallial Muscles.*—The muscles of the mantle-lobes (Fig. 4, *M.L.*) begin at the anterior end as a deep band, and lessen in depth as they proceed posteriorly.

The anterior adductor muscle (Fig. 4, *A.A.*), which lies inclined a little in an antero-ventral position, is a broad and deep muscle, curved dorsally, and gradually decreasing in depth towards the posterior side. It is connected anteriorly with the mantle-lobes and posteriorly with the proximal portion of the foot and body-covering. I cannot trace any complete division of it by the ventral integument passing between the anterior and posterior portions.

The posterior adductor muscle (Fig. 4, *P.A.*) is very deep, but shallows somewhat towards the posterior side. It is connected anteriorly with the body-covering and the posterior retractor pedis muscle, and posteriorly with the mantle-lobes.

The musculus cruciformis (Fig. 4, *M.C.*) is a broad transverse muscle situated ventrally to the posterior adductor muscle, near to the edge of the mantle-lobe. It appears to be in one piece, of nearly the same width and depth throughout, with its external surfaces adhering to the valves of the shell. There is a slight indication of the presence of the branchial muscles (Fig. 4, *B.R.*), which are attached to the shell a little behind the pedis elevator muscles.

*Pedal Muscles.*—As before stated, the muscles of the foot are very muscular, the muscularity reaching as far as the dorsal surface of the proximal portion of it.

The protractor pedis muscles (Fig. 4, *P.P.*) are short and situated posterior to, with the terminal parts a little over, the anterior adductor muscle.

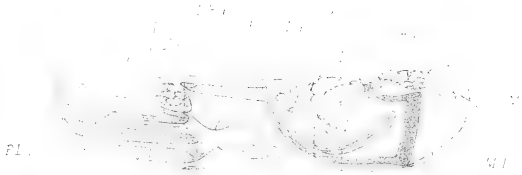
The retractor pedis anterior muscles (Fig. 4, *P.R.A.*) are likewise short, and situated a little distance posterior to the protractor pedis muscles.

The elevator pedis muscles (Fig. 4, *E.P.*) are posterior, though nearer the median line, to the retractor pedis anterior muscles.

The retractor pedis posterior muscle (Fig. 4, *P.R.P.*) is a rounded muscle of medium length, with the distal end of it bifurcated, the bifurcations resting on the antero-dorsal edge of the posterior adductor muscle.

*Alimentary Canal.*—The lips (Figs. 4, 5, and 6, *A.L.* and *P.L.*) point antero-ventrally. The œsophagus (Figs. 5 and 6, *A.L.* and *P.L.*), which is of medium length, soon expands into the œsophageal division of the stomach (Figs. 5 and 6, *Oe.St.*). This division widens out posteriorly as far as what I have previously termed the muscular papilla (Fig. 5, *M.P.*). The anterior continuation of the latter projects laterally some considerable distance across the stomach, separating the cardiac (Fig. 5, *C.St.*) from the central (Fig. 5, *C.D.*) division, but both of these divisions are small. The pyloric division (Figs. 5 and 6, *P.St.*) is large, and continues as the cæcum of the crystalline style





1



2



3



4



5



6

HHB del. ad nat

Huth Lith London

ANATOMY OF TAGELUS GIBBUS & T. DIVISUS.



(Figs. 5 and 6, *C.C.*), which is a sac of considerable length passing directly near to the ventral surface of the foot, when it curves sharply and proceeds to the dorsal surface of the pedal cavity. The intestine (Figs. 4, 5, and 6, *In.*) appears as a constricted groove (Fig. 6, *In.*) on the right side of the cæcum of the crystalline style. Near the distal end of the cæcum the intestinal wall becomes complete, and the intestine returns along, and attached for some distance to, the right lateral side of the cæcum; then, leaving it, proceeds with a curve to the dorsal surface of the pyloric division, and, turning posteriorly, goes as the rectum (Fig. 4, *R.*) over the posterior adductor muscle, around its posterior side to the exhalent chamber (Fig. 4, *A.*).

The nervous system apparently is very similar to that of *T. gibbus*.

#### EXPLANATION OF PLATE XIX.

##### *TAGELUS GIBBUS* (Spengler).

- FIG. 1. View from right side, showing the alimentary canal, etc. Nat. size.  
 ,, 2. Longitudinal section of the stomach, showing the internal structure of the left side.  $\times 2$ .  
 ,, 3. Longitudinal section of the stomach, showing the internal structure of the right side.  $\times 2$ .

##### *TAGELUS DIVISUS* (Spengler).

- ,, 4. View from right side, showing the alimentary canal, etc.  $\times 2$ .  
 ,, 5. Longitudinal section of the stomach, showing the internal structure of the left side.  $\times 3$ .  
 ,, 6. Longitudinal section of the stomach, showing the internal structure of the right side.  $\times 3$ .

*A.* anus; *A.A.* anterior adductor muscle; *A.L.* anterior or upper lip; *B.R.* branchial retractor muscle; *C.C.* cæcum of crystalline style; *C.D.* central division of the stomach; *C.St.* cardiac division of the stomach; *E.P.* elevator pedis muscle; *Ex.S.* proximal portion of the exhalent siphonal chamber; *Ex.S'* exhalent siphonal tube; *F.* foot; *F.In.* folded portion of the intestine; *In.* intestine; *In.S.* proximal portion of the inhalent siphonal chamber; *In.S'* inhalent siphonal tube; *L.* liver; *M.* mouth; *M.C.* musculus cruciformis, a transverse muscle situated ventrally to the siphon; *M.L.* left mantle-lobe; *M.P.* developed portion of the muscular ridge, extending a considerable distance across the stomach and representing the continuation of the muscular papilla of *Solen*; *Oe.* œsophagus; *Oe.St.* œsophageal division of the stomach; *P.A.* posterior adductor muscle; *P.L.* posterior or lower lip; *P.L.P.* posterior portions of the mantle-lobes, which envelop and are connected anteriorly with the siphon; *P.P.* protractor pedis muscle; *P.R.A.* retractor pedis anterior muscle; *P.R.P.* retractor pedis posterior muscle; *P.St.* pyloric division of the stomach; *R.* rectum; *S.R.M.* siphonal retractor muscle; *St.* stomach.

DESCRIPTION OF TWO NEW SPECIES OF HELICOID  
LAND-SHELLS FROM GERMAN NEW GUINEA.

By J. H. PONSONBY, F.Z.S.

Read 14th December, 1906.

RHYTIDA BEDNALLI, n.sp.

Testa depressa, tenuis, patuliformis, corneo-fusca, nitida, umbilicata; anfr. 4 rotundati, sutura bene impressa, vix canaliculata separati, undique pulcherrime regulariter costulati et lineis nonnullis spiralibus leviter notati, ultimus rotundatus, non descendens; umbilicus apertus, infundibuliformis, usque ad apicem pervius, anfr. omnes exhibens; apertura obliqua, fere rotunda, tenuis, marginibus distantibus. Diam. maj. 7, min. 6 mm.; alt. 3.5 mm.; apertura 2.5 lata.

*Hab.*—German New Guinea.



A pretty little species with rather deeply cut suture and wide perspective umbilicus. The spiral sculpture, which in reality is little more than impressed scratches, is very irregular, but here and there distinctly visible both above and below the rounded periphery.

COLIOLUS THRIX, n.sp.

Testa elata, conico-pyramidalis, umbilicata, fusca, strigis et maculis albidis sparsim notata sub epidermide brunnea, dense longipilosa; anfractus 8-9, convexi, ultimus acute carinatus, vix descendens; 3 primi



embryonales spiraliter striati, cæteri undique oblique ruditer striati, epidermide hirsuta induti, sensim a periphèria ad apicem obtusum decrescentes. Basis fere plana, medio circa umbilicum modicum

leviter excavata. Apertura oblique ovata, marginibus distantibus, callo albo elevato junctis. Peristoma tenue, flexuosum, margine columellari brevi, vix incrassato et reflexiusculo. Diam. maj. 13, min. 12 mm.; alt. 13.5 mm.; apertura 7 mm. lata.

*Hab.*—German New Guinea.

The genus *Coliulus* was founded by Tapparone - Canefri for *C. Arfakiensis*, the other known species being *Canefriana*, Smith, and *Weiskei*, Fulton. *C. thrix* therefore forms an interesting addition to this restricted genus, in which, judging from shell characters, it is best included. The sculpture and arrangement of the hairy epidermis resemble those features as described in *C. Arfakiensis*, but the shells now dealt with have only 9 as against 11 whorls, and the general form, as will be seen from the accompanying figures, is quite different. This and the preceding species were received by Mr. Bednall of Adelaide from German New Guinea, and were kindly forwarded by him to the writer for description.

---

DESCRIPTIONS OF SEVEN NEW SPECIES OF *ACHATINA* FROM  
THE CONGO FREE STATE.

By S. I. DA COSTA.

Read 11th January, 1907.

PLATE XX.

THE writer is indebted to Mr. George Grey for his kindness in sending him several interesting shells from the southern part of the Congo State, about  $10^{\circ} 30'$  S. lat., between the watershed of the Lualaba and Lufira rivers. Among them are the following seven species of *Achatina*. Although they differ materially in form and texture from one another, their general characteristics are somewhat similar, the writer therefore refrains from making comparisons between them and the species of other authors. His most cordial thanks are due to Mr. E. A. Smith for the valuable assistance afforded him in the investigations rendered necessary before undertaking the descriptions of these new species.

*ACHATINA GREYI*, n.sp. Pl. XX, Fig. 1.

Testa fusiformi-ovata, subventricosa, imperforata, tenuis, straminea, strigis fulguratis latis fuscis, in anfractu ultimo ad basim productis ornata; anfractus  $7\frac{1}{2}$ , parum convexi, longitudinaliter striati, priores minutissime granulati, ultimus fortiter reticulatus,  $\frac{5}{8}$  longitudinis æquans; sutura suberenulato-marginata; apex obtusus; columella leviter torta, oblique truncata; apertura ovalis, intus lactea; peristoma simplex, acutum. Long. 58, diam. 32 mm.; apertura 32 mm. longa, 15 lata.

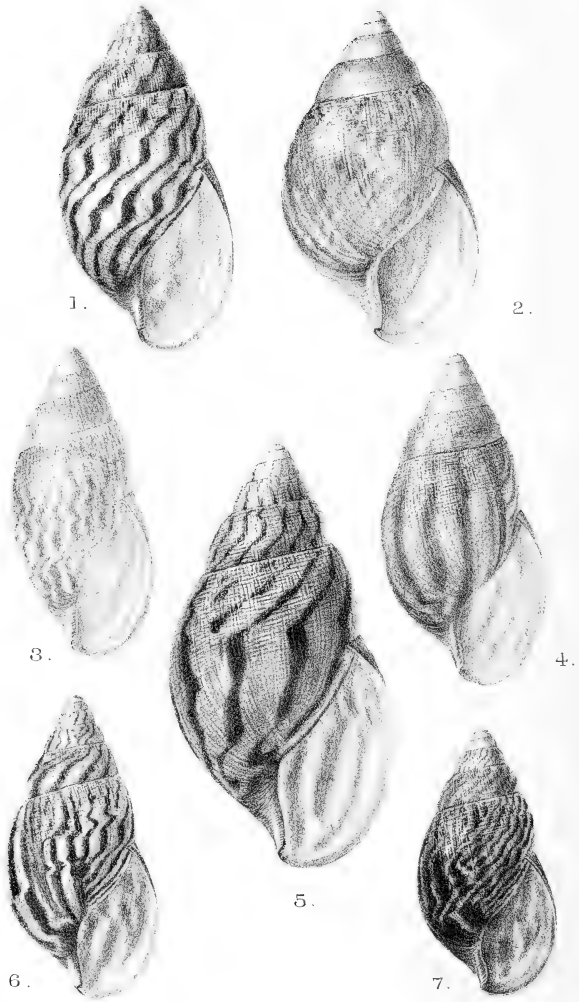
*ACHATINA OVATA*, n.sp. Pl. XX, Fig. 2.

Testa ovata, ventricosa, imperforata, tenuissima, fulva, strigis pallide brunneis fulguratis ornata; anfractus 7, longitudinaliter rugoso-striati, priores minutissime granulati, ultimus  $\frac{3}{5}$  longitudinis æquans, strii infra medium evanidis; apex obtusus; sutura suberenulata; columella recta, alba, leviter torta, abrupte truncata; apertura oblongo-ovalis, intus cæruleo-lactea; peristoma simplex, acutum. Long. 56, diam. 32 mm.; apertura 30 mm. longa, 16 lata.

*ACHATINA TRANSPARENS*, n.sp. Pl. XX, Fig. 3.

Testa oblongo-ovata, imperforata, tenuissima, nitida, diaphana; anfractus 7, longitudinaliter subplicato-striati, priores sub lente minutissime granulati, fusciscentes, strigis castaneo-brunneis undatim fulguratis picti; ultimus  $\frac{3}{5}$  longitudinis æquans; apex obtusus; sutura impressa; columella recta, abrupte truncata; apertura parum obliqua, semiovalis, intus margaritacea, peristoma simplex, acutum. Long. 51, diam. 23 mm.; apertura 26 mm. longa, 12 lata.





A. H. Searle, Del. et Lith.

NEW SPECIES OF ACHATINA.

*ACHATINA SUBOVATA*, n.sp. Pl. XX, Fig. 4.

Testa oblongo-ovata, subventricosa, imperforata, crassiuscula, straminea, strigis latis castaneis ornata; anfractus 7, longitudinaliter subtiliter striati, undique granoso-decussati; ultimus  $\frac{3}{4}$  longitudinis æquans; spira conica; apex obtusiusculus; sutura subcrenulata; columella recta, leviter torta, oblique truncata, cærulea; apertura oblongo-ovalis, intus lactea; peristoma simplex, acutum. Long. 55, diam. 20 mm.; apertura 28 mm. longa, 14 lata.

*ACHATINA ZEBRINA*, n.sp. Pl. XX, Fig. 5.

Testa ovato-fusiformis, subventricosa, imperforata, tenuis, straminea, strigis latis fuscis ornata; anfractus 7, longitudinaliter striati, undique granoso-decussati; ultimus spiram paulo superans; apex obtusatus; sutura subcrenulata; columella alba, subcontorta, abrupte truncata; apertura ovalis, intus cæruleo-lactea; peristoma simplex, acutum. Long. 70, diam. 38 mm.; apertura 38 mm. longa, 18 lata.

*ACHATINA VIRGULATA*, n.sp. Pl. XX, Fig. 6.

Testa fusiformi-ovata, subventricosa, imperforata, tenuis, straminea, strigis latis fulminatis nigricante-castaneis ornata; anfractus 7, longitudinaliter rugoso-striati, priores sub lente minutissime granulati; ultimus  $\frac{3}{4}$  longitudinis æquans, infra medium obsolete decussatulus; spira conica; apex obtusiusculus; sutura impressa; columella recta, leviter torta, oblique truncata, cærulea; apertura angulato-ovalis, intus albida, strigis translucetibus; peristoma simplex, acutum. Long. 50, diam. 27 mm.; apertura 25 mm. longa, 13 lata.

*ACHATINA OBSCURA*, n.sp. Pl. XX, Fig. 7.

Testa ovato-conica, tenuiuscula; imperforata, castanea, strigis fulminatis saturate fulvis et nigris variegata; anfractus 7, convexiusculi, longitudinaliter striati, priores sub lente minutissime granulati; ultimus  $\frac{3}{4}$  longitudinis æquans, infra medium obsolete decussatulus; spira conica; apex obtusiusculus; sutura marginata; columella cæruleo-alba, subcontorta, oblique truncata; apertura oblongo-ovalis, intus cæruleo-alba; peristoma simplex, acutum. Long. 44, diam. 23 mm.; apertura 23 mm. longa, 12 lata.

## EXPLANATION OF PLATE XX.

- FIG. 1. *Achatina Greyi*, n.sp.  
 ,, 2. ,, *ovata*, n.sp.  
 ,, 3. ,, *transparentis*, n.sp.  
 ,, 4. ,, *subovata*, n.sp.  
 ,, 5. ,, *zebrina*, n.sp.  
 ,, 6. ,, *virgulata*, n.sp.  
 ,, 7. ,, *obscura*, n.sp.

A FURTHER CONTRIBUTION TO OUR KNOWLEDGE OF THE GENUS  
*CHLORITIS*, WITH DESCRIPTIONS OF ELEVEN NEW SPECIES.

By G. K. GUDE, F.Z.S.

Read 11th January, 1907.

PLATE XXI.

AN interesting collection of shells from Australia and the Solomon Islands, sent over by Dr. J. C. Cox, was received by Mr. J. H. Ponsonby on the eve of his departure for an extended tour to the Far East, and has been placed in my hands for examination. This collection contains, besides a number of interesting specimens of known forms, no less than eight new species of *Chloritis*. A new species of this genus from New Guinea has also been submitted to me for description by Mr. Ponsonby. Moreover, my own collection has contributed two others, both received from the collection of the late Mr. C. E. Beddome; these were accompanied by labels bearing Mr. Brazier's manuscript names and marked "ex auct." I have adopted these names, as no doubt the shells, so labelled, exist in other collections. At the same time, however, I enter a protest against the bestowal of manuscript names, which gives rise to confusion and is an ill service to science.

I take this opportunity of referring to the opinion expressed by the late Mr. Ancey<sup>1</sup> that *Chloritis Malangensis*, Bullen, described as from Java,<sup>2</sup> is probably identical with *Moellendorffia eucharistus*, Pilsbry, from Loo Choo. Mr. Bullen has obligingly allowed me to inspect his types of *C. Malangensis*, and on comparing them with Pilsbry's species I find that they are certainly identical. *C. Malangensis* must therefore be reduced to a synonym of *Moellendorffia eucharistus*, and, as the locality Java is almost certainly erroneous, this habitat must be deleted. The mistake arose most probably, as already suggested by Mr. Ancey, through Mr. Rouyer, from whom Mr. Bullen's shells were received.

Among the shells sent over by Dr. Cox the following call for remark:—

1. A sinistral specimen of *C. eustoma* from the Solomon Islands.
2. A dead and worn specimen of the very rare *C. Beatricis*, from British New Guinea. I have seen only one other, which is in the collection of Colonel Beddome.
3. A large elevated form of *C. quercina*, measuring: diam. maj. 37, min. 31 mm.; alt. 33 mm.

*Hab.*—Shortland Island, Solomon Islands.

<sup>1</sup> Journ. de Conchyl., vol. liv (1906), p. 128.

<sup>2</sup> Proc. Malac. Soc., vol. vi (1905), p. 192, pl. xi, fig. 2.



4. *C. quercina*, var. *Hombroni*, from Florida Island. An extraordinary pyramidal form, the last three whorls planate above, flattened below, obtusely keeled, the keel exerted in all but the last  $\frac{2}{3}$  whorl. Suture superficial. Diam. maj. 37.5, min. 32 mm.; alt. 24 mm.

Both the type and the variety are represented by bipartite specimens, with the upper side ochreous-brown, the lower straw-yellow.

5. *C. Challengeri*, Byron Bay, New South Wales. A new habitat. One other specimen is labelled Clarence and Richmond Rivers.

6. *C. Novocambrica*, an elevated form, labelled "Scrubs 8 miles from the North Pine River, Queensland." A new habitat, the type being described from New South Wales. Diam. maj. 15, min. 12.5 mm.; alt. 11.5 mm. A second specimen measures: diam. maj. 12, min. 10 mm.; alt. 8.5 mm.

In my former paper, on p. 116, the references to *C. Marimberti* and *C. Balansai*, var. *cincta*, have by a printer's error unfortunately been transposed in the footnotes Nos. 2 and 3.

#### DESCRIPTIONS OF NEW SPECIES.

##### CHLORITIS CONOMPHALA, n.sp. Pl. XXI, Figs. 1, a-d.

Shell widely umbilicated, depressed globose, distinctly and regularly striated, pale ochreous, the last whorl pale fulvous, covered with sparse hair-scars arranged in quincunx. Spire low, subplanate, apex immersed, suture deep. Whorls  $4\frac{1}{2}$ , convex, increasing regularly, the last somewhat suddenly, slowly descending and shortly deflexed in front, a little dilated at the mouth, obtusely angulated round the funnel-shaped umbilicus, which shows the entire penultimate whorl within. Aperture subcircular, little oblique, the margins convergent, united by a thin callus, peristome rosy-fulvous, thickened, shortly expanded and reflexed; upper margin arcuate, outer and basal rounded, columellar slightly dilated above, impinging upon the umbilicus. Major diam. 21.5, min. 17.5 mm.; alt. 14 mm.

*Hab.*—Rubiana, Solomon Islands.

Type in Dr. Cox's collection. Allied to *C. discordialis*, but smaller and with the hair-scars much more sparsely placed; the peristome is less expanded, the last whorl less dilated, and the aperture consequently smaller; the last whorl also descends less, and the umbilicus is not so widely excavated. A second specimen measures: major diam. 20, min. 16.5 mm.; alt. 12.5 mm.

##### CHLORITIS MUNDA, n.sp. Pl. XXI, Figs. 2, a-d.

Shell moderately umbilicated, discoid, dull, dark cinnamon brown, finely irregularly striated, the nepionic  $1\frac{1}{2}$  whorls minutely granulated; covered with distant small warty tubercles (probably bearing hairs when fresh) arranged in quincunx. Spire planate, apex almost immersed, suture deep. Whorls  $4\frac{1}{2}$ , convex, increasing regularly, the last rather suddenly, a little dilated towards the mouth, very slightly descending in front, slightly compressed below, and obtusely angulated round the slightly excavated umbilicus. Aperture ovate-lunate, oblique, margins convergent; peristome thin, fulvous, upper and outer

margins almost straight, the basal slightly reflexed, columellar triangularly dilated above and slightly overhanging the umbilicus. Diam. maj. 12·5, min. 11·25 mm.; alt. 7·75 mm.

*Hab.*—Moon Creek, Burnett River watershed, Queensland.

Type in Dr. Cox's collection. At first I considered this to be *C. spinei*, but that species appears to have a wider umbilicus and more tumid whorls. A second specimen is immature, having only three whorls completed. The warty tubercles probably bear hairs or bristles when the shell is in fresh condition.

CHLORITIS LANUGINOSA, n.sp. Pl. XXI, Figs. 3, *a-d*.

Shell narrowly umbilicated, depressed turbinate, dull corneous, finely striated, with microscopic spirals under a densely, shortly pilose cuticle, giving the shell a velvety appearance. Spire conoid, apex prominent, suture rather deep. Whorls  $4\frac{1}{2}$ , convex, increasing regularly, the last a little widened and but slightly constricted behind the peristome, shortly deflexed in front, obscurely angulated round the narrow umbilicus. Aperture subovate, oblique, margins convergent, united by a thin callus; peristome thin, slightly expanded, not reflexed; margins evenly rounded, columellar triangularly dilated above and reflexed over the umbilicus. Diam. maj. 11, min. 9·5 mm.; alt. 7·5 mm.

*Hab.*—Eidsvold, Queensland.

Type in Dr. Cox's collection. This new species can only be compared to *C. brevipila*, but the whorls are less globose than in that species, the spire is more elevated, the last whorl descends less in front, and the conspicuous bristles of *C. brevipila* are here absent; the margins of the peristome are also more distant. Under a very strong lens the quincuncial arrangement of the pili can with difficulty be detected on the earlier whorls, but on the last it is imperceptible.

CHLORITIS EXILIS, n.sp. Pl. XXI, Figs. 4, *a-d*.

Shell umbilicate, turbinate, very finely and regularly striated, dull, pale corneous, densely covered with minute soft, short, pale bristles arranged in quincunx. Spire conoid, apex obtuse, suture rather deep. Whorls 5, convex, increasing rapidly, last dilated towards the mouth, slightly descending in front, obtusely angulated round the narrow umbilicus. Aperture suboval, oblique, margins convergent; peristome white, scarcely thickened and narrowly reflexed, margins evenly rounded, columellar triangularly dilated and less than half covering the umbilicus. Diam. maj. 18, min. 15 mm.; alt. 13·5 mm.

*Hab.*—Mount Dryander, Port Denison, Queensland.

Type in Dr. Cox's collection. From *C. Coxeni*, its nearest ally, this new species is distinguished by its smaller size, the less covered umbilicus, and the densely crowded, finer, shorter, and paler bristles.

From *C. Bennetti*, another ally, it differs in the narrower umbilicus, and, although larger, in having one whorl less. A second specimen of this new species is paler, and possesses half a whorl less than the type. A third from Warroo, Port Curtis, is a little more elevated in the spire, measuring alt. 15 mm.

*CHLORITIS COGNATA*, n.sp. Pl. XXI, Figs. 5, *a-d*.

Shell moderately umbilicate, globose turbinate, finely regularly striated, whitish corneous, covered with crowded hair-scars arranged in quincunx. Spire conoid, apex obtuse, suture deep, almost channelled. Whorls nearly 5, convex, increasing regularly, the last rather suddenly, shortly deflexed in front, widening towards the mouth and slightly constricted behind the peristome, subangulated round the slightly excavated umbilicus. Aperture subovate, oblique, margins approaching; peristome white, a little thickened, and reflexed; upper margin arcuate, outer and basal rounded, columellar triangularly dilated above and a little overhanging the umbilicus. Diam. maj. 14.5, min. 12 mm.; alt. 10 mm.

*Hab.*—Olsen's Caves, Rockhampton, Queensland.

Type in Dr. Cox's collection. Somewhat similar in shape to *C. exilis*, but more depressed and with the hair-scars less crowded; the margins of the peristome are more approaching, and the umbilicus is a little wider and more excavated.

*CHLORITIS MICROMPHALA*, n.sp. Pl. XXI, Figs. 6, *a-d*.

Shell narrowly umbilicate, globosely turbinate, finely irregularly striated and decussated with wavy incised spirals, dark corneous above, paler beneath. Spire conical, apex obtuse, suture deep. Whorls 4, globose, increasing rapidly, the last dilated towards the mouth, descending suddenly and deeply in front, obscurely angulated round the narrow deep umbilicus. Aperture suboval, oblique, margins approaching, united by a thin callus; peristome white, a little thickened and reflexed, margins evenly rounded, columellar margin broadly triangularly dilated, more than half covering the umbilicus. Diam. maj. 21.5, min. 18 mm.; alt. 17 mm.

*Hab.*—Barrier Range, North-West Australia.

Type in Dr. Cox's collection. The only species to be compared with *C. micromphala* is *C. Blackmani*, but the globose whorls, the broader base, the more dilated last whorl, the more approximate margins of the peristome, and the absence of hair-scars at once separate the new species from its ally; the more broadly dilated columellar margin of the peristome and the more covered umbilicus are also differentiating characters.

*CHLORITIS POOREI*, n.sp. Pl. XXI, Figs. 7, *a-d*.

Shell moderately umbilicate, globose, thin, pale ochreous, a little shining, irregularly striated, very densely covered with minute hair-scars arranged in quincunx. Spire conical, apex obtuse, suture channelled. Whorls  $4\frac{1}{2}$ , increasing regularly, tumid, shouldered near the suture, somewhat compressed at the periphery, obtusely angulated round the deep umbilicus, which is slightly excavated; last whorl slightly dilated towards the mouth, scarcely descending in front. Aperture subcircular, oblique, margins convergent; peristome pale fulvous, thin, a little expanded; margins evenly rounded, columellar triangularly dilated and reflexed, covering half the umbilicus. Diam. maj. 12.5, min. 10.5 mm.; alt. 9.5 mm.

*Hab.*—Cardwell, Queensland.

Type in my collection. This species and the next two, together with *C. Blackmani*, are closely associated on account of the excessively crowded and minute hair-scars, this character varying in an inverse ratio to the size of the shell. *C. Poorei* is distinguished from *C. Blackmani* and *C. Thales* by the narrower umbilicus and the deeper suture.

CHLORITIS THALES, n.sp. Pl. XXI, Figs. 8, *a-d*.

Shell narrowly umbilicate, globose, thin, translucent, corneous, a little shining, irregularly striated, very densely covered with excessively minute hair-points arranged in quincunx. Spire conoid, apex obtuse, suture deep. Whorls 5, convex, obtusely angulated near the suture and round the narrow umbilicus, rounded at the periphery and below, increasing regularly, the last rapidly, slightly dilated towards the mouth, and a little descending in front. Aperture sub-circular, oblique, margins convergent; peristome thin, corneous, slightly expanded; margins evenly rounded, columellar margin triangularly dilated and reflexed, more than half covering the umbilicus. Diam. maj. 14·5, min. 12·5 mm.; alt. 12 mm.

*Hab.*—Rockingham Bay, Queensland. Somewhat like a small *C. Blackmani*, but with narrower umbilicus; the whorls are more tumid, flattened near the suture; the hair-scars in *C. Blackmani* are still more crowded than in the present species

CHLORITIS MISELLA, n.sp. Pl. XXI, Figs. 9, *a-d*.

Shell moderately umbilicate, depressed conoid, thin, pale corneous, finely plicate-striate, densely covered with rather large hair-scars arranged in quincunx. Spire low conical, apex obtuse, suture channelled. Whorls 4, convex, increasing regularly, the last rather suddenly, widened towards the mouth and constricted behind the peristome, slightly compressed below and subangulated round the excavated umbilicus, shortly deflexed in front. Aperture subovate, oblique, margins approaching; peristome thin, scarcely reflexed, margins evenly rounded, columellar slightly dilated and impinging upon the umbilicus. Diam. maj. 8·5, min. 7 mm.; alt. 5·5 mm.

*Hab.*—Queensland.

Type in Dr. Cox's collection. The smallest member of the group, and allied to *C. Poorei*, but much smaller and much more depressed; it somewhat resembles *C. Buxtoni* in shape.

CHLORITIS OBNUBILA, n.sp. Pl. XXI, Figs. 10, *a-d*.

Shell narrowly umbilicate, turbinate depressed, dull ochreous-corneous, finely plicate-striate, with microscopical wrinkled spirals under a deciduous velvety cuticle. Spire conoid, apex granulate obtuse, suture rather shallow. Whorls 5, convex, increasing regularly, the last rather suddenly, obscurely angulated above the periphery, a little widened towards the mouth, scarcely constricted behind the peristome, very shortly deflexed in front, slightly compressed below, and obscurely angulated round the narrow

umbilicus. Aperture ovate-lunate, oblique, margins convergent; peristome thin, whitish, slightly reflexed, margins evenly rounded, columellar triangularly dilated and slightly overhanging the umbilicus. Diam. maj. 18, min. 15.5 mm.; alt. 12 mm.

*Hab.*—Australia.

Type in Dr. Cox's collection. In shape it resembles *C. mucida*, but it is smaller and has a slightly narrower umbilicus, while the aperture is less dilated transversely. No trace of hair-scars can be detected, although the periostracum is quite fresh.

*CHLORITIS ÆTNAENSIS*, n.sp. Pl. XXI, Figs. 11, *a-d*.

Shell imperforate, depressed conoid, dull, dark corneous, very finely and regularly striated, covered with very minute and crowded short bristles. Spire much depressed, apex low, suture rather shallow. Whorls 4, increasing regularly, the last rather suddenly, the earlier ones a little convex, the last compressed above, obtusely angulated above the periphery, compressed below, becoming inflated towards the mouth and slightly constricted behind the peristome, obtusely angulated round the very small umbilical depression. Aperture subelliptic, little oblique, margins approaching, united by a thin callus; peristome whitish, becoming fulvous at the edge, a little thickened, expanded and reflexed; upper margin ascending at first, then slightly curved, outer rounded, basal nearly straight, columellar obliquely ascending, triangularly dilated and reflexed, entirely covering the umbilicus. Diam. maj. 13, min. 11 mm.; alt. 8 mm.

*Hab.*—Etna Bay, Dutch New Guinea.

Type in Mr. Ponsonby's collection. *C. Ætnaensis* differs from *C. telitecta* in the completely covered umbilicus, the more depressed spire, and in having the aperture more contracted laterally. From *C. eurychasma* it may be distinguished by its smaller size, the compressed whorls, the supra-peripheral angulation, the less oblique and more contracted aperture; the last whorl is also more dilated and constricted, and descends less in front; the columellar margin is less dilated, and the bristles are finer and more crowded.

---

DESCRIPTION OF A NEW SPECIES OF *PAPUINA*, AND  
ILLUSTRATIONS OF SOME HITHERTO UNFIGURED SHELLS.

By G. K. GUDE, F.Z.S.

Read 11th January, 1907.

PLATE XXI.

THE shells forming the subject of the present article were for the most part received from Dr. Cox, together with the specimens of *Chloritis* treated of in the previous paper.

*PAPUINA COMPLANATA*, n.sp. Pl. XXI, Fig. 12.

Shell imperforate, trochoidal, the earlier whorls bluish white, the penultimate becoming yellowish brown, the last dark brown above, yellowish brown below, finely distinctly striated and with excessively fine and close spirals above, and distant shallow spiral furrows below. Spire conical, apex exerted, suture shallow, margined. Whorls 6, convex, increasing regularly, the last dilated towards the mouth, convex above, slightly flattened at the suture, bluntly keeled at the periphery, slightly compressed below and excavated at the umbilical region, very shortly descending below the periphery in front. Aperture subelliptical, very oblique, margins convergent; peristome white, thickened, expanded, and reflexed; upper margin slightly curved, outer rounded, columellar flattened, adnate to the parietal wall. Diam. maj. 26·5, min. 20·5 mm.; alt. 18 mm.

*Hab.*—Probably New Ireland (Mus. Cuming).

Type in the British Museum. A single specimen from New Ireland sent by Dr. Cox was found to have its counterpart in the Cuming Collection in the British Museum without habitat. The new species is allied to *P. vexillaris*, but is readily distinguished by its broader and more flattened base, the more pronounced peripheral keel, the more expanded peristome and dilated aperture, and by the absence of the obliquely descending wrinkles above the periphery.

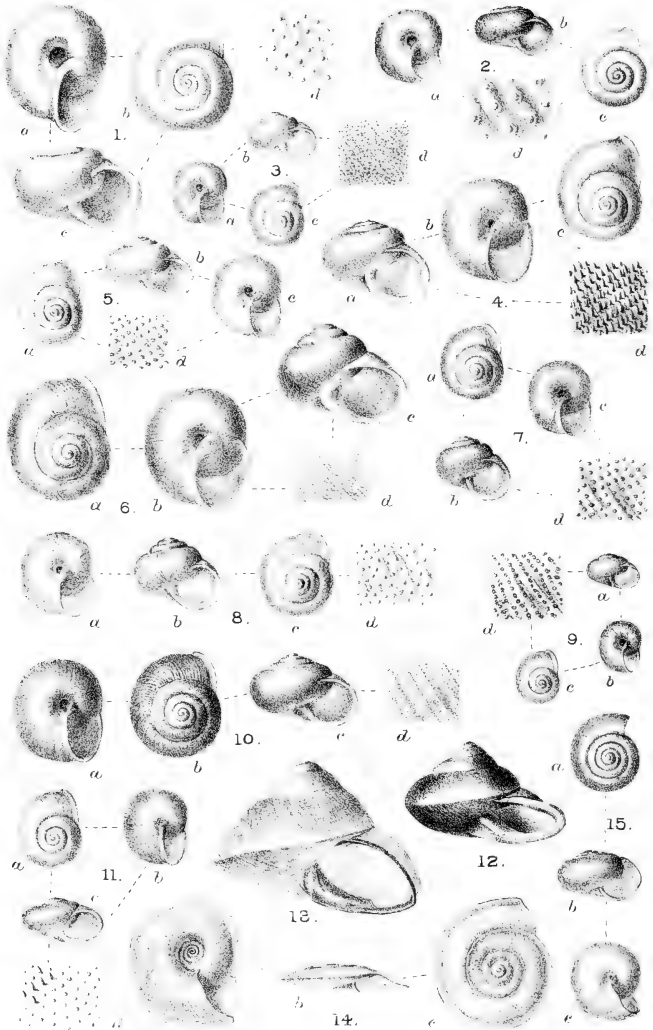
*PAPUINA FRINGILLA*, Pfr.

A curious abnormal specimen from New Georgia, received from Dr. Cox, exhibits a tendency to become scalariform, and on close examination it appears to have sustained an injury to that part of the mantle which forms the peripheral portion of the shell. The first two whorls are normal, but thence onwards the periphery becomes exerted and flattened, in parts with a shallow groove; near the end of the penultimate whorl the periphery becomes again keeled, but a well-defined zone about 2 mm. wide above and below the keel bulges out slightly, is denuded of cuticle, and has the surface rough and irregularly striated. At the aperture a short sinus occurs, with the peristome thin and imperfect. The inside of the shell appears normal.

*CRYSTALLOPSIS TRICOLOR*, Pfr. Pl. XXI, Fig. 13.

The species was described as translucent whitish with spiral lines of opaque white, but this description must have been based on a decorticated shell, for a specimen in my collection has a pale yellowish





A.H. Searle, del et lith.

NEW SPECIES OF CHLORITIS ETC.



cuticle. Another specimen, however, is an albino. In some shells the whorls are more globose and the peripheral keel is less pronounced than in others, while in some the last whorl is strongly gibbous behind the aperture. One specimen in my collection has the last whorl with two narrow brown bands, one above and one below the peripheral keel, but is without the brown articulations usually found between those two bands. Dr. Cox contributes a shell with an elevated spire, measuring major diam. 34, min. 28 mm., alt. 25 mm., which may be designated as var. *conica*. It is unicolorous, opaque white with brown peristome, strongly gibbous at the periphery behind the peristome, and with the keel obtuse. A specimen in my collection is similar, but measures alt. 24 mm., while in another the last whorl is strongly deflexed in front, descending below the keel; the upper and basal margins of the peristome are white, edged with pale brown.

TROCHOMORPHA CRUSTULUM, COX. Pl. XXI, Figs. 14, *a-c*.

*Helix crustulum*, COX: Proc. Zool. Soc., 1873, p. 150.

*Hab.*—Solomon Islands.

This species has hitherto remained unfigured, and I am pleased to be able to give illustrations from a specimen sent by Dr. Cox.

RHYTIDA VILLANDREI, GASSIES.

A sinistral specimen, dark brown, mottled with yellow, was received from Dr. Cox. I am not aware that the reversed form of this species has been recorded.

*Hab.*—San Christoval, Solomon Islands.

?XESTA WANGANENSIS, COX. Pl. XXI, Figs. 15, *a-c*.

*Helix Wanganensis*, COX: Proc. Zool. Soc., 1870, p. 82.

*Hab.*—Solomon Islands.

Another unfigured species a specimen of which has been contributed by Dr. Cox. In the original diagnosis the suture is rather vaguely described "strongly marked." I find it to be very deep and channelled, while the last whorl is shouldered near the suture. Diam. maj. 13, min. 12 mm.; alt. 8 mm.

DESCRIPTION OF PLATE XXI.

- FIGS. 1, *a-d*. *Chloritis conomphala*, n.sp.  
 " 2, *a-d*. " *munda*, n.sp.  
 " 3, *a-d*. " *lanuginosa*, n.sp.  
 " 4, *a-d*. " *exilis*, n.sp.  
 " 5, *a-d*. " *cognata*, n.sp.  
 " 6, *a-d*. " *micromphala*, n.sp.  
 " 7, *a-d*. " *Poorei*, n.sp.  
 " 8, *a-d*. " *Thales*, n.sp.  
 " 9, *a-d*. " *misella*, n.sp.  
 " 10, *a-d*. " *obnubila*, n.sp.  
 " 11, *a-d*. " *Ætneensis*, n.sp.  
 FIG. 12. *Papuina complanata*, n.sp.  
 " 13. *Crystallopsis tricolor*, var. *conica*.  
 FIGS. 14, *a-c*. *Trochomorpha crustulum*, COX.  
 " 15, *a-c*. ? *Xesta Wanganensis*, COX.

DESCRIPTIONS OF NEW NON-MARINE SHELLS FROM  
NEW ZEALAND.

By HENRY SUTER.

Read 11th January, 1907.

PLATE XXII.

1. *LAOMA* (s.s.) *PŒCILOSTICTA* (Pfr.), n.subsp. *CONICULA*.  
Pl. XXII, Figs. 1, 2.

Shell small, dome-shaped, imperforate, radially finely costate, suture margined, last whorl keeled, with a columellar plait. Sculpture consists of close, rounded, flexuous, radiate plications, extending over the base; the latter is microscopically closely and finely spirally striate. Colour fulvous, with rather faint longitudinal zigzag bands of rufous; margins of suture and keel on the last whorl with whitish dots. Epidermis thin, shining. Spire dome-shaped, with a blunt rounded apex. Protoconch formed by  $1\frac{1}{2}$  smooth, flatly convex whorls; a magnifying power of 100 diam. reveals faint spiral striation. Whorls 6, slowly increasing, flatly convex, as is also the base. Suture impressed, margined above on the last four whorls with a distinct thread. Aperture a little oblique, angularly lunate, breadth about twice the height. Peristome simple, straight, outer lip but little convex, forming a distinct angle with the slightly rounded basal lip. Columella callous, oblique, with a not much pronounced plait. Umbilical region showing but a faint impression, no perforation whatever, not even in young examples. Alt. 3.2, diam. 3 mm.

*Hab.*—One specimen, the type, I received some years back from Mr. Strickland, who collected shells in this colony for some time, and who found it near Kaihu, Hokianga. I also found specimens in the bush near Waiwera.

This subspecies is distinguished from *L. pœcilsticta*, of which for comparison the outlines are figured (Fig. 2), by the dome-like spire, the absence of an umbilicus, and the presence of very distinct spiral striation upon the base. Young specimens of *L. pœcilsticta* are distinctly umbilicated, but adult specimens have the perforation mostly more or less sealed up; spiral striation on the base is faintly visible only under a very strong lens. Type in my collection.

2. *LAOMA* (*PHRIXGNATHUS*) *FILICOSTA*, n.sp. Pl. XXII, Fig. 3.

Shell minute, turbinata, imperforate, fulvous with fuscous radial streaks and distant riblets. Sculpture consists of very fine and oblique flexuous costæ, about 8 to 10 per millim.; they are sharp, thin, membranous, white, and extending over the base to the umbilical region;

the interstices with numerous microscopic incremental striae; base microscopically distantly spirally lirata. Colour fulvous, radially ornamented with ziczac bands of rufous at about the same distance apart as the riblets. Epidermis thin, not shining. Spire convexly conoidal, with a blunt and rounded apex. Protoconch formed by  $1\frac{1}{2}$  smooth flat whorls, which are microscopically finely spirally striate. Whorls  $4\frac{1}{2}$ , slowly and regularly increasing, flatly convex, the last distinctly angled at the periphery, base rounded, umbilical region slightly impressed. Suture not deep. Aperture somewhat oblique, lunar; columella but little callous and extended over the umbilical region. Peristome sharp, straight. Alt. 1.25, diam. 1.75 mm.

*Hab.*—A few specimens were found by my son Alfred in a swampy kahikatea bush near Wairangi, Waikato.

The nearest allies to this species seem to be *L. Francesci* and *elaiodes*, Webster, though decidedly very distinct from it. *L. flicosta* is a lovely little shell and well characterized. Type in my collection.

### 3. FLAMMULINA (PHENACOHELIX) LEPTALEA, n.sp. Pl. XXII, Fig. 4.

Shell small, subglobular, fragile, translucent, umbilicated, closely costate. Sculpture formed by radial riblets, about 6 per millim. straight above, slightly sinuate on the periphery and extending to the umbilicus; the costae are thread-like, sharp, the interstices with numerous fine growth-lines which are decussated by equally fine and close spiral lines. Colour light fulvous, with light ziczac markings of brown. Epidermis very thin, not shining. Spire broadly conoidal, with obtuse apex. Protoconch consisting of  $1\frac{1}{2}$  smooth, convex whorls, microscopically finely and densely spirally striate. Whorls  $4\frac{1}{2}$ , convex, regularly increasing, the last indistinctly shouldered, and with the periphery slightly flattened; base rounded. Suture deeply impressed. Aperture vertical, lunate; peristome sharp and straight. Outer lip convex, basal lip somewhat flattened; columella subvertical, concave, a little callous and partly spread out over the umbilicus, which is moderate, deep, diameter .7 millim. Alt. 3.7 mm.; diam. maj. 4.5, min. 4 mm.

*Hab.*—The type was collected by Mr. Strickland at Kaihu, Hokianga. Waitakerei Range and Waiwera (H. S.).

This species is closely related to *F. Ponsoubyi*, Suter, but is smaller, much more globose and fragile, the colour-markings are generally of a different pattern, the riblets more distant, and the umbilicus a little narrower. Type in my collection.

### 4. FLAMMULINA (ALLODISCUS) COOPERI, n.sp. Pl. XXII, Figs. 5-7.

Shell small, orbicular, costate, imperforate, and with broad ziczac streaks. Sculpture consists of close radial and sharp costae, very little sinuous, 6 to 7 per millim., interstices with very fine incremental lines which are crossed by indistinct fine microscopical spiral striae. Colour fulvous with broad and distinct chestnut brown radiate streaks on the upper part of the whorls, forming anastomosing ziczac lines on the periphery and base. Epidermis thin, not shining. Spire low, broadly

convex. Protoconch of  $1\frac{1}{2}$  smooth convex whorls, microscopically very indistinctly spirally lirate. Whorls  $4\frac{1}{2}$ , regularly increasing, convex, periphery sharply rounded, base flatly convex. Suture very distinct and well impressed. Aperture oblique, lunate; peristome sharp and straight; columella oblique, a little concave, with a feeble callus. Umbilical region not much impressed. Alt. 4 mm.; diam. maj. 7, min. 6.2 mm.

*Hab.*—Poor Knights Islands (Mr. C. Cooper).

This species stands nearest to *F. dimorpha*, Pfr., but is distinguished from it by its much smaller size and the closer riblets. It gives me much pleasure to unite the name of my friend Mr. Chas. Cooper, of Auckland, with the species. Type in my collection.

5. FLAMMULINA (ALLODISCUS) THOLOIDES, n.sp. Pl. XXII, Fig. 8.

Shell small, depressed turbinate, imperforate, costate, with brown ziczac bands. Sculpture consists of sharp, almost straight, and subequidistant radial riblets, 8 to 10 per millim., extending over the base, interstices with very fine growth-lines; no spiral sculpture. Colour fulvous with light-brown ziczac bands. Epidermis thin, not shining. Spire broadly dome-like, low. Protoconch of  $1\frac{1}{2}$  smooth and convex whorls. Whorls 5, slowly and regularly increasing, convex, but slightly flattened above; base convex. Suture well impressed. Aperture a little oblique, lunar; peristome thin and straight; columella short, concave, slightly callous, and deflexed over the umbilical region, which is but little immersed. A thin callus on the body-whorl unites the distant margins. Alt. 3.2 mm.; diam. maj. 4.5, min. 3.8 mm.

*Hab.*—Cape Te Reinga (Mr. C. Cooper). I have also a specimen from Whangaroa.

The globular form and the distant, almost straight riblets distinguish this species from the allied *F. Tullia*, Gray, *F. venulata*, Pfr., and *F. rustica*, Suter. Type in my collection.

6. LAGOCHILUS CHILTONI, Suter, n.subsp. SEPTENTRIONALIS.  
Pl. XXII, Fig. 9.

Distinguished from the species by the following characters:—It is considerably larger, the spiral striation is quite distinct, especially upon the base, and the umbilicus is a little larger and open, not covered over by the reflection of the inner lip. Alt. 4, diam. 3 mm. A specimen from Cape Camel is 4 by 2.8 mm.

*Hab.*—Coves Bay, Waiheke Island; type (H. S.). Cape Camel, west of North Cape (Mr. C. Cooper).

The specimens from Cape Camel are slightly more slender and the umbilical tract is angled in some examples. Type in my collection.

7. LAGOCHILUS BICARINATUS, n.sp. Pl. XXII, Fig. 10.

Shell small, turbinate, umbilicate, base bicarinate. Sculpture consists of fine subequidistant and blunt incremental axial striæ; two

carinæ on the base, the upper one arising from the junction of the outer lip with the whorl and terminating a little below the middle of the outer lip; the lower rib departs from the middle of the body-whorl between the margins of the mouth, and ends at the distal side of the basal lip; no microscopic spiral striation is present. Colour fulvous to brown. Epidermis thin, slightly shining; there may be axial membranous plaits, but in the only specimen before me they have evidently been lost. Spire conical, of the same height as the aperture; apex obtuse. Protoconch consisting of one whorl, which is globular and smooth. Suture deeply impressed. Aperture circular, peristome slightly reflexed and callous, but sharp; notch at the suture very indistinct; columella concave, partly concealing the umbilicus, which is deep and of about .5 millim. diameter; the umbilical tract immersed and margined by the lower carina. Operculum thin, circular, multispiral, with membranous outer and central processes. Alt. 5, diam. 4.5 mm.

*Hab.*—Kamo, near Whangarei (Mr. C. Cooper).

This is a very well characterized species, easily separated from all our other species of the genus. Type in my collection.

8. *DIPLODON MENZIESI*, Gray, n. subsp. *ACUTA*. Pl. XXII, Figs. 11, 12.

Distinguished from the species by the very distinctly rostrate posterior end, the nearly total absence of radial sculpture, and by being more compressed. Only young shells show traces of radially arranged nodules near the beaks. The basal margin is generally more straight than in typical *D. Menziesi*. The beaks are much corroded in all the specimens I have. The shell is rather thin, yellowish-brown, with strong concentric sculpture, approaching *D. rugata*, Hutton. The interior is nacreous olive, the hinge not different from that of the species. Alt. 40, long. 70, diam. 16 mm.

*Hab.*—Lake Omapere, between Bay of Islands and Hokianga. The shells were collected by Miss Willis, of Ohaeawai, and kindly given to me by Archdeacon P. Walsh, of Waimate. To both of them my best thanks are due.

The outline of this subspecies is very nearly that of *D. depauperata*, Hutton, but the hinge is very different; it also has almost exactly the outline of *Anodonta complanata*, Ziegler, of Europe. Type in my collection.

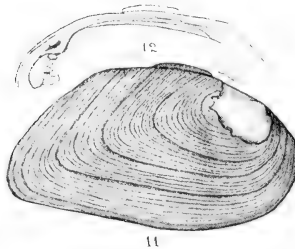
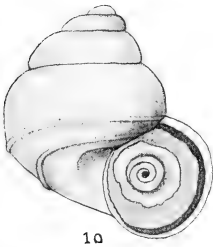
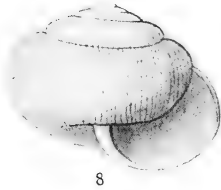
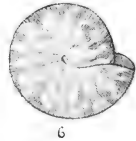
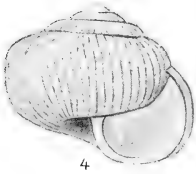
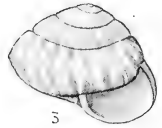
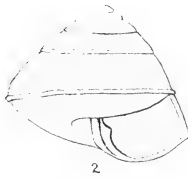
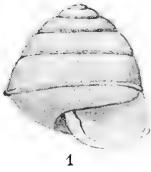
*Appendix.*

Mr. Charles Cooper, of Auckland, submitted to my examination the land and fresh-water shells collected during a trip round the North Cape in the Government steamer "Hinemoa" in 1905, and the following table gives the geographical distribution of the various species obtained. Localities: 1, Little Barrier Island; 2, Poor Knights Islands; 3, Whangaroa Harbour; 4, Tom Bowlines Bay, east of North Cape; 5, Cape Camel, west of North Cape; 6, Te Reinga; 7, Kamo.

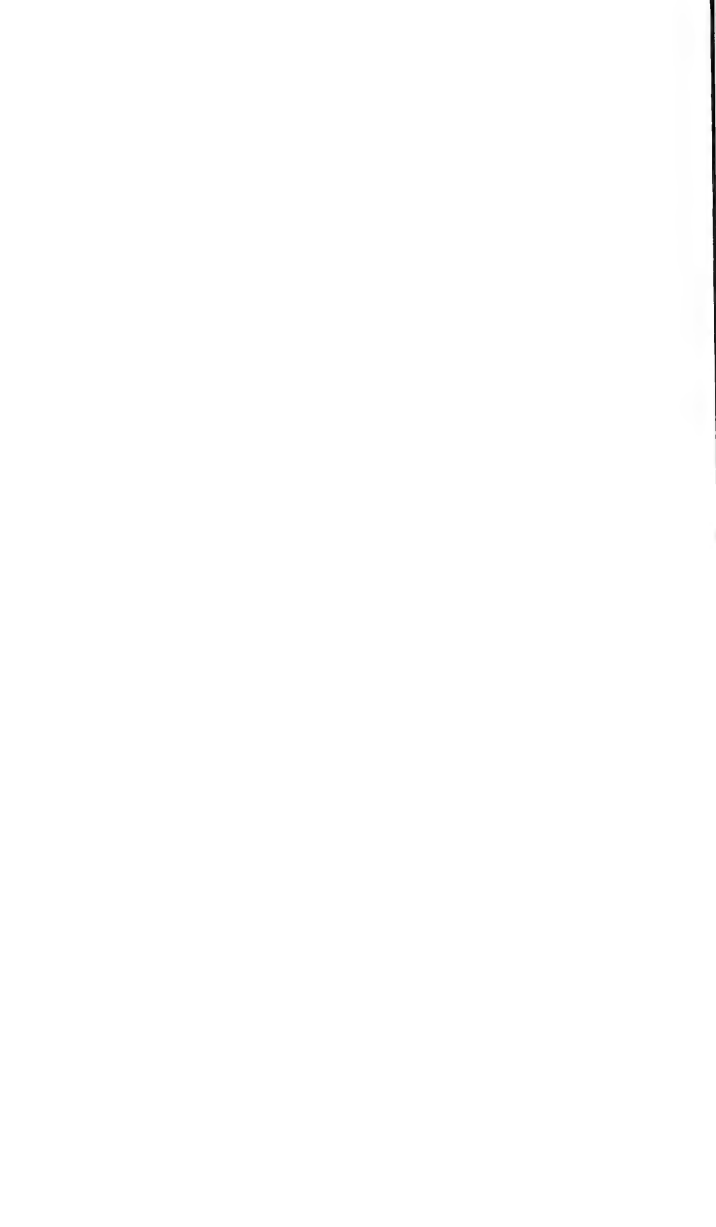
	1	2	3	4	5	6	7
<i>Lagochilus pallidus</i> , Hutton ... ..			x	x		x	
„ <i>Chiltoni</i> , Suter, subsp. <i>septentrionalis</i> , Suter ... ..					x		
„ <i>bicarinatus</i> , Suter ... ..							x
„ sp. near <i>torquillus</i> , Suter ... ..					x		
<i>Realia turriculata</i> , Pfeiffer ... ..						x	x
„ <i>carinella</i> , Pfeiffer ... ..			x				
<i>Potamopyrgus corolla</i> , Gld., subsp. <i>Salleana</i> , Fischer ... ..	x						
<i>Rhytida Greenwoodi</i> , Gray ... ..			x				x
„ <i>Dumia</i> , Gray ... ..			x				x
„ <i>duplicata</i> , Suter ... ..						x	
<i>Delos Jeffreysiana</i> , Pfeiffer ... ..	x		x		x		
<i>Flammulina Zelandiae</i> , Gray ... ..							x
„ <i>Cooperi</i> , Suter ... ..		x					
„ <i>tholoides</i> , Suter ... ..				x	x	x	
„ <i>Kivi</i> , Gray ... ..				x	x		x
„ <i>Celinde</i> , Gray ... ..				x	x	x	x
„ <i>decidua</i> , Pfeiffer ... ..					x		
„ <i>tamora</i> , Hutton ... ..				x			
„ <i>Pomsonbyi</i> , Suter ... ..							x
„ <i>Ide</i> , Gray ... ..				x			
„ <i>Chiron</i> , Gray ... ..				x			x
<i>Laoma leimonias</i> , Gray ... ..							x
„ <i>sciadinum</i> , Pfeiffer ... ..				x	x		
„ <i>Ariel</i> , Hutton ... ..	x				x		
„ <i>Phrynia</i> , Hutton ... ..							x
„ <i>allochroida</i> , Suter, subsp. <i>luteumbilicata</i> , Suter ... ..						x	
„ <i>Mællendorffi</i> , Suter ... ..							x
<i>Endodonta varicosa</i> , Pfeiffer ... ..				x	x	x	
„ <i>Coma</i> , Gray ... ..							x
„ <i>buccinella</i> , Reeve ... ..				x			
„ <i>corniculum</i> , Reeve ... ..					x		
„ <i>caput-spinulae</i> , Reeve ... ..						x	
<i>Athoracophorus</i> sp., var. of <i>bitentaculata</i> , Q. & G. ... ..				x			

## EXPLANATION OF PLATE XXII.

- FIG. 1. *Laoma pœcilsticta*, Pfr., subsp. *conicula*, Suter. 3·2 by 3 mm.  
 „ 2. „ „ „ for comparison.  
 „ 3. „ *flicosta*, Suter. 1·25 by 1·75 mm.  
 „ 4. *Flammulina leptalea*, Suter. 3·7 by 4·5 mm.  
 FIGS. 5-7. „ *Cooperi*, Suter. 4 by 7 mm.  
 FIG. 8. „ *tholoides*, Suter. 3·2 by 4·5 mm.  
 „ 9. *Lagochilus Chiltoni*, Suter, subsp. *septentrionalis*, Suter. 4 by 3 mm.  
 „ 10. „ *bicarinatus*, Suter. 5 by 4·5 mm.  
 FIGS. 11, 12. *Diplodon Menziesi*, Gray, subsp. *acuta*, Suter. 70 by 40 mm.



H. Suter del.





## INCOME AND EXPENDITURE FOR THE YEAR ENDED 31st DECEMBER, 1906.

DR.	£ s. d.	CR.	£ s. d.
To Balance from last year . . . . .	29 15 10	By Cost of "Proceedings"—	
" Annual Subscriptions—		Printing and Postage . . . . .	£79 4 5
Ordinary Members . . . . .	£40 8 6	Illustrations . . . . .	48 16 2
Corresponding Members . . . . .	22 7 0		————— 128 0 7
" Annual Subscriptions in arrear—	62 15 6	" Printing Circulars, etc. . . . .	. . . . . 2 1 0
Ordinary Members . . . . .	£4 14 6	" Treasurer's Postage . . . . .	. . . . . 1 2 7
Corresponding Members . . . . .	3 16 0	" Linnean Society—	
" Annual Subscriptions in advance—	8 10 6	For the use of Rooms . . . . .	£3 3 0
Ordinary Members . . . . .	£1 11 6	Gratuities to Attendants . . . . .	2 10 0
Corresponding Members . . . . .	3 4 0		————— 5 13 0
" Entrance Fees . . . . .	4 15 6	" Lantern Operator . . . . .	. . . . . 0 10 6
" Sale of "Proceedings" . . . . .	4 4 0	" Secretary's Postage . . . . .	. . . . . 2 6 5
" Dividends on £50 Metropolitan 2½% Stock . . . . .	35 2 3	" Balance in hand . . . . .	. . . . . 24 11 6
" Donations for Illustrations . . . . .	1 5 0		————— £164 5 7
" Advertisement Receipts . . . . .	17 12 0		
" . . . . .	0 5 0		
" . . . . .	0 5 0		
	————— £164 5 7		

We have this day examined the accounts of the Treasurer of the Malacological Society of London, and we find the above statement to be correct.

R. P., JOHN H. PONSONBY, Hon. Treasurer.  
R. H. BURNE.

HENRY WOODWARD ( Auditors.  
H. B. PRESTON )

January 21st, 1907.

## ANNUAL GENERAL MEETING.

FRIDAY, 8TH FEBRUARY, 1907.

E. R. SYKES, B.A., President, in the Chair.

Miss L. Digby and Mr. H. B. Preston were appointed scrutineers.

The following report was read :—

“ Your Council, in presenting their fourteenth Annual Report, are able once again to record a year of satisfactory progress.

During the past twelve months nine new members have been elected. On the other hand, the Society has lost by death a good friend in Mr. F. Justen, and two other members, C. F. Ancey and T. Leighton ; and is also the poorer by the retirement of three other members.

The membership of the Society on December 31st, 1906, stood as follows :—

Ordinary members	.....	.....	.....	.....	.....	82
Corresponding members	.....	.....	.....	.....	.....	82
						164
			Total	.....	.....	164

At the end of the year 1905 the total membership was 161, and of 1904, 162.

The financial condition of the Society is quite satisfactory ; all the liabilities of the year have been discharged, and there is a balance in the banking account of £24 11s. 6d., while the sum of £50 still remains invested in Metropolitan 2½ per cent. Stock.

As usual, three parts of the ‘ Proceedings ’ have been published since the last Annual Meeting. They consist of 200 pages, 17 plates (an unusually large number), and 44 text-figures, and form the first half of the seventh volume of the Society’s journal.

Both the Society and malacologists generally are greatly indebted to the following gentlemen, who have either liberally contributed towards the cost of the illustrations or have furnished drawings for reproduction :—Colonel R. H. Beddome, W. T. Bednall, F. G. Bridgman, Rev. R. Ashington Bullen, R. H. Burne, S. I. Da Costa, Sir Charles Eliot, Lieut.-Colonel H. H. Godwin-Austen, G. K. Gude, J. C. Melvill, R. B. Newton, Professor H. A. Pilsbry, H. B. Preston, A. Reynell, G. B. Sowerby, E. R. Sykes, and B. B. Woodward. It is only through such generous help that the Society is enabled to issue such a fully illustrated publication.

Further, the thanks of the Society are especially due to the Council of the Linnean Society, through whose kindness it has been permitted, as in previous years, to hold its meetings in Burlington House.”

On the motion of Dr. Henry Woodward, seconded by Mr. A. Reynell, the above was adopted as the Annual Report of the Society.

The following were elected as Officers and Council for the year 1907 :

*President.*—B. B. Woodward, F.L.S.

*Vice-Presidents.*—R. H. Burne, B.A. ; Sir C. N. E. Eliot, K.C.M.G. ;  
W. G. Ridewood, D.Sc., F.L.S. ; E. R. Sykes, B.A., F.L.S.

*Treasurer.*—J. H. Ponsonby, F.Z.S., 15, Chesham Place, London, S.W.

*Secretary.*—Alexander Reynell, 152, Selhurst Road, South Norwood,  
London, S.E.

*Editor.*—E. A. Smith, I.S.O., Natural History Museum, Cromwell  
Road, London, S.W.

*Other Members of Council.*—H. H. Bloomer ; Rev. R. Ashington  
Bullen, B.A., F.L.S. ; G. C. Crick, F.G.S. ; S. I. Da Costa ;  
R. Bullen Newton, F.G.S. ; Henry Woodward, LL.D., F.R.S.

On the motion of Mr. E. A. Smith, seconded by Mr. A. Reynell,  
a vote of thanks was accorded to the Retiring Officers and Members of  
Council, and to the Auditors and Scrutineers.

---

#### ORDINARY MEETING.

FRIDAY, 8TH FEBRUARY, 1907.

B. B. WOODWARD, F.L.S., President, in the Chair.

The President delivered an inaugural address, taking for his  
subject "What evolutionary processes do the Mollusca show?" On  
the motion of Mr. E. R. Sykes, seconded by Dr. W. G. Ridewood, a  
vote of thanks was passed to Mr. Woodward for his very interesting  
address.

---

#### ORDINARY MEETING.

FRIDAY, 8TH MARCH, 1907.

B. B. WOODWARD, F.L.S., President, in the Chair.

The following communications were read:—

1. "Notes on the Post-Pliocene Mollusca of the Mylne Collection." By A. S. Kennard, F.G.S., and B. B. Woodward, F.L.S.
2. "Notes on some Holocene Shells from Ightham." By A. S. Kennard, F.G.S., and B. B. Woodward, F.L.S.
3. "Descriptions of four new species of *Melania* from New Ireland and Kelantan." By H. B. Preston, F.Z.S.
4. "On the Arms of the Belemnite." By G. C. Crick, F.G.S.
5. "Relics of Coloration in Fossil Shells." By R. Bullen Newton, F.G.S.

The President exhibited some photographs of species of *Pisidium*,  
and, on behalf of Dr. R. F. Scharff, specimens of *P. hibernicum*.

Mr. E. A. Smith, I.S.O., exhibited some abnormal examples of  
'bones' of Cuttlefishes.

Mr. H. B. Preston exhibited the types of new species of *Corbula* and *Bithinella* from Port Canning.

Mr. R. H. Burne exhibited shells of *Cymbulia* stained with Bismarck brown to show the details of structure.

Mr. A. Reynell exhibited a malformed specimen of *Lima lata*, Smith, dredged in the Bay of Biscay.

---

ORDINARY MEETING.

FRIDAY, 12TH APRIL, 1907.

E. A. SMITH, I.S.O., in the Chair.

E. R. Waite, F.L.S., and F. W. Reader were elected to membership of the Society.

The following papers were read:—

1. "Notes on New Zealand Polyplacophora, with descriptions of five new species." By H. Suter.

2. "Descriptions of new Marine Mollusca from New Caledonia, etc." By G. B. Sowerby, F.L.S.

3. "Descriptions of new species of *Drymaeus* from Peru, Mexico, etc." By S. I. Da Costa.

4. "Description of a new species of *Vallonia* from South India." By G. K. Gude, F.Z.S.

The following specimens were exhibited:—

By Rev. R. Ashington Bullen: An example of *Unio pictorum* from a pond at Hurstpierpoint, Sussex; *Testacella haliotideae* from a garden at Woking; also the following collected by Professor Boulger—*Bulimulus culmineus* (D'Orb.), found in grass, near springs forming the water-supply of Santa Rosa, in the Titicaca basin (Province of Carabaza), Peru, in the Sierra region, at an altitude of about 13,300 feet; *Neocyclotus Inca* (D'Orb.), from the grassy plaza of the village of Ollachéa, Carabaza, at about 9,200 feet, but in the Montana (i.e. forest) region; *Ampullaria solida*, v. d. Busch, in low 'monte,' on wet earth, a few feet above the right bank of the river Atahnalpa (Amazon basin), in the same province but in the Montaña region, at about 2,200 feet.

By A. S. Kennard: *Helix nemoralis* and *H. Tonnensis* from South Germany.

By G. B. Sowerby: *Cypræa arabica*, var. *atra*, from New Caledonia; a very large *Cypræa tigris*,  $4\frac{7}{8}$  inches long and  $9\frac{7}{8}$  in circumference; an interesting variety of *Conus eburneus*, and specimens of a curious form of *Amalthea* or *Capulus*.

By A. Reynell: Living young specimens of *Thersites Evandaleana*.

By E. A. Smith: A remarkable abnormal specimen of *Pterocera aurantia*.

---

## OBITUARY NOTICE.

CÉSAR FÉLIX ANCEY was elected a Corresponding Member of the Society in 1902. He was born at Marseilles on the 15th of November, 1860, and was educated at the College of the Jésuites d'Avignon, where he took degrees in literature, science, and law. Natural history, however, had the greatest attraction for him, and at first he devoted himself to entomology, especially to the study of Coleoptera, and at one time was occupied in the superintendence of the famous collection of MM. Oberthür of Rennes. However, he subsequently displayed a predilection for the study of conchology, which henceforth was maintained to the end of his life.

He left France in 1887 to occupy an official position in Algeria, where step by step he rose to the rank of 'administrateur titulaire.' He stayed a long time at Kabylie, until he became the oldest official in that district. He possessed a great capacity for work, was an excellent linguist, and always exhibited a very pleasant and affable manner to friends and acquaintances. The great desire of his life was to have made a scientific journey to the Cape Verd Islands or to South America. However, this hope was never to be realized. He died from fever on October 10th of last year in his 46th year.

M. Ancey's conchological writings commenced with the year 1881, and continued almost without interruption until the year of his death. Altogether he published about 750 pages, distributed among some 121 different papers. His longest memoirs treated upon the fauna of the Hawaiian Islands, altogether occupying 135 pages. M. Ancey was a member of the 'Nouvelle école' of French conchologists, and consequently many of his so-called species are merely regarded as slight varieties of long-established forms. An instance of this kind, familiar perhaps to some of the members of this Society, is worth recalling. In 1884 he wrote a paper entitled "Mollusques inédits du système européen," in which he described two forms of *Hyalinia* and eighteen so-called new species of *Helix*. One of the latter, *H. cantianiformis*, was from Folkestone! I think that British conchologists will not admit the possibility of the existence in Kent of a 'new species' of *Helix*, even as far back as the year 1884. I may mention that no figures accompanied M. Ancey's paper, and as far as I can ascertain most, if not all, of these eighteen forms are still known only by the author's Latin diagnoses. It is to be greatly regretted that the writings of M. Ancey are so inadequately illustrated; in fact, altogether only five plates and forty-one text-figures accompany his 750 pages. His descriptions in themselves are, however, very good, and many of his "Notes critiques" contain much useful information. M. Ancey contributed two papers to these "Proceedings," both treating upon the fauna of the Sandwich Islands, and doubtless had he lived others would have been offered for publication. Although we may disagree with M. Ancey in what constitutes a species, at the same time the utility and thoroughness of much of his work must be admitted.

E. A. S.

## INAUGURAL ADDRESS BY THE PRESIDENT,

B. B. WOODWARD, F.L.S., F.G.S.

*Delivered 8th February, 1907.*

## WHAT EVOLUTIONARY PROCESSES DO THE MOLLUSCA SHOW?

LADIES AND GENTLEMEN,—

My first duty—and it is also a great pleasure—on succeeding to this presidential chair, is naturally to tender you my sincere thanks for the great honour you have thus conferred upon me in selecting me for the position. When I call to mind the noted naturalists, some, alas! no longer with us, who have in the past filled the office of president with such ability and distinction, I feel that, while it is not for me to dispute the wisdom of your choice, a long interval in merit separates him, who now has the honour to address you, from his presidential forbears. Nevertheless, let me assure you that so far as the endeavour to do one's uttermost to advance the best interests of the Society is concerned, no breach of continuity shall be observable.

As some earnest of this I trust you will accept the fact, that at rather short notice, the mission of addressing you at this Annual Meeting has been taken up by myself. In the natural course of events my predecessor should have given us his swan-song.

Under these circumstances it seemed best to put before you the results of some recent cogitations on my part as to what evidences exist, if any, of progressive development in the Molluscan phylum. This naturally implies passing in review many well-known points and familiar facts; but though the beads may be old and the string not altogether new, the rethreading may perhaps prove interesting, and possibly even suggestive, to the members of this Society.

The extreme plasticity of the Mollusca naturally renders them both peculiarly susceptible and readily responsive to the operation of the two great factors that govern the lives of all animals, namely, the influence on them of their environment, and the necessity laid on one and all of procuring food. The Molluscan mode of life is, in fact, mainly governed by the combined action of these two controlling influences, and in turn becoming itself a potent factor, completes the cycle by reacting on the animal, which is thus impelled, so long as similar conditions hold, yet further along a given line of development.

Owing, however, to the paucity of stable elements to be acted on, continuous progress in any direction has, despite the antiquity of the race, been slow indeed. The total lack of anything like internal framework has militated against any such wonderful progress as

exhibited in the Vertebrate kingdom; the very plasticity of the Mollusca has thwarted progressive development, as we understand the phrase, and they readily retrograde or branch off into bye-paths.

Hence the study of evolution in this group is an exceedingly complex one, offering, like a very tangled skein, so many clues to follow out that one is in doubt which thread to pursue first.

On the present occasion it will suffice to take certain leading features and organs, to summarize what is known concerning them, and to endeavour to ascertain how far, if at all, any definite conclusions can be based upon them.

It may fairly be conceded that the tidal zone was in all probability the cradle of the race, and that thence the various members gradually betook themselves, mostly to deeper and deeper water on the one hand, but also, though perhaps more tentatively and gradually, to fluvial and terrestrial conditions on the other.

Now the first requirement of a soft-bodied animal, and especially of one considered by its fellows to be good eating, is protection. In early days, however, enemies were far fewer than now, and it was rather from the force of the elements that preservation was needed.

This first requirement is supplied by the shell, and all three types, univalve, bivalve, and multivalve, make their appearance early in the history of the race.

The last named, the Chitons, first occur in the Ordovician (*Priscochiton*). They are, however, a conservative race, and have not materially changed their form since those far-off days. Still, taking the Amphineura as a whole, the class shows a desire to disburden itself of its coat-of-mail. Through the successive genera of one branch of the Polyplacophora (*Acanthochites*, *Amicula*, *Cryptochiton*, and *Cryptoplax*) the component plates become wider and wider apart, and the whole animal more vermiform, while in the worm-like Aplacophora the shell has disappeared, though numerous calcareous spicules remain scattered over the mantle.

As regards the Gastropoda, when it is borne in mind that the embryonic shell is nautiloid and exogastric (and allowing for the gastropod peculiarity of spiral torsion, which is a deep-seated phenomenon, foreshadowed early in the cleavage of the egg-cell), the number and variety of forms assumed in the adult state is remarkable. Seeing that departures from this embryonic and therefore primitive type are pronounced, even in the earliest known gastropods, it is not possible to say how far environment or other forces may have played part in their development. Certain elongate forms like *Terebra* would seem a positive disadvantage to the animal, and still more so to the Hermit-crab, who, with mistaken notions of levity, occupies an empty example.

Nevertheless, certain broad characteristics are observable. Primarily among the inhabitants of a rough foreshore the massive strength of the shell is noticeable, the object being, of course, to withstand the battering action of the waves and hard substances like stones cast up by them.

To this end the conical form of the tests of *Patella* and *Fissurella* is admirably adapted, hence the recurrence of this particular shape in widely different molluscs. Thus it reappears in the Capulidæ, a family dating back in time as far as do the Docoglossa, the Hipponycidæ; *Ancylus* and *Acroloxus*, which in swift running waters are liable, only in a lesser degree, to the same troubles as the marine surf dwellers; and more strikingly still in those pulmonates (*Siphonaria* and *Gadinia*) that have reverted to the marine surf as a habitat. The patelloid shape is also approximated in the fresh-water genus *Septaria*, in which the operculum, being no longer in use, is reduced in size and buried in the substance of the foot. While a parallel instance, in a widely different animal, dwelling under similar conditions, is afforded by the familiar Barnacle.

The early spiral Rhipidoglossates seem mostly to have had stout shells; certainly this is the case with the modern Neritidæ, Turbinidæ, Trochidæ, and their allies. Most of the members of these groups are furnished with thick opercula, which are not withdrawn far within the mouth of the shell. With the capacity on the part of the animal, however, for retreating further and further into the shell and so out of the more immediate reach of danger of violent injury, the operculum, always an incumbrance, tends to become less and less ponderous.

Other inter-tidal forms belonging to families higher in the molluscan scale have also, under the necessity of facing similar conditions, developed strong shells: such are *Littorina*, *Purpura*, *Nassa*, and among tropical forms *Pterocera*, *Turbinella*, and *Strombus*. The last-named, indeed, is the most difficult of all shells to break, resisting even the lusty application of a geological hammer.

When, however, the foreshore is quitted in favour of deeper water, where no surf ever breaks and where the sea-bottom is composed of soft sand, or silt, a ponderous shell ceases to be essential for protective purposes and becomes a positive disadvantage in locomotion. This drawback is further increased in the case of Gastropoda that are carnivorous, as the higher forms mostly are, for even the slow-moving bivalves on which they feed require greater activity to seek out and capture than a rooted plant. Hence the reduction in shell and operculum shown by the inhabitants of the laminarian as contrasted with those of the littoral zone.

The process continuing as specialization proceeds, the shell ever tends to decrease in size till it remains solely as a protector for the more vital organs, as in the Tectibranchs, or disappears altogether, as in the rhipidoglossate *Titiscania* and the Nudibranchs.

A similar reduction and disappearance take place among the pelagic forms. Light as *Ianthina* shells are, they are substantial compared to the glassy films carried by the Heteropoda and Pteropoda Thecosomata, while *Phyllirhoë* and the Pteropoda Gymnosomata have discarded all covering whatsoever.

The fresh-water Gastropoda, save those few that inhabit turbulent waters, have, as might be expected, thin shells; but though *Amphipeplea* and *Physa* tend to overflow their shells, an absolutely shell-less fresh-water gastropod remains to be discovered.



On land heavy shells are certainly at a discount, and though some such occur among the Auriculidæ, in certain species of *Strophocheilus*, in *Leucochroa* (where it serves as a protection against excessive heat), and many of the Cyclophoridæ, still, viewed broadly, the tendency, as might be expected, is to a lightening and diminution of the shell to the point of disappearance, and this more especially in the carnivorous and semi-carnivorous forms. In fact, nearly all the families of land-snails culminate with highly specialized representatives, in which the shell is not only extremely dwarfed, as in many well-known instances, but is reduced to an internal vestigial plate, as in *Chlamydothorus* (Testacellidæ), *Limax* and allied genera (Limacidæ), *Metostrocon* (Helicidæ), *Hyalimax* (Succineidæ?), and *Athoracophorus*, or to mere granules, as in *Arion*, while it is totally wanting in *Trigonochlams*, *Pseudomilax*, *Philomyces*, *Veronicella*, and *Oncidium*.

The Scaphopod shells do not assist in our present enquiry. The animals have not materially altered their habits, and the function of the shell is merely to protect the soft parts from the lateral pressure of the surrounding silt, and to that end the tubular form is most suited. The young shell in its very early stages is so deeply cleft as to be almost bivalve. Unfortunately some recent textbooks, professedly founding their information on the translation of Claus' great work, have overlooked the 'almost.' In the course of growth the apical portion of the Scaphopod shell is absorbed in proportion as the aperture is added to, consequently the apical slits in all adult shells, and the perforations in *Schizodentalium*, owe their existence to absorption, and are not due, as in certain Gastropoda, to the inclusion of quondam marginal slits.

Among the Pelecypoda the shore-frequenters of the older and, broadly speaking, less specialized types exhibit on the whole stouter and more convex shells than the later and more specialized ones. Especially stout are some that have, like *Tridacna* and *Hippopus*, to withstand the full beat of ocean waves; so, too, are those of the fossil reef-builders of the *Rudistes* group.

The most primitive form, *Nucula*, that has come down to us from palæozoic times is without siphons or byssus, but some species of its near ally, *Arca*, which boasts an equally long ancestry, have attained the faculty of mooring themselves by a byssus and so defying the waters. *Mytilus*, which also comes of a family having a long pedigree, has not a particularly stout test capable of resisting heavy blows, but it meets the waves with its outwardly directed, sharp, wedge-shaped shell and cleaves them instead; while it does not settle, or perhaps, to speak more accurately, does not establish, itself in spots where it would be liable to damage from stones thrown up by the sea.

Allusion may here be made to the great inequality of size the anterior and posterior portions of the body present in certain forms like *Mytilus*, and the disappearance *pari passu* of the anterior adductor muscle in proportion, as, by the increase of growth in the posterior

portion of the body, it is brought more and more into line with the hinge and posterior adductor muscle, and consequently ceases to be needful.<sup>1</sup>

It is possible that in the case of *Mytilus* the predisposing cause may be due to the long-continued action of gravity operating on successive generations of suspended animals, aided perhaps by some other morphological influence. Whether a similar tendency to monomyarianism observable in forms that, like *Pecten*, *Ostrea*, etc., rest on their sides, may be attributable to a like cause is not clear, but it is at least remarkable that so many of the Monomyaria should be forms that assume a position out of the normal vertical.

*Tridacna*, so long a puzzle, and concerning which it was even held that the animal must have rotated in its shell, has been successfully shown by Mons. R. Anthony<sup>2</sup> to be simply a case of a monomyarian that has taken to live with its umbo downwards. All its anatomical features correspond closely in arrangement and position with those of *Mytilus*, only it occupies a relatively reverse position, and its huge plastic body tends by its own weight to spread out and consequently to form a shell that has its longer axis at right angles to that of the *Mytilus* shell.

To return, however, to the pelecypod shell. Most of the bivalves, as a matter of fact, do not live in exposed positions, but burrow more or less deeply into soft sand or silt. Here those that do not penetrate to any depth below the surface, and do not live in deep water beyond the reach of ground swells, are liable to considerable pressure from the shifting of the loose material that surrounds them. Hence these generally have acquired stout, more or less globular, shells, as in *Isocardia*, *Cardium*,<sup>3</sup> the Veneridæ, etc.

The disadvantage of this form of shell, of course, is the amount of muscular power required to force a passage with it down into the sand. A gauge of this may be seen in the huge scar of the retractor pedis muscle in the Veneridæ, that has generally been overlooked because it is situated at the back of the broad hinge-plate.

In proportion, however, as the bivalve seeks shelter from the strains of the shifting sand, either in quieter waters or by burrowing deeper, so the shell in response tends to become less heavy and solid, and to assume a flatter shape, permitting of more rapid passage down into the silt. This is seen in the later date forms, such as *Tellina*, *Psammobia*, and *Scrobicularia*. The habit of deeper burrowing is of necessity accompanied by an increase in the length of the siphons to ensure proper respiration, and this in turn results in the prolongation of the

<sup>1</sup> This was first pointed out by Mr. B. Sharp, Proc. Acad. Philad., 1888, pp. 121-124, and first illustrated by specimens in the Index Hall of the Natural History Museum shortly afterwards.

<sup>2</sup> Comptes-rendus Acad. Sci. Paris, tom. cxxxviii (1904), pp. 296-298.

<sup>3</sup> It is interesting to note that the spines on the shell of the prickly species of *Cardium* are more pronounced on those dwelling in sand than on those individuals inhabiting muddy or silty sea-floors, the more shifting material exacting a better means of anchorage.

posterior portion of the test to house them, as well as the ultimate abandonment of the flattened form, till finally in the deepest burrowers, the Myidæ and Solenidæ, the closed shell is frankly abandoned, and the valves, which no longer cover the whole animal, function solely as fenders against lateral pressure from the surrounding silt.

Facility in penetration is probably likewise the accountable cause of the elongate shape of the rock-boring representatives of several families of Pelecypoda.

To the borers, rather than to the burrowers, should be referred *Fistulana* and *Brechites*, with their specialized shelly tubes, which are a secondary product quite distinct from the true shell. In the case of the former we have had proof of its drilling powers brought before this Society on more than one occasion.<sup>1</sup>

There are a few instances among the bivalves in which the shell becomes internal (i.e. invested by the mantle): *Chlamydoconcha*, which passes its life attached to the sheltered sides of rocks by its byssus; *Ehippodonta*,<sup>2</sup> which is commensal in the burrow of a species of prawn (*Axinus*); *Scioberetia*, which is a parasite in the ambulacral zones of an incubating echinoderm (*Tripylus*); and *Entovalva*, which is parasitic within *Synapta*. Semper has also recorded the occurrence in similar situation of another mollusc with internal shell, from the Philippines,<sup>3</sup> possibly belonging to the same genus as the last.

No instance of a shell-less pelecypod has as yet been recorded.

While, therefore, it is not so pronounced as in the case of the Gastropoda, there is still evidence of an increasing tendency in the Pelecypoda towards the reduction of the shell as one proceeds from the more primitive to the more specialized forms.

One feature in connection with the bivalve shell there is, that distinctly shows a tendency to simplification, and that is the progressive reduction of the number of teeth in the hinge. The oldest forms, such as many of the Palæoconcha of Neumayr, the more archaic living forms (Nuculidæ, Arcidæ, etc.), and the embryo shells of many higher forms (Ostreidæ, Pteriidæ, Philobryidæ, Mytilidæ, etc.), exhibit a more or less rectilinear hinge-line with numerous small teeth (Taxodont). In the yet more advanced forms (*Condylocardia* and *Scioberetia*) this stage, present in the early embryo, is succeeded by the series of folds (characteristic of the young stages of the higher Pelecypods) that subsequently divide off into cardinal and lateral teeth, thus linking the Taxodont with the Heterodont and Desmodont types of hinge. In these last groups the hinge-teeth progressively dwindle in number, till in the most specialized Septibranchs they are wanting altogether, as they are also, exceptionally, in other less advanced forms.

<sup>1</sup> Proc. Malac. Soc., vol. v, pp. 258, 345; vi, p. 185; and as an exhibit at the meeting in December last.

<sup>2</sup> The anatomy of this genus formed the subject of one of the late Martin F. Woodward's earliest papers: Proc. Malac. Soc., vol. i, pp. 20-25. Examples were also exhibited at a recent meeting by Mr. Burne.

<sup>3</sup> Reisen im Archipel der Philippinen: Holothurien, p. 99.

In dealing with the Cephalopoda it is essential to take into account the past history of the race, since so many, especially of the shell-bearing forms, have long been extinct.

The modern representatives of the class<sup>1</sup> number close on 500 species, belonging to about 80 genera, of which total about half are referable to the genera *Polypus*, *Sepia*, and *Loligo*, while only five species, all belonging to the genus *Nautilus*, are possessed of an external shell.

The Nautiloidea,<sup>2</sup> which began in the Cambrian with seven straight-shelled species representing four genera, attained their maximum in the Silurian with about 230 species belonging to 20 different genera and subgenera. Since that epoch they have steadily diminished in numbers down to their minimum at the present day, while the surviving genus, *Nautilus*, only made its first appearance in the Trias, or, *sensu stricto*, the Tertiary. Nor did the vigorous offshoot of Ammonoidea that started in the Devonian and attained to a countless host of species, which from some monographs one might almost infer were referable to an equal number of genera, succeed in keeping up the number of testaceous Cephalopoda, for with the close of the Cretaceous period the whole group died out after experimenting in every type of shell-form in the effort to survive.

Nothing is at present known of the embryonic development of *Nautilus*, and we do not consequently know if the primitive, embryo shell differs in any respect from the adult, but the fact that the earliest Cephalopods had straight shells and that the line of development led through curved to coiled forms is suggestive, and raises the speculation whether the primitive gastropod shell may not also have been straight, and this phase in its development subsequently suppressed in its embryonic history.

Following up the scale of geological time, we meet with the first of the decapods (*Aulacoceras*, belonging to the family Belemnoteuthidæ) in the Trias. It is interesting to note that, in the same series, the earliest gastropod referable to the Tectibranchia, a species of *Bullinella*, is also recorded. So that we have a cephalopod with an internal shell comparing in time with a gastropod of a group that only subsequently in the chalk period achieved a partially internal shell (*Philine*).

The Myopsida or next higher tribe of Cephalopoda began in the Lias (*Geoteuthis* and *Beloteuthis*); while in the Cretaceous of Lebanon the oldest known octopod, *Palæoctopus Newboldi*, makes its appearance just as the Belemnites and Ammonites disappear from the scene.

So far as the shell is concerned, then, the Cephalopoda seem to have been yet more eager than the Gastropoda to jettison the encumbrance, and their predatory habits have obviously had much to do in hastening this consummation.

<sup>1</sup> Cf. Hoyle: "Cat. Recent Cephalopoda" and "Supplement," Proc. Roy. Phys. Soc., Edinburgh, ix (1886), p. 207; xii (1897), p. 364.

<sup>2</sup> Foord: "Cat. Fossil Ceph. in Brit. Mus.," pt. ii, pp. xviii-xix. These and the following paragraphs have been kindly checked by Mr. G. C. Crick.

Turning next to the form of the animal itself, it cannot be said that any definite line of development is presented, unless, perhaps, in the case of the more specialized Gastropoda, where, with the discarding of the shell, the visceral hump tends to be smoothed down and distributed along the dorsal keel till the true slug-like form is attained. Even this seems to be due to the burrowing habit of the animal rather than indicative of any definite product of development.

The foot largely modifies in response to individual requirements, whether for locomotory or other purpose. The simple reptant foot becomes a strong sucker-like organ in the Docoglossa, *Haliotis*, and other rock-frequenting kinds. It assumes the snow-plough outline in *Natica*, *Sigaretus*, and other species that search about in loose surface sand for their bivalve prey. It is expanded and functions like a snow-shoe in those of the Bullidæ that frequent very soft ooze, while the widely extended pleuropodial<sup>1</sup> margins function as fins, enabling the animal to swim (*Hydatina*, *Gastropteron*, etc.). In the pteropods and other oceanic gastropods it is modified into a swimming organ, but in this connection it is interesting to note that, according to Tesch,<sup>2</sup> the fin of the heteropod is constituted by the extension of the columella muscle through the true foot and its fan-like expansion into the swimming organ.

In the Pelecypoda the primitive reptant foot of the Nuculidæ becomes a leaping organ in *Cardium* and *Trigonia*, and converted by successive stages into an efficient digging organ in the burrowers, while it is aborted in fixed forms.

The Cephalopod foot has made more definite progress. Beginning with the numerous series of weak tentacles in the *Nautilus*, and presumably also in the fossil predecessors and allies thereof, it culminates in the powerful eight-armed weapon of *Polypus*.

The alimentary system does not furnish any particular evidence with respect to our quest of the moment, although, taking the molluscan group as a whole, the radula, which is characteristic of the phylum, does.

Speaking broadly, the teeth in the older families are numerous and weak. There may be as many as 300 or more teeth in each transverse row in the Rhipidoglossa. Our late Secretary, Mr. Martin F. Woodward, in his careful and most excellent monograph on "The Anatomy of *Pleurotomaria Beyrichii*," discussed the question of the radula, and gave reasons<sup>3</sup> that will hardly be disputed for thinking it represents the most primitive type among all existing Gastropoda, and, further, that it was derived from one in which all the teeth in a transverse row were similar. In *Pleurotomaria*, although all the various specialized tooth areas merge into one another, five tracts on

<sup>1</sup> The term 'parapodia' adopted by some authorities has already long been in use, in a very different sense, for quite other animals; nor does 'pteropodia,' proposed by von Jhering, seem quite appropriate. Garstang's alternative term, therefore, seems preferable.

<sup>2</sup> Siboga Expeditie, vol. li, p. 104.

<sup>3</sup> Quart. Journ. Micro. Sci., n.s., vol. xlv, p. 255.

either side of the median are distinguishable; but of these the first and second, and again the fourth and fifth, counting from the centre, show less differentiation from each other than from the third, so that three tracts on either side are really all that practically strike the eye. Now Troschel and others have laid considerable stress on the breaking up of the rhipidoglossate radula into three zones on either side and on the occasional replacement of a group of marginal laterals by a single large tooth, which generally retains sufficient traces of the individuals it replaces to suggest that it represents the fusion of a series. This is noticeable in *Addisonia*, *Cocculina*, the Neritidæ and Helicidæ among the Rhipidoglossa, and also in certain archi-tænioglossate Cyclophoridæ, the Solariidæ, and even in *Ovula*.<sup>1</sup> Hence it may be legitimately inferred that the tænioglossate radula, whose formula is 1 : 1 : 1 : 1 : 1 : 1 : 1, is derived from the rhipidoglossate by a fusion of the elements of the three original zones.

The docoglossate radula, judged from its modern representatives, the Patellidæ, is explicable on similar lines, for if the aborted median tooth, sometimes represented by a rudimentary plate, be allowed for, the remaining teeth form three series of pairs on either side.

A further fusion, or, what is more probable in this case, the suppression of the outer laterals, in the Rhachiglossa and more primitive of the Toxoglossa gives rise to the 1 : 1 : 1, the typical radula of these forms; and a further abortion of the laterals to the single median tooth left in *Harpa*, *Marginella*, and most of the Volutidæ. In the Cones, on the other hand, it is the median tooth that is abolished, leaving the double row of barbed laterals.

What, then, is to be said of such exceptions as occur in *Ianthina* and *Scala* and others? Simply that either individual requirements have necessitated a return to the more primitive form of radula, or that their ancestry goes further back in geological time than suspected. Fossils doubtfully referred to the latter occur in the Silurian and Devonian, but *Ianthina* extends, so far as at present known, only back to the Middle Tertiaries.

The Opisthobranchia offer every variety of radula in their ranks, from the uniform multiserial to the single row of median teeth in *Elysia*, and much further research will be necessary ere a solution of this diversity is found.

The Pulmonata present considerable variation in the composition of the radula. The Auriculidæ, pronounced by Pelseneer<sup>2</sup> to be the most primitive of the group, have also a primitive type of radula, but geologically date only from the Cretaceous period. The Limnæidæ, which appear in the Jurassic, have a similar primitive radula. So, too, have the Siphonariidæ, but here, if *Hercynella* be correctly referred to this family, which seems doubtful, we have an ancestry dating from the Devonian.

<sup>1</sup> In *Ovula ovum*, indeed, fusion has proceeded so far that the formula is 1 : 1 : 1 : 1 : 1.

<sup>2</sup> "Recherches sur divers Opisthobranches": Mém. Cour. 4<sup>o</sup> Acad. Sci. Belg., tome liii, p. 114.

The Stylommatophora, likewise, are primitive in the arrangement of the radula, most of them having a great number of similar teeth in the transverse row. The oldest of them, *Pyramidula* and *Jaminia*, appear, as well known, in the Coal-measures. The determination of the former is due to Pilsbry, than whom we have no greater living authority on helicoids. It was first referred to *Zonites*, and subsequently to *Archæozonites*, and under these names still masquerades in geological text-books, even the latest, so gyroscopic in their immutability are these works of instruction. *Zonites* proper, as typified by *Z. Algirus*, shows no diminution, but in *Vitrea* there is a considerable reduction in the number of teeth in each transverse row. Of the British species, *V. nitidula* has 36, the other species from 12 to 15 laterals in each row on either side of the median tooth, whereas in *Helix aspersa* there are about 55.

As regards the character of the individual teeth, Pilsbry<sup>1</sup> points out that the multicuspidate form of the primitive pulmonates gives way in the helicoids to the tricuspid type. In many Endodontidæ the teeth are all tricuspid, a form usually correlated with small size and strictly terrestrial habits. All modifications in the teeth proceed from the median line of the radula outwards, the outer marginal teeth being the last to be modified. A study of the marginal teeth, or of those of the embryo, therefore gives a clue in many cases to the ancestral condition of a much modified radula.

The yet more highly specialized of the pulmonates, the Agnatha, typified by the Testacellidæ, which date back to the Cretaceous, have likewise a primitive form of radula, in which, however, the individual teeth have become specialized to fit them for their actively carnivorous habits.

The radula of the Cephalopoda shows successive diminution in the number of teeth, but the gradation does not quite correspond with their taxonomy. Thus *Nautilus* on either side of the median has, first, two very similar admedians, then two long, pointed teeth, with a vestigial basal plate between them and another on the outer margin, indicating that the primitive nautiloid radula had six teeth on either side of the central, or a transverse row of thirteen. The remaining members of the Class, with one exception, have only three laterals on either side; but *Loligo*, *Polypus*, and *Bolita* have a vestigial plate on the outer side. The exceptional genus, *Gonatus*, has only two laterals on either side. Hoyle<sup>2</sup> has noticed that in the Cephalopoda there is a tendency in the corresponding teeth, especially the median, in following rows to vary slightly in a cycle, five or six rows going to each set.

[Since the above remarks on the radula were written, a most important paper has been published by Miss Igera B. J. Sollas (Quart. Journ. Micro. Sci., vol. li, pp. 115-136) dealing with the composition and some points in the development of this organ.

<sup>1</sup> Manual of Conchology, ser. II, vol. ix, p. xiii.

<sup>2</sup> "Challenger" Reports: Zoology, pt. xlv (1886), p. 54.

Miss Sollas finds that in all the odontophorous Mollusca the radula has an organic basis of chitine; that in the Docoglossa the teeth further contain as much as 27 per cent. of silica hydrate or opal in their composition, while in the rest of the Gastropoda the chitine is hardened superficially (*enamel layer*) by deposits containing calcium, iron, and phosphoric acid to the amount of from 2.4 to 6 per cent.; that the Chitons differ from this second group in alone having ferric oxide as the most important mineral constituent, which causes the dark colour of the teeth.

By employing Bethé's and other stains the interesting fact is brought out that the various tracts of the radula take the stains differently. A comparison of specimens thus treated should therefore enable a correct correlation to be made of the tracts of radulae in the several stages of evolutionary development. Miss Sollas' results in this respect, so far as they go, bear out the conclusions set forth in the foregoing paragraphs; although obviously unaware of the opinion of previous writers on the subject concerning coalescence, she has been almost tempted to suggest that the "marginals are," as she puts it, "multiplied laterals."]

The circulatory system can be adduced as showing development if those of the tribe at the head of the phylum, the dibranchiate cephalopods, and the primitive gastropods be contrasted. For in the latter the circulatory system, instead of branching off into capillaries, is distended into swollen, irregular cavities, and sinuses, which are, so to speak, insinuated among the various organs of the body, while a certain amount of the blood finds its way back to the heart without passing through the respiratory organs. The Dibranchia, on the other hand, have the most complete circulatory system of any mollusc, the blood being nearly entirely contained in true vessels.

The molluscan heart, at the same time, offers some anomalies when the different groups are compared. It is most primitive, and more nearly approximates the annelidean type, in *Nautilus*, where the single ventricle (and no mollusc has more than one) is served by four auricles, whereas in all the other symmetrical mollusca it has but two auricles (except in the Scaphopoda and Aplousobranchia in which the heart is rudimentary). In the streptoneurous Gastropoda proportionately as the right (originally left) ctenidium becomes aborted in the higher Rhipidoglossa, and disappears in the rest, as the result of the general torsion of the body, so the corresponding auricle diminishes and disappears also. The simplification of the heart in this case, therefore, is not due to any progressive development from a less to a more perfect condition.

The respiratory system supplies some very interesting points, especially in those cases where a secondary system has been brought into play as in *Patella*, many Nudibranchia, and the Pulmonata. With these latter, howbeit, our present enquiry is not concerned, and we confine our attention to the true gills.

There is every indication that the primitive gill of the mollusca must have consisted of at least a pair of very simple, plume-like



structures, and that as increased facilities for respiration were required, which of course implied increase of gill surface, it could only be obtained in one of two ways—the flattening out into a leaf-like expansion of the individual gill-filaments (aspidobranch), or their prolongation (pectinibranch). The former modification is the one that appears in all the archaic members of the different Classes, and may be recognized in the Polyplacophora, the rhipidoglossate Gastropoda, the protobranchiate Pelecypoda, and the Cephalopoda. This structure, nevertheless, is limited by the confined space of the pallial cavity, and further increase of surface can only be gained by the corrugation of the gill-filament. A beginning of such plication was observed by Martin Woodward in the case of *Pleurotomaria*,<sup>1</sup> and doubtless it exists in other aspidobranchs, but it is carried to a much greater degree in the cephalopods, in which the gill-filaments exhibit two series of plications crossing one another.

In the Gastropoda some changes, which would be startling if they were not so familiar, take place. In the first instance the right (morphologically left) ctenidium, as one ascends from lower to higher members, atrophies and disappears. Martin Woodward shows that this had begun in *Pleurotomaria*,<sup>2</sup> but it is far more marked in *Scissurella*. In the pectinibranchs not only has one ctenidium disappeared, but the other, except in the case of *Valvata*, has become attached by its whole length to the wall of the pallial cavity, and as a consequence has parted with the whole of the row of filaments on that side; so that three-quarters of the gill potentiality of the primitive mollusc is sacrificed. By way of partial compensation the individual gill-filaments have been somewhat lengthened till the familiar pectinibranch condition arises. In *Ianthina* these gill-filaments are, furthermore, plicated.

It is in the Pelecypoda, however, that the most extraordinary development of the gills takes place. The aspidobranch type of *Nucula* and the rest of the protobranchs is abandoned in the others for the pectinibranch type, and the lengthened filaments have to be folded back on themselves to keep them within the limits of the shell. The all-important monographs of Ménégau<sup>3</sup> and Pelseneer,<sup>4</sup> crowned by the able memoir by Dr. Ridewood,<sup>5</sup> have made all malacologists familiar with the successive stages whereby these gill-filaments become united to form reticulate lamellæ, and afterwards by plication and further transverse unions from lamella to lamella give rise to the

<sup>1</sup> Quart. Journ. Micro. Sci., n.s., vol. xliv, p. 224.

<sup>2</sup> Op. cit., p. 222.

<sup>3</sup> "Recherches sur la circulation des Lamellibranches marins": Thesis, 4to, Besançon, 1890.

<sup>4</sup> "Contribution à l'étude des Lamellibranches": Archives de Biol., tom. xi (1891), pp. 147-312.

<sup>5</sup> "On the structure of the Gills of the Lamellibranchia": Phil. Trans., ser. B, vol. cxv (1903), pp. 147-284. The members of this Society had the advantage of a personal exposition of his work from Dr. Ridewood in March, 1904.

complicated, almost spongy structure met with in *Anodonta* and other specialized forms.<sup>1</sup>

The question then arises why there should be this remarkable development of gill in the Pelecypoda when the other Classes of the mollusca find their requirements amply met by far simpler structures.

The answer seems clearly that it is a matter of facility of respiration. The majority of the gill-bearing Gastropoda and the less specialized Pelecypoda live in waters that are constantly in a state of more or less agitation, and where, consequently, entangled oxygen is comparatively abundant; whereas the bivalves that burrow do not get the water in their lurking places so fully or so frequently aerated, and hence the necessity for being able to extract proportionately more oxygen from the water around them and the consequent development of the gill in response to this demand.

The fact, for instance, that *Anodonta* has developed such a complicated gill-structure becomes intelligible when it is borne in mind that it lives mostly in ponds or sluggish water, poor in oxygen, and has, moreover, for six or eight months out of the twelve to shelter within its gill-chamber hundreds of young, all like itself consuming oxygen from the same limited supply.

If this explanation be the right one, and complicated gill-structure be a result of environment, rather than progressive development, it may well happen that some of the groups of Pelecypoda founded on these gill-structures, particularly the more specialized ones, may prove to comprise forms that taxonomically are extremes of more than one family, just as the slugs have been shown to be. On this point it will be necessary to await further careful investigations of the type of those begun by Mr. Bloomer on the anatomy of the British Solenidæ, of which the latest have been laid before this Society.

All this tends to throw doubt on the taxonomic value of gill-structure *alone* for this group, and to lend greater weight to Dr. Dall's *caveat*, echoed by Dr. Ridewood, "that systems based on a single character . . . are bound to prove unsatisfactory as our knowledge of intermediate types advances; and that almost any group may have among its members some which retain archaicisms longer than the rest . . . Any permanent classification must necessarily be eclectic, considering all characters, and distinguishing sufficiently between genetic and adaptive features."<sup>2</sup>

So thoroughly has the nervous system of the Mollusca been worked at and described that, though much doubtless still remains to be done, it is possible to get a comprehension of the whole, and here at once a definite progressive development is traceable. In the earlier and more archaic Gastropoda the nervous system is diffuse, the nerve

<sup>1</sup> For interesting papers on the circulation of the water through the Pelecypod gill and the part these currents play in conveying food to the mouth of the animal, see Wallengren, "Zur Biologie der Muscheln": Lunds Univ. Arskrift., N.F., Afd. ii, Bd. i, nos. 2 and 3 (1905).

<sup>2</sup> Dall: Trans. Wagner Free Institute, vol. iii, p. 505. Ridewood: Phil. Trans., ser. B, vol. cxcv, p. 185.

ganglions are comparatively widely separated, and the connectives and commissures that unite them are long. Passing to higher and higher representatives, the nerve-centres tend to become more and more concentrated, at first the sensory and motor nerve-centres and then all the others, till they form a ring round the anterior part of the œsophagus, and finally are intimately united and localized on the dorsal surface of the latter, as in *Pleurobranchus*, or the ventral side, as in the thecosomatous Pteropods. This progressive advance is observable also in the Cephalopoda, and to a lesser degree in the Pelecypoda and even the Amphineura.

In the Cephalopoda we meet for the first time in the Mollusca with internal structures of great import, namely, cartilages, which are especially developed in the head. In *Nautilus* there is the H-shaped capito-pedal cartilage, which supports the ventral portion of the nerve-centres, two of its branches extending to the base of the funnel. In the Dibranchia the cephalic cartilage completely invests the central nervous system, the œsophagus passing through it. Different Cephalopoda have additional cartilaginous pieces in other parts of the body, such as the bases of the fins, and the arms, at the base of the neck (when the mantle is not fused to the head), at the internal extremities of the retractor muscles of the head and funnel, and even in the two branchial lamellæ. Here we have the bases of a possible internal skeleton that might conceivably be called into existence by the operation of circumstances at present unforeseen, but seeing that, despite the long geological ages of their existence, the Cephalopoda are still behind the earliest known fishes in this respect, much time must elapse before its evolution, and the further chronicle of any progress in this respect will fall to others than ourselves.

#### *Summary.*

Despite the plastic nature of the Mollusca, progressive development is traceable in certain characters, while in other conspicuous features the action of environment, or individual requirement, alone seems responsible.

In all the Classes there is a tendency to get rid of the shell, apparently as the result of the assumption of more active habits, especially among the carnivorous individuals.

The form of the body and the adaptations of the foot would appear to be solely influenced by considerations of habit and habitat.

In the Radula, on the other hand, there is consistent progress in the shape of the replacement of numerous, weak, little teeth by few, strong ones, especially in the carnivorous groups.

The Circulatory System shows advance from a diffuse form in the archaic to a well-defined one in the highest tribes.

The Respiratory System, *per contra*, develops in response to individual requirements rather than on any well-determined lines of progress.

Finally, the Nervous System shows distinct advance from the dispersed character that obtains in the primitive groups up to the concentrated form that it assumes in the highest types.

## NOTES.

NOTE, TO CORRECT THE NAME *JOUSSEAUMIA*.—In the thirty-sixth Supplementary Report on the Pearl Oyster Fisheries of the Gulf of Manaar (part v, published by the Royal Society, 1906), I described under the name *Joussearumia* a new genus of Eulamellibranchiate molluscs, commensal along with the Sipunculid *Aspidosiphon* in the basal chamber of the corals *Heteropsammia Michelini* and *Heterocyathus æquicostatus*. Since the publication of this paper my attention has been called to the fact that the name *Joussearumia* is preoccupied, and indeed has been used twice over, once to denominate a subgenus of *Cypræa* (Sacco, "I Molluschi dei Terreni Tertiarii del Piemonte e delle Liguria," part xv, 1894) and again as the name of a new genus of the Alpheidæ (H. Coutière, Bulletin du Muséum d'Histoire Naturelle, Paris, 1896, p. 381). By a singular coincidence the name in both instances was omitted from the Zoological Record, and therefore does not appear in the Index. It is, I hope, a sufficient excuse for my having fallen into the error of using a generic name for the third time that I relied upon these two excellent guides in questions of nomenclature. Under the circumstances a variation of the termination seems preferable to the invention of an entirely new name, and I therefore propose to substitute the name *Joussearumiella* for that originally given.

G. C. BOURNE.

CORRECTION.—In my paper "On the Anatomy of *Tagelus gibbus* and *T. divisus*," p. 219, line 6 :—for "but both portions of the muscle are of the same depth. In *T. rufus* the anterior is deeper than the posterior part," read: "though both portions of the muscle are of the same depth (in *T. rufus* the anterior is deeper than the posterior part)."

H. H. BLOOMER.

NOTES ON THE POST-PLIOCENE MOLLUSCA OF THE  
MYLNE COLLECTION.

By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S.

Read 8th March, 1907.

A SMALL collection of Post-Pliocene Mollusca formed by the late R. W. Mylne (whose Geological Map of London is so well known) is preserved in the British Museum (Natural History), and we are indebted to Dr. A. Smith Woodward for the opportunity of examining these specimens. Unfortunately, though all the examples are localized, and there is no difficulty in determining their age, we have been unable to trace details of some of the sections from which they were obtained.

The collection consists of three series from Shoeburyness, an extremely interesting set from St. James's Square, two series from Spring Gardens, Charing Cross, and a good number of species from Menchecourt and St. Acheul.

(1) "Shoeburyness Boring."

*Bithynia tentaculata* (Linn.).  
*Paludestrina ventrosa* (Mont.).

*Corbicula fluminalis* (Müll.).  
*Cardium edule*, Linn.

(2) "Blue mud, Boring B, Shoeburyness."

*Paludestrina ventrosa* (Mont.).

*Cardium edule*, Linn.

(3) "Parsons Long Field, Shoeburyness; 14 feet mud with shells, bottom 3 feet mud and shells."

*Paludestrina ventrosa* (Mont.).  
*Corbicula fluminalis* (Müll.).

*Cardium edule*, Linn.

These three series are evidently from the same deposit, and are undoubtedly of Pleistocene age. The examples of *Corbicula fluminalis* are small, and many of the examples still retain their periostracum. The brackish-water conditions as shown by the presence of *Cardium edule* may probably account for the dwarfing. *Paludestrina ventrosa* was not uncommon, and the examples are very similar to those found at Grays, but are rather smaller. The other species call for no comment.

"Spring Gardens, Charing Cross": *Unio littoralis*, Lamarck.

There can be no doubt that this example was obtained from the same beds that yielded to W. J. Lewis Abbott so varied a fauna.<sup>1</sup>

<sup>1</sup> W. J. Lewis Abbott: "The Section exposed in the Foundations of the new Admiralty Offices," vol. xii (1892), pp. 346-356.

“Shells from the sands in St. James’s Square.”

<i>Helicella itala</i> (Linn.).	<i>Pl. spirorbis</i> (Linn.).
<i>Hygromia hispida</i> (Linn.).	<i>Bithynia tentaculata</i> (Linn.).
<i>Succinea oblonga</i> , Drap.	<i>Valvata piscinalis</i> (Müll.).
<i>Limnæa palustris</i> (Müll.).	<i>Pisidium amnicum</i> (Müll.).
<i>L. pereger</i> (Müll.).	<i>P. supinum</i> , A. Schmidt.
<i>Planorbis umbilicatus</i> (Müll.).	

This is an extremely interesting series from a Pleistocene deposit which belongs either to the third or the fourth terrace, and in all probability to the latter, and is of the same age as the beds at Spring Gardens. *Succinea oblonga* was fairly common, and the examples are often large; in fact, they are the finest we have seen from any deposit in these Islands. The specimens of *Limnæa palustris* are rather small and slender, in marked contrast with the extremely fine specimens found at Spring Gardens. *Pisidium supinum* is an extremely interesting shell which we have evidence was living in the Thames Valley down to a very recent period.

“Spring Gardens, Charing Cross.”

<i>Limnæa pereger</i> (Müll.).	<i>Neritina fluviatilis</i> (Linn.).
<i>Planorbis carinatus</i> , Müll.	<i>Sphærium rivicola</i> (Leach).
<i>Pl. Stroemii</i> , West.	<i>Sph. corneum</i> (Linn.).
<i>Bithynia tentaculata</i> (Linn.).	<i>Pisidium amnicum</i> (Müll.).
<i>Valvata piscinalis</i> (Müll.).	<i>Unio tumidus</i> , Retz.

Without doubt these shells came from a sandy bed of probably early Holocene age. An account of the Holocene beds at Spring Gardens has been given by Mr. Abbott.<sup>1</sup> Of these shells the most noteworthy is *Sphærium rivicola*, which is extremely rare in a fossil state in both the Holocene and Pleistocene. *Planorbis Stroemii* is another noteworthy species. It was not found by Mr. Abbott and did not occur at the New War Office, but was not uncommon at the Houses of Parliament and the New Scotland Yard.

“Base of sands, Menchecourt.”

<i>Jamnia muscorum</i> (Linn.).	<i>Pl. carinatus</i> , Müll.
<i>Vallonia pulchella</i> (Müll.).	<i>Pl. albus</i> , Müll.
<i>Hygromia hispida</i> (Linn.).	<i>Bithynia tentaculata</i> (Linn.).
<i>Limnæa pereger</i> (Müll.).	<i>Valvata piscinalis</i> (Müll.).
<i>Planorbis umbilicatus</i> , Müll.	<i>Pisidium amnicum</i> (Müll.).

“White sands, Menchecourt.”

<i>Vallonia pulchella</i> (Müll.).	<i>Planorbis spirorbis</i> (Linn.).
<i>Hygromia hispida</i> (Linn.).	<i>Bithynia tentaculata</i> (Linn.).
<i>Jamnia muscorum</i> (Linn.).	<i>Pisidium amnicum</i> (Müll.).
<i>Limnæa pereger</i> (Müll.).	

“Loess, Menchecourt.”

<i>Vitrea nitidula</i> (Drap.).	<i>Limnæa pereger</i> (Müll.).
<i>Hygromia hispida</i> (Linn.).	<i>Planorbis carinatus</i> , Müll.
<i>Clausilia bidentata</i> (Ström.).	<i>Pisidium amnicum</i> (Linn.).

<sup>1</sup> Loc. cit., p. 352.

## "Sands, St. Acheul."

*Jamnia muscorum* (Linn.).  
*Succinea oblonga*, Drap.

*Valvata piscinalis* (Müll.).  
*Pisidium amnicum* (Linn.).

## "Marly sands, St. Acheul."

*Hygromia hispida* (Linn.).  
*Succinea oblonga* (Drap.).  
*S. putris* (Linn.).

*Planorbis spirorbis* (Linn.).  
*Pl. arcticus*, Möller.

These five series are extremely interesting, since they are without doubt of the same age as the deposit at Swanscomb, Kent, which has yielded so abundant a fauna.<sup>1</sup> Perhaps the most interesting form is *Planorbis arcticus*. This form, which is a near ally of *P. glaber*, Jeff., and *P. parvus*, Say, is known in a living state from West Greenland, Fort Chimo, Ungava, and Labrador in the New World, whilst as *P. sibiricus*, Dunk., it has been recorded from Siberia. It occurs not uncommonly in the Pleistocene of Crayford, whilst in Germany, as *P. Rossmasslerii*, Aucs, or *P. sibiricus*, Dunk., it has been recorded from the Pleistocene of Osterode Eckbolsheim near Strassburg, Hangenbeiten near Strassburg, Uichteritz near Weissenfels, and Halberstadt.

---

<sup>1</sup> A. S. Kennard & B. B. Woodward, "The Post-Pliocene non-marine Mollusca of the South of England": Proc. Geol. Assoc., vol. xvii (1901), pp. 238, 239, and table.

## NOTES ON SOME HOLOCENE SHELLS FROM IGHTHAM.

By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S.

Read 8th March, 1907.

In 1902 an early interment was exposed in Stanley's Quarry, Ightham. This quarry is situate on the opposite side of the valley of the Shade to the quarry in which are situated the well-known Ightham fissures that have yielded so many Pleistocene vertebrate remains. The remains of three earthenware vessels and portions of a human skeleton were found in the grave. The age of the interment is a little uncertain. The pottery exhibits no traces of Roman influence whatever, and may well be late Celtic or early Iron age. At the same time it must be remembered that similar pottery is often found with Roman remains, so that it is perhaps safer to consider the interment as of early Romano-British age. The fragmentary remains of the human skeleton probably belonged to a woman, but it is impossible to speak definitely on this point. The skeleton was found about three feet away from the pottery. There were no traces of any calcined bones.

The grave had been formed by heaping up pieces of Kentish Rag on the old surface soil to a height of about six feet. The molluscan remains were obtained from the old soil at the base of the grave. The species are:—

<i>Vitrea cellaria</i> (Müll.)	...	...	...	Common.
<i>V. nitidula</i> (Drap.)	...	...	...	Common.
<i>V. crystallina</i> (Müll.)	...	...	...	Common.
<i>V. alliaria</i> (Müll.)	...	...	...	One example.
<i>Pyramidula rotundata</i> (Müll.)	...	...	...	Common.
<i>Hygromia hispida</i> (Linn.)	...	...	...	Common.
<i>H. rufescens</i> (Penn.)	...	...	...	Common.
<i>Helicella itala</i> (Linn.)	...	...	...	Five examples.
<i>Helix aspersa</i> , Müll.	...	...	...	Two examples.
<i>H. hortensis</i> , Müll.	...	...	...	Three examples.
<i>H. nemoralis</i> , Linn.	...	...	...	Common.
<i>Helicigona arbustorum</i> (Linn.)	...	...	...	Two examples.
<i>H. lapicida</i> (Linn.)	...	...	...	Two examples.
<i>Cochlicopa lubrica</i> (Müll.)	...	...	...	One example.
<i>Azeca tridens</i> (Pult.)	...	...	...	Two examples.
<i>Carychium minimum</i> , Müll.	...	...	...	Three examples.
<i>Clausilia laminata</i> (Mont.)	...	...	...	Three examples.
<i>Cæcilioides acicula</i> (Müll.)	...	...	...	One example.
<i>Pomatias elegans</i> (Müll.)	...	...	...	Common.

It is not often that we are able to fix with anything approaching accuracy the age of a holocene deposit. Hence the importance of these shells. The close proximity of the Ightham fissures enables us to make a comparison with the Pleistocene molluscan fauna of the district. There are sixteen species which have apparently existed in the district from Pleistocene times:—*Vitrea cellaria*, *V. nitidula*, *V. crystallina*, *V. alliaria*, *Hygromia hispida*, *H. rufescens*, *Pyramidula rotundata*, *Helix nemoralis*, *H. hortensis*, *Helicigona lapicida*, *H. arbustorum*, *Cochlicopa lubrica*, *Carychium minimum*, *Cæcilioides acicula*, *Clausilia laminata*, and *Pomatias elegans*. Of these *Vitrea nitidula* is far more abundant in the tumulus and living than it was



in the Pleistocene deposit, whilst the holocene and recent examples of *Helix nemoralis* and *H. hortensis* are by no means so fine as the older specimens. Four species occur in the Pleistocene, but are unknown later—*Pyramidula ruderata*, *Hygromia umbrosa*, *Jaminia muscorum*, and *Succinea oblonga*. One species, *Helicella itala*, occurred in the Pleistocene and in the tumulus, but is quite extinct in the neighbourhood at the present day. *Helix aspersa* occurred in the tumulus, but not in the Pleistocene, and is of course too abundant living, whilst *Helicella cantiana* must be considered a recent immigrant, since it is absent from both deposits, though common living. The band formulæ of *Helix nemoralis* from the tumulus are:—

1 2 3 4 5	...	...	...	...	...	Nineteen examples.
0 0 0 0 0	...	...	...	...	...	Eight examples.
0 0 3 0 0	...	...	...	...	...	Three examples.
(1 2 3)(4 5)	...	...	...	...	...	Two examples.
1 2 3 (4 5)	...	...	...	...	...	Five examples.
0 0 3 4 5	...	...	...	...	...	One example.
0 0 3 4 0	...	...	...	...	...	One example.

These figures are very similar to those of the Pleistocene examples, the only noticeable difference being that 0 0 3 0 0 was far more abundant in Pleistocene times than later. The example of 0 0 3 4 5 is perhaps noteworthy, for this is a rare mutation in England, though far more common in the west of Ireland. The band formulæ of *Helix hortensis* from the tumulus are:—

1 2 3 4 5	...	...	...	...	...	Two examples.
0 0 0 0 0	...	...	...	...	...	One example.

We have to tender our best thanks to Mr. Benjamin Harrison, of Ightham, for kind assistance during the examination of the tumulus.

ALLENS FARM, IGHTHAM.

Mr. F. J. Bennett, F.G.S., kindly forwarded us some material from a holocene deposit situate on Allens Farm, Ightham. Although the exact age of the deposit is uncertain, yet the contained mollusca are of some interest. Twelve species were noted:—

<i>Limax arborum</i> , Bouch.-Chant.	...	...	...	Six examples.
<i>Arion ater</i> (Linn.)	...	...	...	Common.
<i>Vitrea cellaria</i> (Müll.)	...	...	...	Four examples.
<i>Hygromia hispida</i> (Linn.)	...	...	...	One example.
<i>Vallonia pulchella</i> (Müll.)	...	...	...	One example.
<i>Pyramidula rotundata</i> (Müll.)	...	...	...	Common.
<i>Helix nemoralis</i> , Linn.	...	...	...	Fragments.
<i>Vertigo pusilla</i> , Müll.	...	...	...	One example.
<i>Carychium minimum</i> , Müll.	...	...	...	Common.
<i>Acicula lineata</i> (Drap.)	...	...	...	Two examples.
<i>Limnaea truncatula</i> , Müll.	...	...	...	Two examples.
<i>Pisidium casertanum</i> (Poli)	...	...	...	One valve.

Of these the two most noteworthy forms are *Acicula lineata* and *Vertigo pusilla*, both of which are extremely rare in Kent in a living state, whilst it may be noted that both these species, as well as *Limax arborum* and *Arion ater*, are absent from both the tumulus and the Pleistocene of the fissure.

DESCRIPTIONS OF FOUR NEW SPECIES OF *MELANIA* FROM  
NEW IRELAND AND KELANTAN.

By H. B. PRESTON, F.Z.S.

Read 8th March, 1907.

*MELANIA* *NOVÆ-HIBERNIÆ*, n.sp.

Shell sharply subulate, rather thin, pale yellowish brown; remaining whorls 12, sculptured with coarse oblique ribs and fine spiral striæ; the latter more numerous in the region of the sutures, while the ribs



become obsolete below the periphery; sutures impressed; peristome simple, produced, the margins joined by a slight callus; aperture ovate. Long. 32, diam. maj. 9 mm.; aperture, long. 8.5, diam. 3.5 mm.

*Hab.*—New Ireland.

*MELANIA* *BROWNI*, n.sp.

Shell subulate, solid, dull yellowish brown, a pale band appearing just below the sutures; remaining whorls 9, the earlier convolutions



being sculptured with closely set costæ, which are split up by spiral grooves on the later whorls into four or five rows of nodules; these

disappear below the periphery altogether, the shell in this region being only sculptured by eight spiral grooves; suture impressed; peristome simple and only slightly produced, a callus joining the margins; aperture ovate. Long. 27·5, diam. maj. 10 mm.; aperture, long. 9·5, diam. 4 mm.

*Hab.*—New Ireland.

#### MELANIA MELVILLI, n.sp.

Shell fusiform, rather solid, dark brown; remaining whorls 4–5, sculptured on the first four with closely set transverse ribs, crossed by 3 spiral grooves, presenting a beaded appearance, the lower portion of the body-whorl bearing four or five spiral ridges much interrupted by lines of growth; sutures impressed; aperture oblong-ovate; peristome



simple; columella lip slightly expanded below, callously effused above. Long. (type-specimen) 18, diam. maj. 9 mm.; aperture, long. 9, diam. 3·5 mm.

*Hab.*—Kelantan, Malay Peninsula.

Somewhat closely allied to *M. rudis*, Lea, a common Eastern form. The general sculpture is, however, coarser than in *M. rudis*, and it lacks the narrow channelled spiral groove just below the sutures so noticeable in that species.

#### MELANIA KELANTANENSIS, n.sp.

Shell acuminately turreted, dark blackish brown; remaining whorls 4, angular, bearing a single row of coarse nodulous tubercles on the



angle; upper whorls sculptured above the angle with two spiral liræ and numerous very fine wavy striæ, and below the angle with one spiral liration, the body-whorl bearing seven liræ below the angle;

suture impressed, a supersutural ridge being formed by the spiral liration below the angle; columella curved, a thin callus joining it with the lip above; peristome simple; aperture subquadrate, scarcely channelled below; interior of shell dark brown, except in the region of the tubercular thickenings, where it is bluish grey; operculum horny, nucleus subcentral, paucispiral, radiately marked with growth laminae. Long. 25.25, diam. maj. 15 mm.; aperture, long. 10, diam. 6 mm.

*Hab.*—Kelantan, Malay Peninsula.

In some respects allied to *M. spinata*, G.-Austen,<sup>1</sup> from the Kopili River, North Cachar Hills. That species is, however, much larger, bears a double row of tubercles, and lacks the two spiral liræ and fine wavy striæ above the angle on the whorls. Moreover, the spiny tubercles readily distinguish it from *M. Kelantanensis*.

---

<sup>1</sup> Proc. Zool. Soc., 1872, p. 514.

---

## ON THE ARMS OF THE BELEMNITE.

By G. C. CRICK, F.G.S., etc.

Read 8th March, 1907.

## PLATE XXIII.

IN a paper communicated to this Society,<sup>1</sup> in discussing the relationships of the fossil which Professor James Buckman named *Belemnoteuthis Montefiorei*, the present writer incidentally referred to the number of the arms of the Belemnite, and stated that it seemed "fairly safe to conclude that those Belemnites, of which any remains of the arms had been obtained, had only six *uncinated* arms."<sup>2</sup> The conclusion is so important that it seems desirable to fully set forth the evidence on which such a statement was made. This is attempted in the present paper.

The statement that the Belemnite possessed only six uncinated arms is not new, although it seems to have been generally overlooked, for Professor Huxley,<sup>3</sup> writing in 1864 on the structure of the Belemnitidæ, says (p. 16): "I have not been able to make out more than six or seven arms in any specimen, nor has any exhibited traces of elongated tentacles, though the shortness of the arms which have been preserved would lead one to suspect their existence."

In England remains of Cephalopoda with uncinated arms have been recorded from both Lower Liassic and Oxfordian rocks. Whenever at all well preserved, each arm is seen to have borne a double row of hooklets, but the character of the hooklets of the Liassic forms is very different from that of the hooklets of the Oxfordian forms. In all cases the hooklets seem to have been placed on the inner surface of the arms, with their proximal ends towards the base of each arm; the distal end of each hooklet is pointed and turned inwards. In the Oxfordian forms the proximal end, or that which was attached to the arm, is also pointed, whilst in the Liassic examples this part of each hooklet is thickened. The hooklets of the Oxfordian specimens have been well figured by Professor Owen,<sup>4</sup> who referred the species possessing them to the genus *Belemnites*, but they have long since

<sup>1</sup> Proc. Malac. Soc., vol. v, pt. 1 (April, 1902), pp. 13-16, pl. i.

<sup>2</sup> This fact is alluded to by Professor G. B. Howes in his address as President of the Section of Zoology at the meeting of the British Association in 1902 (Report, p. 631) as follows:—"In palæontology, history records the fact that in 1864 Huxley observed that the genus *Belemnites* appears to have borne but six free arms, a startling discovery which lay dormant till the present year."

<sup>3</sup> T. H. Huxley: Mem. Geol. Surv. United Kingdom, Figures and Descriptions illustrative of British Organic Remains, Mon. ii, "On the Structure of the Belemnitidæ," etc., 1864.

<sup>4</sup> Phil. Trans., 1844, pls. iii, v, vi.

been recognised as generically distinct therefrom and referable to the genus *Belemnoteuthis*. All the Oxfordian forms known to the present writer that exhibit hooklets have hooklets with pointed proximal ends, and are referable to the latter genus; they are not therefore considered in the present paper. The genus *Belemnoteuthis* certainly possessed *ten* uncinated arms, as is well shown by the example of *Belemnoteuthis antiqua* in the British Museum collection [B.M. No. 25,966],<sup>1</sup> that has been figured by Mantell<sup>2</sup> and others. This specimen also exhibits remains of the fleshy portion of the arms.

Of the remains of uncinated-armed Cephalopods from the Lias, the British Museum collection contains seventeen examples, all from the Lias in the neighbourhood of Lyme Regis and of Charmouth in Dorset. Each specimen exhibits a number of uncinated arms associated usually with an ink-bag, sometimes also with nacreous matter, and in two instances also with the guard or rostrum. In all these specimens the hooklets have thickened proximal ends, but in no case are there traces of the fleshy part of the arms. The two examples in which the remains of the animal are associated with the guard are the specimens figured as *Belemnites Bruguerianus* (pl. i, figs. 1, 1a) and *B. elongatus* (pl. i, figs. 2, 2a) respectively by Professor Huxley,<sup>3</sup> who described and gave several drawings of the hooklets of the arms (pl. i, figs. 1a, 2a, 5, 5a). Since in both these examples, in which remains of the arms have been preserved associated with the guard, the hooklets had peculiar thickened proximal ends, it is much more than probable that all the other examples of arms bearing similar hooklets that are associated with an ink-bag and portions of nacreous matter belonged to *Belemnites*, the guards having become detached, the nacreous matter that is present having formed part of the nacreous pro-ostracum.

It must, however, be mentioned that Professor James Buckman described from the Lower Lias shales between Charmouth and Lyme Regis a specimen which he referred to the genus *Belemnoteuthis* (*B. Montefiorei*), but the present writer has already elsewhere given his reasons for believing this fossil to be the remains of a *Belemnite*.<sup>4</sup>

Again, Professor Dr. O. Jaekel<sup>5</sup> has described from the soft dark clays of the Lower Lias of Lyme Regis a specimen which he refers to the genus *Acanthoteuthis*. The description was not accompanied by a figure, but thanks to the kindness of Dr. Jaekel and of the late Professor Dr. K. A. v. Zittel, to whom Dr. Jaekel had sent the

<sup>1</sup> The numbers in square brackets refer to the register numbers in the British Museum collection.

<sup>2</sup> G. A. Mantell: "Petrifications and their teachings," 1851, p. 459, lign. 100. G. A. Mantell: "Medals of Creation," 2nd ed., vol. ii (1854), p. 460, lign. 145. J. Prestwich: "Geology," vol. ii (1888), p. 218, f. 116. Oxford Clay: Christian Malford, Wiltshire.

<sup>3</sup> T. H. Huxley: Mem. Geol. Surv. United Kingdom, Figures and Descriptions of British Organic Remains, Mon. ii, "On the Structure of the *Belemnitidæ*," etc., 1864.

<sup>4</sup> G. C. Crick: Proc. Malac. Soc., vol. v, pt. 1 (April, 1902), pp. 13-16, pl. i.

<sup>5</sup> O. Jaekel: Sitz.-Ber. Gesell. naturf. Freunde, Berlin, Jahrg. 1890, pp. 88-92.

specimen, the present writer has been enabled to see a photograph of the fossil.<sup>1</sup> Now the hooklets in *Acanthoteuthis* were pointed at their proximal ends just as in the genus *Belemmototeuthis*; in fact, it is not quite certain that the two genera are distinct.<sup>2</sup> The photograph, however, though not particularly sharp, shows that the proximal ends of the hooklets were thickened, and not sharp; in fact, they much more closely resemble those figured by Professor Huxley as belonging to *Belemnites* than the hooklets of *Acanthoteuthis*. But Dr. Jaekel describes the fossil so completely—the outline of the body with a terminal triangular fin near the hinder end on each side, the head, the funnel, the arms, and the remains of a dorsal pen—that if the remains had belonged to a Belemnite one would have expected to have been preserved, if not the guard, at least some indications of the phragmocone, but the author does not allude to these. The various structures here referred to are not at all clearly indicated in the photograph, though it must be admitted that, as already stated, this is by no means so sharp as one could have wished. So far as can be judged from the photograph, the present writer sees no reason for regarding the fossil as generically distinct from the forms referred to in the present paper.

Assuming, then, that the seventeen examples of Liassic uncinated-armed Cephalopoda in the British Museum above alluded to belonged to Belemnites, the number of arms may be considered. In several instances the arms are so well preserved that there can be no doubt whatever about the arrangement of the hooklets. These were arranged in a double row of opposite hooks along each arm, the hooks being largest at the mid-length of each arm, and gradually diminishing in size towards each end. The hooks were placed on the inner surface of the arm, and, in the contracted state of the arm, the bases of each pair of hooklets were almost in contact. The arrangement is shown very clearly in one of the arms (*d*) of an example [B.M. No. 47,020] in the British Museum collection that is described below as specimen No. 5 (Pl. XXIII, Fig. 5). Since in these Liassic examples the fleshy part of the arms is not usually preserved, in determining the number of the arms exhibited in any particular specimen it must be remembered that each arm is represented by a double row of hooklets.

Of the seventeen examples of Liassic Cephalopoda in the British Museum collection exhibiting uncinated arms, the only specimens showing the arms in association with a guard are the two examples already referred to that were figured and described by Professor Huxley<sup>3</sup> as *Belemnites Bruguièrianus* (Pl. I, Figs. 1, 1*a*) and *B. elongatus* (Pl. I, Figs. 2, 2*a*) respectively. Unfortunately the

<sup>1</sup> The photograph included two specimens. Dr. Angermann, during a visit to the British Museum, identified for the present writer the example described by Dr. Jaekel.

<sup>2</sup> See E. Angermann, "Ueber das Genus *Acanthoteuthis*, Münt., aus den lithographischen Schiefer in Bayern": Neues Jahrb., Beil. Bd. xv, Heft 1 (1902), pp. 205-230, pl. vi.

<sup>3</sup> Op. cit.

arms are not well preserved in either of these specimens. In the example of *B. Bruguierianus* [B.M. No. 74,106], from the Lower Lias (*obtusus*-zone) near Charmouth, there are only a few scattered hooklets, whilst the arms of *B. elongatus* [B.M. No. 39,855], from the Lower Lias of Charmouth, are represented by a confused mass of hooklets. Of the other fifteen examples, in one [B.M. No. 39,857] there are merely a few solitary hooklets; in another [B.M. No. 66,360], the number of the arms is very indistinct; in two [B.M. Nos. 39,859 and 48,894], the remains of only two arms are preserved; in one [B.M. No. 47,715], there are traces of three arms; in two [B.M. Nos. C. 315 and 39,856], there are indications of three, or possibly of four, arms; in one [B.M. No. 66,359], there is a confused mass of probably four arms; and in one [B.M. No. C. 310], there are the remains of four, or possibly of five, arms. In each of the remaining six specimens six arms can be more or less clearly made out, whilst there is not a single example in which more than six uncinated arms are preserved.

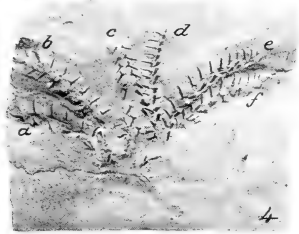
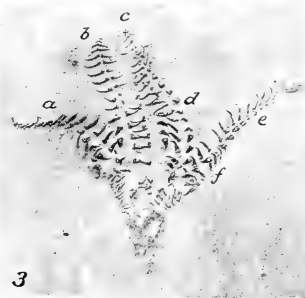
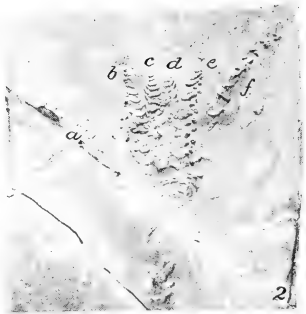
Dr. Jaekel states that the specimen described by him had four uncinated arms, the outer one on each side longer than the others, but he concludes that there were originally eight such arms, the others either lying embedded in the matrix, or having been removed from the exposed surface of the fossil, a conclusion based chiefly upon the evidence of a specimen in the collection of the Berlin University, that, although on the whole not so well preserved as his own, nevertheless, according to that author, exhibited eight arms each with its double row of hooks. Besides these eight arms Dr. Jaekel considered that there was a fifth pair, probably longer than the rest, and not provided with hooks. The photograph so kindly sent me by Dr. Zittel included besides the specimen described by Dr. Jaekel another Cephalopod with uncinated arms that he had received from Dr. Jaekel. It is labelled "Lias, Lyme Regis." The hooklets have the thickened bases like those examples referred to in the present paper. For the determination of the number of the arms the photograph is not so sharp as one could wish, but in that specimen also the present writer does not see evidence of the existence of more than six arms.

Of the six specimens in the British Museum collection that exhibit six uncinated arms, four [B.M. Nos. 47,020, 47,716, 82,895, and C. 3,007] are stated to be from the Lias of Lyme Regis; one [B.M. No. 39,901] is from the Lias of Charmouth; and one [B.M. No. C. 5,026] is the type-specimen of Professor James Buckman's *Belemnoteuthis Montefiorei* from the Lower Lias shales between Charmouth and Lyme Regis. The exact horizon of the fossils has not been recorded. The remains are preserved on the surfaces of slabs.

The arms vary in length and seem to be arranged in three pairs, a short, a medium-sized, and a long pair. Since the arms are usually found to be symmetrically disposed, and as they would be arranged symmetrically around the head, it may be concluded that the body of the animal, together with any lateral appendages which it may have possessed, was wider than thick, and that the aspect of the body that







ARMS OF BELEMNITES.

is presented is either ventral or dorsal. The attempt to determine whether the view that is presented is dorsal or ventral, is based upon the fact that the pro-ostracum was situated principally on the dorsal side of the ink-bag; when, therefore, the pro-ostracum is seen to rest upon the ink-bag, a dorsal aspect of the fossil is probably presented, but if it passes beneath the ink-bag a ventral aspect of the fossil is probably exposed. If no remains of the pro-ostracum are visible either upon or beneath the ink-bag, the aspect of the specimen is most probably ventral, though it may possibly be dorsal, in which case the pro-ostracum would have been removed.

With respect to the order of the arms the present writer has not been able to arrive at a satisfactory conclusion. The longest pair of arms was lateral, but of the other two pairs it is somewhat uncertain which was dorsal and which ventral. The writer believes, however, that the medium-sized pair was dorsal, and the shortest pair ventral.

The fossils in which the six uncinated arms have been seen are described below. The arms being almost symmetrically placed, and also well preserved in the type-specimen of *Belemnoteuthis Montefiorei*, this fossil is described first.

*Specimen No. 1* (Pl. XXIII, Fig. 2).—This is Professor James Buckman's type-specimen of *Belemnoteuthis Montefiorei*, from the Lower Lias shales between Charmouth and Lyme Regis [B.M. No. C. 5,026]. It was originally figured by that author,<sup>1</sup> and has since been refigured by the present writer.<sup>2</sup> Professor Buckman described the fossil as nearly 12 inches in length. It is now at most only 10 inches (=254 mm.) long, and, as the present writer has already explained elsewhere, when Professor Buckman's figure was drawn the uppermost portion of the slab containing the arms was so placed that the arms were at right angles to the rest of the body, but since then this part of the slab has been detached and replaced in such a manner that the arms now have the same general direction as the rest of the body. From the base of the arms to the posterior boundary of the ink-bag measures 126 mm. Although the relative position of the hooklets in the outermost row on each side is not quite so clearly indicated as in the rest, there are six double rows of hooklets, indicating six arms. These are almost symmetrically disposed, and occupy an angle of about 60° or 70°. The two outermost arms (*a, f*) are longer than the rest; they were apparently more slender and had their hooklets more sparsely distributed than the remaining four arms; of the latter the two outer ones (*b, e*) are a little longer than the others (*c, d*). The arms of the specimen can be grouped in three pairs; the first pair consists of the two outermost arms (*a, f*), each being about 60 mm. long or possibly more, since they appear to be interrupted by the edge of the slab bearing the specimen; the second pair includes the two intermediate arms (*b, e*), each about 46 mm.

<sup>1</sup> J. Buckman: Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. iii (1879), pp. 141-3, plate facing p. 142.

<sup>2</sup> G. C. Crick: Proc. Malac. Soc., vol. v, pt. 1 (April, 1902), pp. 13-16, pl. i.

long; and the third the two inner ones (*c, d*), each about 40 mm. long. The longest pair seems to have been comparatively slender; whilst the others are relatively broader and taper very quickly at their distal ends.

With regard to the relative position of the arms, it is to be noted that in the view of the fossil that is here presented the two longest arms are the outer ones on each side (*a, f*) and occupy a lower level than all the rest, whilst one or two of the hooklets of each of the medium-sized pair of arms (*b, e*) are on the top of those belonging to the smallest pair, and the medium-sized arm on the right (*e*) certainly seems to occupy a higher level than the smallest arm on the same side (*d*). Although one of the hooklets about 13 mm. from the proximal end of the arm *d* appears to rest on a hooklet belonging to the medium-sized arm *e*, the base of the arm itself seems to be below that of the medium-sized arm on the same side. On the left side some of the hooklets of the medium-sized arm (*b*) rest upon those of the smallest arm (*c*) on that side, but the base of the longest arm is not preserved; in fact, this arm is indicated merely by the impressions of a few of the hooklets (*a*). If this interpretation of the position of the arms is the correct one, in the view of the fossil that is here presented the two medium-sized arms are uppermost; the two longest, lateral; and the two smallest, the lowest.

The ink-bag is shown. There are a few pieces of the pro-ostracum upon it, whilst the slender longitudinal rib below the ink-bag may possibly be the median rib of the pro-ostracum. If so, the aspect of the fossil that is presented is probably dorsal. Although, as seen from Professor Buckman's figure, the head of the fossil when first described was placed almost at right angles to the rest of the body, the present writer has no reason to doubt that it belongs to the rest of the fossil. If the present interpretation of the order and relative position of the arms is correct, the medium-sized pair were dorsal; the longest, lateral; and the shortest, ventral.

*Specimen No. 2* (Pl. XXIII, Fig. 1).—This specimen from the Lias of Lyme Regis [B.M. No. C. 3,007] shows the ink-bag and its duct bearing upon their surface fragments of the nacreous pro-ostracum, whilst at the lowest portion of the fossil a part of the phragmocone is preserved. It would seem, therefore, that it is a dorsal aspect of the animal that is here presented. There is an irregular depression in the region of the mouth. The length of the specimen from the base of the arms to the posterior end of the ink-bag, at the anterior end of the phragmocone, is 125 mm. Six arms can be seen, but though differing in length the pairs cannot be easily made out. All their proximal ends are united. Commencing the description at the extreme left of the specimen, the first arm (*a*) is 30 mm. long, but distally it ends abruptly, being intercepted by the edge of the slab; its proximal end appears to pass beneath the second arm (*b*). The hooklets are rather large in proportion to the size of the arm, and are rather wide apart. The second arm (*b*) is about 50 mm. long and appears to be complete, the distal end being quite acute. Its proximal end seems to pass along the left side of the hollow at the base of the arms. The

third (*c*) and fourth (*d*) arms are each about 45 mm. long, and each is incomplete distally. Their proximal ends pass into the hollow at the base of the arms. The fifth arm (*e*) cannot be traced for more than about 35 mm., and is obviously very imperfect; its distal end terminates very abruptly, whilst its proximal end passes along the right side of the hollow at the base of the arms; the hooklets are rather large and sparsely situated. The sixth arm (*f*) is about 30 mm. long, and is probably nearly, if not quite, complete, since the distal end is very acute; proximally it seems to pass under the fifth arm (*e*); the hooklets are very small. The order of the arms cannot be satisfactorily determined. There appear to be three pairs, as in the previous example. The third (*c*) and fourth (*d*) seem to lie uppermost, and to constitute one pair. Next to these appear to be the second (*b*) and fifth (*e*) arms, of which the proximal ends pass on each side of the hollow at the base of the arms; these constitute a second pair. The two lowest seem to be the two outer ones, the first (*a*) and sixth (*f*), which pass under the second (*b*) and fifth (*e*); these form a third pair. As to their original length it is not easy to decide, but the opinion of the present writer is that the third (*c*) and fourth (*d*) arms constitute the medium-sized pair; the second (*b*) and fifth (*e*) the longest; and the first (*a*) and sixth (*f*) the shortest. If, therefore, the aspect of the fossil is dorsal, and the interpretation of the order of the arms is correct, then the medium-sized pair were dorsal; the longest, lateral; and the shortest, ventral; just as in the previously-described example.

*Specimen No. 3* (Pl. XXIII, Fig. 4).—In this example [B.M. No. 39,901] from the Lias of Charmouth, the six arms are preserved within an angle of about  $120^\circ$ , but they are not quite so distinct as in the two specimens already described. The specimen measures 128 mm. from the base of the arms to the bottom of the ink-bag. The arms appear to be in the order in which they are preserved; the two innermost are the uppermost, and the two outermost the lowest. Commencing the description on the left side, the first arm (*a*), which is intercepted distally by the edge of the slab, can be traced for a distance of rather more than 20 mm., when it passes beneath the second arm (*b*), which it meets at an angle; the hooklets are rather wide apart. The second arm (*b*), which is also intercepted distally by the edge of the slab, can be traced for about 37 mm.; and, in the size of the hooklets and their distance apart, closely resembles the first arm (*a*). The third arm (*c*), also imperfect distally, can be traced for a length of about 37 mm. The fourth (*d*), also imperfect distally, is visible for about 33 mm., its proximal end being apparently connected with the third arm (*c*). The fifth arm (*e*), which, judging from its acute distal extremity, appears to be nearly, if not quite, complete distally, can be traced for about 47 mm.; whilst the sixth arm (*f*), also nearly, if not quite, complete distally, is visible for a distance of about 37 mm., and then passes beneath the fifth arm (*e*). The order of the arrangement of the arms is not quite easy to make out, and at one time the present writer was inclined to think that the arms were arranged in pairs thus: *ab, cd, ef*; in which case probably a lateral

aspect of the head would have been presented. In that case, however, the third arm (*c*) would have been the highest, and the fourth (*d*) the lowest, lower even than the first (*a*) and the fifth (*e*), but this is certainly not the case. The third arm (*c*) is the highest; the fourth arm (*d*) is almost on the same level, this being a little higher than the second (*b*) and fifth (*e*), which again are higher than the first (*a*) and sixth (*f*). On the other hand, if the third (*c*) and fourth (*d*) are regarded as the shortest pair of arms, the second (*b*) and fifth (*e*) as the medium-sized pair, and the first (*a*) and sixth (*f*) as the longest pair, then it must be observed that the first (*a*) is much more extended than the sixth (*f*), the second (*b*) than the fifth (*e*), and the third (*c*) than the fourth (*d*); that is to say, the three arms on the left-hand side of the fossil are more extended than the corresponding arms on the right-hand side. On the whole, however, the latter rendering of the order of the arms seems to be more probably correct. The ink-bag bears on its surface fragments of the pro-ostracum, so that if a dorsal aspect of the specimen is presented, and the present interpretation of the relative position of the arms is correct, the third and fourth (counting from the left) arms (*c* and *d*) are the two dorsal, the second and fifth (*b* and *e*) the lateral, and the first and sixth (*a* and *f*) the ventral. The arms *b* and *e* are regarded as the lateral, because *a* and *f* seem to pass beneath them as though passing to the opposite side of the head.

*Specimen No. 4* (Pl. XXIII, Fig. 6).—This interesting specimen [B.M. No. 47,716] is preserved on the surface of a small slab from the Lias of Lyme Regis. It shows the six arms arranged fan-shaped in a sector, consisting of a little more than a semicircle. The arms are all in the same plane; the ink-bag is present, and beneath it are remains of the pro-ostracum. The specimen is evidently very much squeezed together because the duct of the ink-bag touches the bases of the arms. The ink-bag with its duct is 45 mm. long, and its greatest width 25 mm. The extreme bases of the arms are not preserved. Six arms are very clearly shown, but the six do not occupy an angle of more than about 200°. As only two of the arms (*c* and *d*) are nearly complete and the others more or less imperfect, it is difficult to recognize the arms belonging to each pair. Their arrangement, however, appears to have been as they are now placed. Commencing from the left, the first arm (*a*) is 25 mm. long, and is intercepted distally by the edge of the slab; its hooklets are rather widely separated. The second arm (*b*) is somewhat shorter, but this again is imperfect distally. The third (*c*) appears to be about 30 mm. long, and is nearly, but not quite, complete distally. The fourth (*d*) is 35 mm. long, and like the third (*c*) its distal end is nearly, but not quite, complete. The fifth (*e*) is nearly of the same length as the fourth (*d*), but is not nearly so complete distally; whilst the sixth (*f*) seems to be at least 35 mm. long, but its distal end is not quite complete. The pairs of arms in this specimen then seem to be *af*, *be*, *cd*. The arms *a* and *f* appear to have been the most slender, and may have been either the shortest or the medium-sized pair, probably the former, but each is interrupted distally by the edge of the slab on

which the fossil is preserved. The arms *b* and *e* were apparently the stoutest, and, although in their present state shorter than *c* and *d*, were most probably originally longer than those arms, and very possibly were the longest pair of arms. The arms *c* and *d* are the most nearly complete, and though somewhat stout, were possibly either the shortest or the medium-sized pair, probably the latter. In this example the ink-bag rests upon the pro-ostracum, so that in all probability the ventral aspect of the animal is displayed. If an oral aspect of the arms is presented, and if the identification of the order of the arms is correct, the medium-sized pair of arms (*c* and *d*) was dorsal; the longest (*b* and *e*), lateral; and the shortest (*a* and *f*), ventral. Judging from the appearance of the hooklets, the arms may present their outer surface, as if the head with the arms spread out had been turned towards the dorsal surface with the mouth downwards, in which case the medium-sized pair of arms would be ventral, and the shortest dorsal.

*Specimen No. 5* (Pl. XXIII, Fig. 5). — This example [B.M. No. 47,020], preserved on the surface of a slab from the Lias of Lyme Regis, shows the arms arranged in a fan-shaped manner, with a small portion of a dark-brownish material at their base (apparently the remains of the jaws), the ink-bag, and portions of the mantle and of the pro-ostracum. The distance from the base of the ink-bag to the base of the arms is 135 mm. The arms vary in length, but are rather difficult to arrange in pairs. Commencing on the left, the first arm (*a*), traceable for a length of about 22 mm., is imperfect distally, and proximally coalesces with the second arm. At a distance of about 5 mm. from its distal end there is the detached proximal end of an arm, about 12 mm. long, that appears to have belonged to this first arm. The second arm (*b*) is 40 mm. long, and seems to be nearly complete, at both its proximal and its distal end. The third arm (*c*) seems to be stouter than either the first or the second; it is about 22 mm. long, and is obviously imperfect at its distal end; immediately above it, and at a distance of about 10 mm. from it, there are a few detached hooklets, which seem to have belonged to this arm. The fourth arm (*d*) appears to have been about 32 mm. long, the hooklets being very clearly shown for a length of 28 mm.; its inner aspect seems to be displayed, the arrangement of the hooklets on the arm being particularly well shown. The fifth arm (*e*), about 32 mm. long, is not quite complete distally; proximally it coalesces with the sixth arm (*f*). The sixth arm (*f*) is about 40 mm. long and incomplete distally. Judging by the position of one or two of the hooklets near the proximal end of the sixth arm, this arm appears to pass under the fifth arm (*e*); a hooklet near the base of the fifth arm (*e*) rests upon a hooklet of the fourth (*d*), and one or two of the third (*c*) certainly rest upon the fourth (*d*), whilst near the proximal end a hooklet apparently belonging to the first arm (*a*) certainly passes beneath the second arm (*b*). In this view of the head, therefore, the smallest pair, *c* and *d*, appear to be at the back, the medium-sized pair, *b* and *e*, in the front, and the longest pair, *a* and *f*, at the sides. The ink-bag bears upon its surface remains of the muscular portion of the animal

and very thin portions of nacreous material. Possibly, therefore, the aspect of the animal that is presented is dorsal; in that case, and provided the interpretation of the relative position of the arms is correct, the medium-sized pair of arms is dorsal; the smallest pair, ventral; and the longest, lateral.

*Specimen No. 6* (Pl. XXIII, Fig. 3). — This example [B.M. No. 82,895], preserved on the surface of a slab from the Lower Lias of Lyme Regis, Dorset, displays the arms arranged fan-shaped, with some brownish material (possibly the remains of the jaws) at their coalesced proximal ends, and the ink-bag bearing upon its surface very delicate fragments of nacreous matter. From the base of the arms to the posterior end of the ink-bag the specimen measures about 153 mm., the greatest width of the ink-bag being 30 mm. In this example the number of the arms is not quite so clear as in the other specimens. Five arms are plainly shown, but the disposition of a few remaining hooklets is rather difficult. Each arm is slightly curved. Commencing on the left, the first fairly complete arm (*a*) measures, including the small hooklets at its proximal end, 53 mm. It seems to be complete distally. On the left-hand side of this arm, at about its mid-length, there are some detached hooklets, which probably belonged to this arm. The second arm (*b*), apparently complete distally, measures from its distal end to the coalesced bases of the arms 54 mm. Lying by the side of this and almost parallel to it is the third arm (*c*) of about the same length. The fourth arm (*d*) is not quite complete distally, and appears to lie on the third. The fifth arm (*e*) can be traced for a distance of about 52 mm. from the coalesced bases of the arms, and its distal end appears to be nearly, though not quite, complete. At about its mid-length and on its right side, there are three or four hooklets (*f*), which from their regularity seem to have belonged to another arm, but, if so, its proximal portion is confused with that of the fifth arm (*e*). In this example the order of the arms is not at all clear. If the outermost arm on each side constitutes a pair, one would expect to find an even number of arms in the space between them. Three can be made out with certainty, but it is not easy to decide which formed the pair and which is the odd one. It seems, however, highly probable that the second (*b*) and fourth (*d*) arms (*b* and *d*) constituted the pair, and that the third arm (*c*) is the odd one. Again, the little hooklets on the right of the fifth arm (*e*) are somewhat difficult to interpret. If they formed part of another arm it is not easy to see with which other arm it formed a pair. On the whole, therefore, this specimen is not quite easy to interpret, and, further, the relative position of the arms is very obscure. One or two of the hooklets of the second arm (*b*) rest upon those of the first (*a*), whilst some of the hooklets of the third (*c*) rest upon those of the second (*b*), but the greater part of the third arm (*c*) underlies the fourth (*d*), and one or two hooklets near the base of the latter rest upon those of the fifth arm (*e*).

The conclusions arrived at in the present paper may be summarised as follows:—(1) That in the Lower Liassic seas there existed a Cephalopod having six uncinated arms; (2) that this Cephalopod



is the animal known as the Belemnite; (3) that the six uncinated arms were arranged in three pairs of unequal length, of which the longest pair was lateral, the medium-sized pair *probably* dorsal, and the shortest pair *probably* ventral; (4) that the presence of tentacular arms is doubtful.

## EXPLANATION OF PLATE XXIII.

- FIG. 1.—*Belemnites* sp. Lias: Lyme Regis, Dorset. In the British Museum (No. C. 3,007). (p. 274.)
- „ 2.—*Belemnites* sp. Anterior portion of the type-specimen of *Belemnoteuthis Montefiorei*, J. Buckm. Lower Lias Shales: between Charmouth and Lyme Regis, Dorset. In the British Museum (No. C. 5,026). (p. 273.)
- „ 3.—*Belemnites* sp. Lower Lias: Lyme Regis, Dorset. In the British Museum (No. 82,895). (p. 278.)
- „ 4.—*Belemnites* sp. Lias: Charmouth, Dorset. In the British Museum (No. 39,901). (p. 275.)
- „ 5.—*Belemnites* sp. Lias: Lyme Regis, Dorset. In the British Museum (No. 47,020). (p. 277.)
- „ 6.—*Belemnites* sp. Lower Lias: Lyme Regis, Dorset. In the British Museum (No. 47,716). (p. 276.)

All the figures are about three-fifths of the natural size; in figs. 1-5 only the cephalic portion of each specimen is represented.

## RELICS OF COLORATION IN FOSSIL SHELLS.

By R. BULLEN NEWTON, F.G.S.

*Read 8th March, 1907.*

## PLATE XXIV.

SHELL-COLORATION, as observed among modern Mollusca, usually exists beneath the epidermis, its secretion having been effected by the border of the mantle. According to Edward Forbes,<sup>1</sup> who was one of the earliest investigators of this phenomenon, such secretion depends largely upon the action of light, so that shells found in shallow waters would be, as a rule, more brilliant than those obtained from considerable depths. His studies of the bathymetrical distribution of existing molluscs enabled him to infer that "well-defined patterns were, with very few and slight exceptions, presented only by testacea inhabiting the littoral, circum-littoral, and median zones. In the Mediterranean only one in eighteen of the shells taken from below 100 fathoms exhibited any markings of colour, and even the few that did so were questionable inhabitants of those depths. Between 35 and 55 fathoms the proportion of marked to plain shells was rather less than one in three, and between the sea-margin and 2 fathoms the striped or mottled species exceeded one half of the total number." He then surmised that, as vivid patterns are not presented by testacea living below certain depths, it might be possible to indicate, within certain limits, the depth of Palæozoic seas from a study of their molluscan fauna exhibiting traces of colour. Forbes further stated that "original colour is very rarely exhibited by fossil shells; occasionally we meet with specimens in which, owing probably to organic differences in the minute structure of the coloured and colourless portions of the shell, the pattern of the original painting is clearly distinguished from the ground tint." He also thought that as Mesozoic and Tertiary shells are closely related to existing types, there should be little difficulty in ascertaining the probable bathymetrical zone of the sea in which they lived. With regard to Palæozoic strata such calculations he considered more difficult, because the "general assemblage of articulate, molluscan, and radiate forms is so different from any now existing with which we can compare it, and so few species of generic types still remaining are presented for our guidance, that in many instances we can scarcely venture to infer with safety the original bathymetrical zone of a deposit from its fossil contents." However, after referring

---

<sup>1</sup> "Report on the Mollusca and Radiata of the Ægean Sea, and on their Distribution, considered as bearing on Geology": Rep. Brit. Assoc., 1843-4, pp. 172, 173.  
 "Note on an Indication of Depth of Primæval Seas, afforded by the Remains of Colour in Fossil Testacea": Proc. Roy. Soc. Lond., vol. vii (1854), pp. 21-23.

to a number of Carboniferous shells which showed unmistakable pattern-markings derived from original colour, Forbes was of opinion that they were characteristic of molluscs which had lived in a less depth of water than 50 fathoms, and he consequently considered that the Carboniferous Limestone deposit of most regions must have been a shallow-water formation.

These views were subsequently supported by Lyell,<sup>1</sup> S. P. Woodward,<sup>2</sup> and Paul Fischer,<sup>3</sup> besides being generally accepted at the present day. Gwyn Jeffreys,<sup>4</sup> however, disbelieved in this argument on the ground that some vividly coloured shells had been obtained from depths varying from 60 to 118 fathoms, including such forms as *Tapes virginea*, *Venus ovata*, and *Trochus ziziphinus*; and he was of opinion that "the extent to which light penetrates into the abysses of the ocean, as well as the mode of its transmission, does not seem to be known."

Examples of fossil shells exhibiting colour-markings are comparatively rare from the fact that chemical changes, erosion, and a variety of other causes operating during the process of fossilization, have altered to a large extent the constituent elements of the shell-structure. Whatever colours may be now apparent in such fossils they do not necessarily represent what was there in the life of the mollusc, but rather a replacement of the same has most probably resulted by subsequent colouring mediums, generated by the agencies just mentioned, which were pregnant at the time of the consolidation of the strata in which the shells are found. Such markings on fossil shells are, therefore, of interest as denoting the position and general arrangement of the colour-patterns that were characteristic of the mollusc during life.

Shell colour-markings are by no means superficial, as can be tested by examining a modern *Circe*, the valve-margins of which show that the pigment lines are sunken to about half a millimetre in depth. Thus it is that in fossil shells the colour-patterns are often preserved as finely indented lines, bands, spots, etc., which are slightly below the ordinary level of the surface.

According to Fischer's "Manuel" (p. 27), melanism and albinism are phenomena well known among the Mollusca. For instance, such genera as *Trochus*, *Turbo*, *Chiton*, *Fissurella*, *Mitra*, *Turritella*, etc., found off the west coast of South America, have a black exterior; whilst Monterosato<sup>5</sup> has noticed pronounced albinism existing amongst marine shells which live in sponges found at Tunis in Northern Africa, 35 albino forms having been observed out of a total of 120 species.

Colour remains are also met with in other organisms that are found in the fossil state. Among the Brachiopoda, for instance, may be mentioned the radiating stripes which are frequently preserved on the

<sup>1</sup> "A Manual of Elementary Geology," 5th ed. (1855), p. 410.

<sup>2</sup> "A Manual of the Mollusca," 1851, p. 46.

<sup>3</sup> "Manuel de Conchyliologie," 1880, fasc. i, p. 26.

<sup>4</sup> "British Conchology," vol. i (1862), p. xlix.

<sup>5</sup> "Notizie intorno ad alcune conchiglie delle coste d'Africa": Bull. Soc. Malac. Ital., vol. v (1880), pp. 213-233.

valves of *Dielasma hastata*, a Carboniferous member of the Terebratulidæ. According to Forbes, *Terebratula* is a genus inhabiting deep water, although the species found in modern seas having striped shells come from shallow water.

Dr. Bather<sup>1</sup> has observed coloration among fossil Crinoids, and particularly refers to one example, *Cyathocrinus acinotubus*, from the Silurian Limestone of Dudley, showing dark spots on the arms, which "may possibly be the relic of some original colouring, since similar ornament is found in recent forms." He mentions also the purple colouring in the roots of *Apiocrinus* from the Bradford Clay which he had chemically examined, besides having succeeded in extracting from such roots a large proportion of animal carbon, the presence of which he was inclined to think gave the specimens their rich colour.

Following these preliminary remarks, some examples of fossil shells will now be referred to which exhibit such markings as may be attributable to ancient coloration. Certain specimens in the British Museum have been selected for illustration, and where a particular form was not available a good published figure of the same has been copied. In illustration of the subject, some further shells are also quoted which have been suitably figured elsewhere, and which have not been reproduced on the present occasion. The species are arranged in stratigraphical order, commencing with the Cainozoic, followed by a zoological grouping.

### CAINOZOIC—Oligocene.

#### GASTROPODA.

NERITINA CONCAVA, J. de C. Sowerby. Pl. XXIV, Fig. 18.

*Neritina concava*, Sowerby: Mineral Conchology, vol. iv (1823), p. 118, pl. 385, figs. 1-8.

*Formation*.—Priabonian.

*Locality*.—Headon Hill, Isle of Wight.

It is possible that the colours frequently found in Tertiary shells may sometimes be the same as those that flourished during the life of the mollusc. The present example of the genus *Neritina* exhibits considerable variation in colour, the surface consisting of minute zigzag and lozenge-shaped markings with occasional spiral bands, the whole forming quite a lace or network combination. No two shells appear to be marked exactly the same, yet they are very abundant in the Oligocene formation and belong to one species.

This specimen is in the British Museum [G. 17999].

### MESOZOIC—Cretaceous.

#### PELECYPODA.

OSTREA cf. CURVIROSTRIS, Nilsson. Pl. XXIV, Fig. 17.

*Ostrea curvirostris*, Nilsson: Petrificata Suecana, etc., 1827, p. 30, pl. vi, fig. 5.

<sup>1</sup> Kongl. Svenska Vet.-Akad. Handl. [Stockholm], vol. xxv (1893), No. 2, p. 151.

*Formation*.—Santonian.

*Locality*.—Bromley, Kent.

Specimen consisting of the upper valve of a species probably related to Nilsson's *O. curvirostris*. The relics of coloration are represented by a few darkish bands radiating from the umbonal region and extending to the ventral margin, being considerably curved and bent during their progress over the surface of the valve.

In the British Museum [44677].

GRYPHÆA COLUMBA, Lamarck. Pl. XXIV, Fig. 16.

*Gryphæa columba*, Lamarck: Hist. Nat. Anim. sans Vert., vol. vi (1819), pt. 1, p. 198 (described from figure in Bruguière's Ency. Méthod., 1791, pl. clxxxix, figs. 3, 4).

*Formation*.—Cenomanian.

*Locality*.—Co. Antrim, Ireland.

The markings on this shell consist of dark, broad, radiating stripes, extending from the umbo to the ventral margin, being mostly arranged equidistantly, although sometimes rather irregularly or bent. Only little more than half the specimen has been figured, because the actual shell-structure is absent from the lower part of the valve; its total height measurement is 75 millimetres. All the known figures of this species show the bands reaching to the basal margin of the shell, a fact also proved by actual specimens examined from Bohemia, France, etc. These radiating stripes are indicated in Bruguière's old figures, as well as being referred to by Lamarck.

The specimen is in the British Museum [L. 14399].

PECTEN FULMINIFER, Holzapfel.

*Pecten fulminifer*, Holzapfel: Palæontographica, vol. xxxv (1889), p. 230, pl. xxvi, fig. 14.

*Formation*.—Santonian.

*Locality*.—Aix-la-Chapelle, Germany.

The specimen figured in the above work exhibits a valve with zigzag patterns, arranged longitudinally in four or five series, with regular angulations fitting into one another. The ears are decorated with oblique, crinkled markings. The figure represents an enlarged restoration made up from a fragmentary specimen.

SYNCYCLONEMA ORBICULARIS (J. Sowerby).

*Pecten orbicularis*, J. Sowerby: Min. Conch., vol. ii (1817), p. 193, pl. clxxxvi.

*Syncyclonema orbicularis*, Noetling: Palæontologische Abhandlungen (Dames & Kayser), vol. ii (1885), part 4, p. 214, pl. xviii, fig. 5.

*Formation*.—Cenomanian.

*Locality*.—Baltic regions.

Dr. Noetling figures a small example, 7 by 9 mm., of this species in the above memoir, which shows zigzag markings in longitudinal arrangement of four rows, the two lowest occupying the best half of the shell and furnished with long lines and few angulations, whilst the upper series are more broken up and form several angulations.

## CAMPTONECTES cf. CURVATUS (Geinitz). Pl. XXIV, Fig. 15.

*Pecten curvatus*, Geinitz: Versteinerungen von Kieslingswalda, 1843, p. 16, pl. iii, fig. 13.

*Formation*.—Cretaceous.

*Locality*.—Zululand, South-East Africa.

This shell exhibits two divergent bands emanating from the umbo, which may have originally extended to the ventral margin. The reddish-brown colour which the bands now present ceases about two-thirds distance from the umbo, although there are slight indications that the bands were continued to the base of the valve. From the character of the radiating ribs which curve outwards on each side the specimen appears to be closely related to *Pecten arcuatus* of Goldfuss, the supposed equivalent of the *curvatus* of Geinitz. This shell was collected by Mr. Anderson in Zululand, and is at present under description in another place. It will ultimately become the property of the British Museum.

## CYPRIINA LINEOLATA (J. Sowerby). Pl. XXIV, Fig. 14.

*Venus lineolata*, J. Sowerby: Min. Conch., vol. i (1813), p. 57, pl. xx, upper figure.

*Formation*.—Albian.

*Locality*.—Blackdown, Devonshire.

The original description states that "four-fifths of the surface [is] covered with obscure zigzag striæ." The figure now given of this shell has been drawn from Sowerby's original specimen in the British Museum [43104]. Parkinson first referred it to *Venus castrensis* of Linnæus, but Sowerby pointed out that it differed from the Linnæan shell, and therefore changed the specific name as above. Parkinson's description mentioned that it "is perfectly silicified, and in the transparent parts the angulated tent-like characters are beautifully shown in white and opaque markings" ("Organic Remains of a Former World," vol. iii, 1811, p. 187). Another specimen in the British Museum [L. 17209] shows the chevron pattern as a series of well-indented lines.

Although up to the present time the zigzag striæ of this shell have been referred to as part of the sculpture, it seems more than probable that they are attributable to a former coloration. The V-shaped patterns, although obscure in places, are seen to cover the valve, with the exception of the posterior side; they are of darker colour than the ordinary ground tint, having all the appearance of being still filled with a material which might represent the pigment originally secreted by the mollusc, but under considerably altered mineralogical conditions.

## MESOZOIC—Oolite.

## GASTROPODA.

## NATICA CINCTA, Phillips. Pl. XXIV, Fig. 12.

*Natica cincta*, Phillips: Illustrations of the Geology of Yorkshire, Yorkshire Coast, 1829, p. 130, pl. iv, fig. 9.

*Formation*.—Bathonian.

*Locality*.—Stratton, Gloucestershire.

This specimen represents the body-whorl of *Natica cineta*, on which is clearly depicted a series of nearly equidistant, black, divergent markings, extending from the suture to the basal margin, the apices of the angles pointing inwards or away from the margin of the mouth. The test of this specimen is ornamented with a series of closely arranged longitudinal striations. A recent form of this genus, *Natica fulminea* of Gmelin, shows zigzag colour-markings, but they are less regular, smaller, and more complicated than in the fossil example now figured.

The specimen is in the British Museum [G. 1604].

*PSEUDOMELANIA HEDDINGTONENSIS* (J. Sowerby). Pl. XXIV, Fig. 13.

*Melania Heddingtonensis*, J. Sowerby: Min. Conch., vol. i (1813), p. 86, pl. xxxix, right- and left-hand figures.

*Chemnitzia Heddingtonensis*, D'Orbigny: Paléontologie Française, Terrains Jurassiques, Gastéropodes, 1850, p. 56, pl. ccxlv, figs. 4, 5.

*Pseudomelania Heddingtonensis*, Hudleston: "A Catalogue of British Jurassic Gasteropoda," 1892, p. 111.

*Formation*.—Oxfordian.

*Locality*.—France.

A number of regularly spaced, well-indented, zigzag markings occur in longitudinal rows on the later whorls of this species, when favourably preserved; British examples, however, seldom show these indications of colour-remains. A reproduction of D'Orbigny's figure 4 is given on the present plate. The original remarks in connection with the curious zigzag patterns are as follows:—"Ses couleurs dont on juge par les lignes d'altération de sa surface forment des linéoles ondulées, ou des zigzags en long."

*PSEUDOMELANIA* cf. *LINEATA* (J. Sowerby).

*Melania lineata*, J. Sowerby: Min. Conch., vol. iii (1818), p. 33, pl. ccxviii, fig. 1.

*Melania Heddingtonensis*, Deslongchamps: Mém. Soc. Linn. Normandie, vol. vii (1842), p. 225, pl. xii, figs. 9, 10; non Sowerby.

*Formation*.—Bajocian.

*Locality*.—Normandy, France.

An elaborate figure of a so-called *Melania Heddingtonensis* was published by Deslongchamps in 1842 (fig. 10 of his plate), drawn from an example found in the Bajocian rocks of Les Moutiers, Normandy, in which is depicted, on a kind of cream-coloured groundwork, numerous reddish-brown streaks of various forms arranged both transversely and longitudinally, some bifurcating into fine lines, whilst many take a zigzag course. According to these figures, this complicated coloration exists from the apex of the spire to the margin of the mouth. This specimen has a length of 85 mm.

It was subsequently pointed out by D'Orbigny that Deslongchamps was in error as to the specific determination of this shell (Paléontologie Française, Terrains Jurassiques, Gastéropodes, 1850, p. 57), and he

was of opinion that it would be more correctly referred to *Melania lineata* of J. Sowerby, another recognized form of *Pseudomelania*, more especially as the true *Heddingtonensis* was restricted to Oxfordian and Corallian times. For present reference purposes the shell is recognized as having affinities with the Sowerbyan species, *lineata*.

**PSEUDOMELANIA COARCTATA (Deslongchamps).**

*Melania coarctata*, Deslongchamps: Mém. Soc. Linn. Normandie, vol. vii (1842), p. 226, pl. xii, figs. 11, 12.

*Pseudomelania coarctata*, Huddlestone: Mon. Pal. Soc. (British Jurassic Gasteropoda), 1892, p. 242.

*Formation*.—Bajocian.

*Locality*.—Normandy, France.

The two original figures of this species represent most gorgeously coloured shells, the groundwork being of cream colour, on which are large reddish-brown patches arranged longitudinally and giving off thin streaks, which bifurcate, trifurcate, and even further split up, looking frequently like a series of antlers. Zigzag patterns are also observable, especially on the body-whorl of Deslongchamps's figure 12.

The longest of these specimens measures 103 mm.

**PELECYPODA.**

**SYNCYCLONEMA DEMISSA (Phillips).**

Var. *INUTILIS*, Whidborne.

*Pecten demissus*, Phillips: Illust. Geol. Yorkshire, Yorkshire Coast, 1829, p. 140, pl. vi, fig. 5.

*Pecten demissus*, var. *inutilus*, Whidborne: Quart. Journ. Geol. Soc., vol. xxxix (1883), p. 499, pl. xv, fig. 15.

*Formation*.—Bajocian.

*Locality*.—Yeovil Junction.

A valve of this shell (length 35, height 35 mm.) is described as being covered with "beautiful zigzag colour-markings" in longitudinal arrangement. Mr. Whidborne, in the monograph above quoted, also refers to a number of further English Jurassic shells exhibiting relics of coloration, which the student would do well to examine.

**PALÆOZOIC—Carboniferous.**

**CEPHALOPODA.**

**MELOCERAS ACUS (Koninck).**

*Cyrtoceras acus*, Koninck: Ann. Mus. Roy. Hist. Nat. Belgique, vol. v (1880), pt. 2, p. 28, pl. xxxv, fig. 6.

*Meloceras acus*, A. H. Foord: Cat. Fossil Cephalopoda British Museum, pt. i, Nautiloidea, 1888, p. 307.

*Formation*.—Bernician.

*Locality*.—Belgium.

This Cephalopod possesses chevron-shaped markings arranged longitudinally. An example of this species is in the British Museum [64837], but the markings are somewhat obscure.



## GASTROPODA.

CAPULUS MARGARITA, G. S. Boulger. Pl. XXIV, Fig. 5.

*Capulus margarita*, Boulger: Proc. Geol. Assoc., vol. xi (1890), p. 445, pl. iv, figs. 1-3.

*Formation*.—Bernician.

*Locality*.—Ayrshire.

This interesting fossil was originally described as "showing dark olive green colour-bands radiating from the apex of the spire." Mr. Boulger's figure 1, representing a natural sized drawing of the original specimen, is reproduced on the present plate.

PLATYOSTOMELLA SCOTOBURDIGALENSIS, R. Etheridge, jun. Pl. XXIV, Figs. 6, 7.

*Platyostomella Scotoburdigalensis*, Etheridge: Proc. Roy. Phys. Soc. Edinburgh, vol. v (1880), p. 161, pl. iii, figs. 1-6.

*Formation*.—Bernician.

*Locality*.—Fifeshire.

Mr. Etheridge, jun., described this species more than a quarter of a century since, as "a small Naticiform Gastropod showing colour-bands." These colour-remains were found to be very variable, the bands occurring in pairs and also singly, being arranged both spirally and longitudinally, whilst one of the examples showed no bands at all. Figs. 6 and 7 of this paper, copied from Etheridge's original plate, illustrate the single-banded character and also the twinned condition observed in some examples of the species. The specimens are extremely small from the fact that the figures are said to be ten times enlarged.

MOURLONIA CARINATA (J. Sowerby). Pl. XXIV, Fig. 4.

*Helix carinatus*, J. Sowerby: Min. Conch., vol. i (1812), p. 34, pl. x, upper and lower figures.

*Pleurotomaria flammigera*, Phillips: Illust. Geol. Yorkshire, pt. ii, The Mountain Limestone District, 1836, p. 226, pl. xv, fig. 2.

*Pleurotomaria carinata*, J. de C. Sowerby: Min. Conch., vol. vii (1844), p. 70, pl. 640, fig. 3.

*Mourlonia carinata*, Koninck: Ann. Mus. Roy. Hist. Nat. Belgique, vol. vii (1883), pt. 4, p. 77, pl. xxxiii bis, figs. 4, 5.

*Formation*.—Bernician.

*Locality*.—Yorkshire.

Phillips originally referred to this Pleurotomaroid shell by stating "colour varied with zigzag flashes." The markings mostly occur on the surface of the body-whorl and above the so-called band which characterizes this group of shells; only rarely are they seen below that structure. They consist of thick zigzag stripes, more or less equally spaced, regular, and arranged transversely, and between them can be seen the fine striations which form the sculpture of the shell.

The zigzag markings were not present on the specimen selected for illustration when James Sowerby published his account of this species. In the meantime Phillips issued a remarkably good figure, showing these remains of ancient coloration, and referred his specimen to the

then new specific name, *flammigera*. Subsequently James de Carle Sowerby completed the history of his father's species by publishing another figure of this shell which included the peculiar zigzag markings. In this representation it is noticeable that the stripes are seen to occur beneath the encircling band as well as above it. The later Sowerby also recognized that Phillips's *flammigera* was synonymous with the earlier *carinata*.

The late Professor L. de Koninck included this species in his genus *Mourlonia*. The specimen now figured has been slightly restored on account of its basal contour being more or less fractured in places.

The specimen is in the British Museum [G. 130].

## PELECYPODA.

SYNCYCLONEMA SOWERBYI (McCoy). Pl. XXIV, Fig. 11.

*Pecten Sowerbyi*, McCoy: "A Synopsis of the Characters of the Carboniferous Fossils of Ireland," 1844, p. 100, pl. xiv, fig. 1.

*Formation*.—Bernician.

*Locality*.—Kildare, Ireland.

This valve is furnished with about eight fairly stout, divaricating bands, extending to both the anterior and posterior margins and equally divided from each other, the apices of the angles being quite central and directed dorsally. The bands form slightly roughened grooves, as if the pigment material which originally filled them had decomposed on account of its constituents being of a softer nature than the shell-structure itself. Fine and closely-arranged concentric striations are also present on this valve, forming its sculpture. McCoy's original figure obscurely indicates the presence of such bands, although they were not referred to in the descriptive text.

From a later study of the species McCoy found that by removing the top, very thin, superficial layer of the shell he disclosed "a number of small, interrupted zigzag and divaricating, scratch-like markings" ("Systematic Description of the British Palæozoic Fossils," 1855, p. 478).

Mr. Etheridge, jun., subsequently made a study of the shell (Geol. Mag., 1874, p. 300, pl. xiii, figs. 1, 2), especially in connection with the peculiar V-shaped markings or grooves, referred to by McCoy, and which he stated occurred on the "inner lamina of the shell."

Another important contribution in connection with this species was the re-figuring of McCoy's original specimen by W. H. Baily ("Figures of Characteristic British Fossils," 1875, p. 113, pl. xxxix, fig. 3), who directed attention to the "wavy bands of colour-markings in addition to the concentric lines of growth." The markings, of which seven can be counted on the figure, were stated to be of a "burnt umber colour."

The shell evidently exhibits considerable variation so far as these markings are concerned. A specimen in the British Museum [30355] possesses more than twenty divaricating bands stretching across the valve, although near the basal margin these appear to be replaced by a number of zigzag striæ; and all these patterns are well indented.

From an examination of a number of specimens exhibiting these different patterns and their comparison with the colour-markings of modern shells, there can be little doubt that they represent the remains of original coloration. Dr. Wheelton Hind is followed in regarding this species as belonging to *Syncyclonema* (Mon. Pal. Soc., "British Carboniferous Lamellibranchiata," 1903, p. 118, pl. xviii, figs. 21-26).

The specimen now figured is in the British Museum [30346].

SYNCYCLONEMA COLORATA (Koninck).

*Entolium coloratum*, Koninck: Ann. Mus. Roy. Hist. Nat. Belgique, vol. xi (1885), pt. 5, p. 241, pl. xxxii, fig. 21.

*Formation*.—Bernician.

*Locality*.—Belgium.

This specimen is a pectinoid valve bearing a series (about 18 rows) of longitudinally arranged, zigzag patterns, which fit into one another, but having equal spaces of separation. The actual surface structure is quite smooth, and not ornamented with concentric striations. The dimensions of the specimen are: length 33, height 44 mm.

AVICULOPECTEN RUGULOSUS (McCoy). Pl. XXIV, Fig. 10.

*Pecten rugulosus*, McCoy: "A Synopsis of the Characters of the Carboniferous Limestone Fossils of Ireland," 1844, p. 98, pl. xvii, fig. 7.

*Formation*.—Bernician.

*Locality*.—Kildare, Ireland.

More than a dozen dark spots are observed on the umbonal half of this (right) valve. They are of nearly equal size, covering mostly about three ribs, and are rather more elongate than round. This colour feature is extremely rare among Palæozoic pectinoid shells, and was very early noticed by Edward Forbes in connection with a specimen he had examined in the Museum of Practical Geology, Jermyn Street, referring to it as an unnamed species of *Aviculopecten* showing "spotty markings on the ribs in the manner of many existing *Pectines*" (Proc. Roy. Soc. London, vol. vii, 1854, p. 23).

The specimen is in the British Museum [30,348].

STREBLOPTERIA SUBLOBATA (Phillips). Pl. XXIV, Figs. 8, 9.

*Avicula sublobata*, Phillips: Illustrations of the Geology of Yorkshire, Mountain Limestone District, 1836, p. 211, pl. vi, fig. 25.

*Formation*.—Bernician.

*Locality*.—Derbyshire.

The radiating brownish bands, representing the original colour-markings so frequently seen on this shell, have been ably described by Mr. R. Etheridge, jun. (Geol. Mag., 1876, p. 152, pl. vi, figs. 2-6), who recognized considerable variation, one valve possessing as few as six or seven, another showing fourteen or fifteen, and all passing from the umbo to the margin in a straight course. They sometimes differ in width, the central ones being broadest. Both bifurcation and trifurcation exist in some examples, whilst a smaller band is

occasionally found between the larger ones. The larger of the two specimens here figured shows six bands on the right valve, the four centrals being nearly equidistant or paired, whilst the laterals are more widely separated. These bands are narrow and fine from the umbonal region, but gradually thicken in their descent to the ventral margin, where they are observed to be of equal width. The opposing valve of this specimen possesses only two bands, and these are in the centre. The smaller specimen starts with about seven primary bands which bifurcate soon after leaving the umbonal area, then continue their course to the margin in well-arranged pairs; a short, isolated band occasionally occurs in the spaces separating the couples. This species is recognized as belonging to McCoy's genus *Streblopteria*, first suggested by Mr. Etheridge, jun., although it is only right to mention that Dr. Wheelton Hind places it in *Pseudamusium* (Mon. Pal. Soc., 1903, "British Carboniferous Lamellibranchia," p. 110).

Both the specimens figured are in the British Museum [L. 10072] and come from Derbyshire. Further excellent examples of this species exhibiting similar remains of ancient colour-markings are also in the British Museum and localized as from Yorkshire and Ireland; one of these has the stripes or bands following a triplicate arrangement [L. 19679].

## PALÆOZOIC—Devonian.

### CEPHALOPODA.

ORTHOCERAS ANGULIFERUM, Archiac & Verneuil. Pl. XXIV, Fig. 2.

*Orthoceras anguliferum*, Archiac & Verneuil: Trans. Geol. Soc. London, vol. vi (1842), p. 346, pl. xxvii, fig. 6.

*Formation*.—Eifelian.

*Locality*.—Paffrath, Germany.

The figure on the present plate is taken from the original illustration. The entire surface of the specimen is seen to be covered with a number of regularly sinuated markings arranged longitudinally, thus forming a beautiful chevron pattern.

### GASTROPODA.

NATICOPSIS HARPULA (J. de C. Sowerby). Pl. XXIV, Fig. 3.

*Murex harpula*, J. de C. Sowerby: Min. Conch., vol. vi (1827), p. 152, pl. 578, fig. 5.

*Nerita subcostata* (Goldfuss MS.), Bronn: Lethæa Geognostica, 2nd ed., vol. ii (1838), p. 1282 (non *Buccinites subcostatus*, Schlotheim, 1822).

*Natica subcostata*, Archiac & Verneuil: Trans. Geol. Soc. London, ser. II, vol. vi (1842), p. 366, pl. xxxiv, figs. 5, 6. Goldfuss: Petrefacta Germaniæ, vol. iii (1844), p. 116, pl. excviii, fig. 22.

*Naticopsis harpula*, Whidborne: Mon. Pal. Soc., 1891, p. 189, pl. xix, figs. 3, 4.

*Formation.*—Eifelian.

*Locality.*—Paffrath, Germany.

The figure given of this form is copied from Archiac & Verneuil's work, pl. xxxiv, fig. 5, which represents a specimen from the Devonian rocks of Paffrath, Rhenish Germany. It shows three distinct transverse rows of what are stated to be "brown spots" forming "the remains of the colouring matter of the shell." A much larger example from the same locality is in the British Museum with the markings equally well preserved as are exhibited in the figure. This species also occurs in the Devonian rocks of England, but no specimens that have been examined have any relics of the colour-spots remaining.

The determination and synonymy of this shell are taken from Mr. Whidborne's "Monograph of the Devonian Fauna of the South of England."

## PALÆOZOIC—Silurian.

### CEPHALOPODA.

ORTHO CERAS ANNULATUM, J. Sowerby.

*Orthoceras annulatum*, J. Sowerby: Min. Conch., vol. ii (1818), p. 73, pl. cxxxiii.

*Formation.*—Wenlockian.

*Locality.*—Wenlock.

The late Professor J. F. Blake called attention some years since to a specimen of this species in the Museum of Practical Geology showing straight longitudinal colour-bands, which were stated by Mr. A. H. Foord ("Catalogue of the Fossil Cephalopoda in the British Museum (Natural History)," part i, Nautiloidea, 1888, p. 54) to be very distinct. Blake's published figure, however, of this specimen is not particularly convincing as an example of colour-banding ("British Fossil Cephalopoda," 1882, p. 91, pl. iv, fig. 4), although of interest to refer to on the present occasion.

### GASTROPODA.

POLYTROPINA HELICINA (Lindström). Pl. XXIV, Fig. 1.

*Oriostoma helicinum*, Lindström: Kongl. Svenska Vet.-Akad. Handlingar, Stockholm, vol. xix (1884), No. 6, pl. xx, figs. 30, 31.

*Formation.*—Ludlovian.

*Locality.*—Gothland, Sweden.

A small form of Gastropod exhibiting transverse bands of colour at regular distances, parallel with the sculpture lines. Fig. 30 of the original plate has been copied for this paper; it represents a specimen having a height of 10 mm., the illustration being made twice natural size. According to Lindström the Gothland Silurian deposits contain a littoral fauna.

The species is here referred to *Polytropina* of Miss Jane Donald (now Mrs. Longstaff), who founded this generic name to replace

Lindström's *Oriostoma*, which the authoress correctly discovered was entirely different to Munier-Chalmas's shell of the same name and earlier date (Quart. Journ. Geol. Soc., vol. lxi, 1905, p. 575).

CYRTOLITES PHARETRA, Lindström.

*Cyrtolites pharetra*, Lindström: Kongl. Svenska Vet.-Akad. Handlingar, Stockholm, vol. xix (1884), No. 6, p. 83, pl. vi, fig. 39.

*Formation*.—Ludlovian.

*Locality*.—Gothland, Sweden.

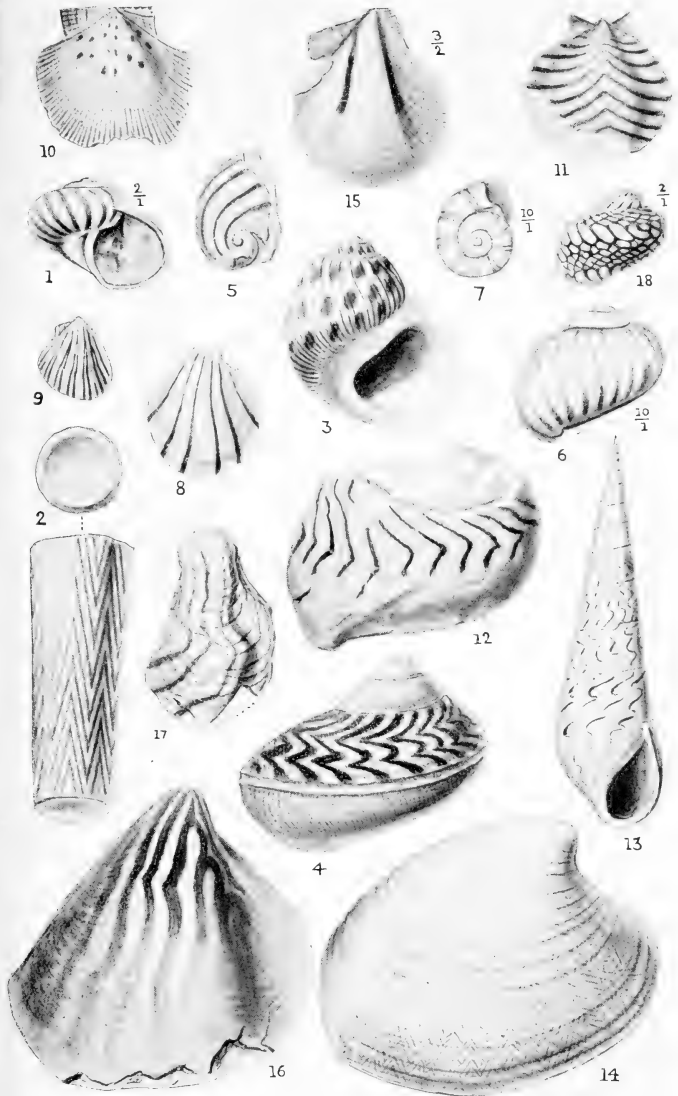
Specimen showing spiral or longitudinal colour-bands; a transverse, ridge-like ornamentation forms the sculpture of the shell.

Lindström's shell is said to measure 15 mm. in length, the published figure being enlarged three times.

EXPLANATION OF PLATE XXIV.

- FIG. 1. *Polytropina helicina* (Lindström). Silurian, Sweden. Copied from original figure.  $\times 2$ .
- „ 2. *Orthoceras anguliferum*, Archiac & Verneuil. Devonian, Germany. Copied from original figure.
- „ 3. *Naticopsis harpula* (J. de C. Sowerby). Devonian, Germany. Copied from original figure (pl. xxxiv, fig. 5) of Archiac & Verneuil's *Natica subcostata*.
- „ 4. *Mourlonia carinata* (J. Sowerby). Carboniferous, Yorkshire. Drawn from a specimen in the British Museum [G. 130].
- „ 5. *Capulus margarita*, Boulger. Carboniferous, Ayrshire. Copied from original figure (fig. 1).
- FIGS. 6, 7. *Platyostomella Scotoburdigalensis*, R. Etheridge, jun. Carboniferous, Fifeshire. Exhibiting both the single and the twinned stripes. Copied from original figures (figs. 1a and 2).  $\times 10$ .
- „ 8, 9. *Streblopteria sublobata* (Phillips). Carboniferous, Derbyshire. Exhibiting both the single and the twinned stripes. Drawn from specimens in the British Museum [L. 10072].
- FIG. 10. *Aviculopecten rugulosus* (McCoy). Carboniferous, Kildare, Ireland. Drawn from a specimen (right valve) in the British Museum [30348].
- „ 11. *Syneclonema Sowerbyi* (McCoy). Carboniferous, Kildare, Ireland. Drawn from a specimen in the British Museum [30346].
- „ 12. *Natica cineta*, Phillips. Great Oolite, Stratton, Gloucestershire. Drawn from a specimen, with only the basal whorl preserved, in the British Museum [G. 1604].
- „ 13. *Pseudomelania Healdingtonensis* (J. Sowerby). Oxfordian, France. Copied from Orbigny's interpretation of this species (pl. ccxlv, fig. 4).
- „ 14. *Cyprina lineolata* (J. Sowerby). Cretaceous, Blackdown, Devonshire. Drawn from the original specimen (a right valve) in the British Museum [43104].
- „ 15. *Camptonectes* cf. *curvatus* (Geinitz). Cretaceous, Zululand. Drawn from a specimen (left valve) collected by Mr. William Anderson, F.G.S.
- „ 16. *Gryphæa columba*, Lamarek. Cretaceous, co. Antrim, Ireland. This figure includes rather more than the half of a large specimen (lower valve) in the British Museum [L. 14399].
- „ 17. *Ostrea* cf. *curvirostris*, Nilsson. Cretaceous, Bromley, Kent. Drawn from a specimen in the British Museum [44677].
- „ 18. *Neritina concava*, J. de C. Sowerby. Oligocene, Isle of Wight. Drawn from a specimen in the British Museum [G. 17999].  $\times 2$ .

The figures on this plate, unless otherwise marked, are drawn natural size.



P. Highley, del.

COLOUR-MARKINGS IN FOSSIL SHELLS.





NOTES ON NEW ZEALAND POLYPLACOPHORA, WITH  
DESCRIPTIONS OF FIVE NEW SPECIES.

By HENRY SUTER.

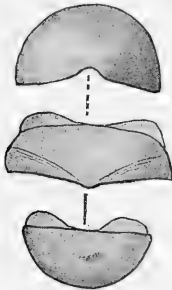
*Read 12th April, 1907.*

ISCHNOCHITON (s.str.) CONTRACTUS (Reeve).

This species, which is in the Cuming Collection as from New Zealand, and was placed by me amongst the species doubtfully occurring in the New Zealand seas,<sup>1</sup> has been again met with. Capt. J. Bollons kindly gave me a specimen which he collected at the Auckland Islands. It is a young example, having a length of 9 mm. only, and most of the valves are broken. The colour is yellowish white, with three longitudinal rows of brown spots. The sculpture consists of the characteristic ziczac wrinkles, which are very delicate, as might be expected in such a young specimen.

ISCHNOCHITON (s.str.) LUTEOROSEUS, n.sp.

Shell very small, elongately oval, minutely granulate, uniformly pink or yellowish, with longitudinal pink bands. Anterior valve with a posterior rounded sinus, finely granulated in quincuncial pattern, as is the surface of all the other valves. Intermediate valves with



1

the lateral areas hardly raised, and not well defined; slightly beaked, and the jugum sharply rounded. Posterior valve with a central mucro, a slight transverse impression below it, the posterior slope straight. Girdle scaly, scales roundish, imbricating, flatly convex,

<sup>1</sup> Proc. Malac. Soc., vol. ii, p. 200.

smooth, and of equal size. Colour pink, but mostly yellowish with concentric pink bands on the head valve, longitudinal, usually three on each side, on the intermediate valves, and mostly absent on the tail valve; these bands are slightly undulating or zigzagging.

Interior bright pink, sinus broad and smooth, sutural laminae broadly rounded. Anterior valve with 11 slits at irregular distances, intermediate valves with 1 slit on each side, posterior valve with 8 slits; corresponding with the slits there are radiate fine white lines in all valves. Length 5, breadth 3 mm.; divergence 80°.

*Hab.*—A few specimens and a number of valves in sand dredged in 50 fathoms near the Bounty Islands by Capt. J. Bollons.

To judge from the valves gathered, the species will attain a slightly larger size, but most of my specimens are considerably smaller.

The smallness, colour, and absence of radiating sculpture distinguish this species from the other New Zealand forms of the genus. Type in my collection.

#### CALLOCHITON ILLUMINATUS (Reeve).

A young specimen, only 5 mm. long, kindly given me by Capt. J. Bollons, was found amongst dredgings in 50 fathoms near the Snares Islands. The specimen is semi-transparent, dirty-white, has the characteristic girdle-scales of the genus, and the sculpture of the species; there are only five elevated threads on each side of the central areas. The first known occurrence of this species in New Zealand waters was recorded by the writer in 1897.<sup>1</sup>

#### CALLOCHITON SULCULATUS, n.sp.

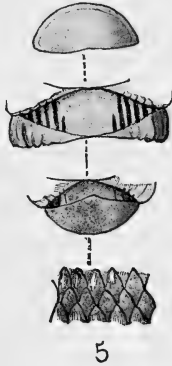
Shell very small, oval, angularly raised, side-slopes straight, central areas laterally grooved, colour light fulvous. Anterior valve smooth, with a few fine growth-lines, the whole surface dotted with small black eyes. Intermediate valves having the jugum sharply rounded, central areas microscopically longitudinally closely striate, on each side 4 to 5 deep grooves, twice as broad as the ribs, the innermost groove extending only over half the length; lateral areas distinctly raised, microscopically radially striate, with numerous eyes, flatly and broadly nodulous by a few concentric furrows, more pronounced near the margins; sutures crenate. Posterior valve smooth, with many eye-dots; mucro in front of the middle, low; posterior slope slightly concave. Girdle with elongated, pointed, and slightly keeled smooth scales. Colour light fulvous, darker on the end-valves and lateral areas; girdle white, with fulvous patches. Interior pinkish-white; anterior valve with 14, median valves with 2, and posterior valve with 10 slits; teeth blunt, propped up on the outside; eaves spongy; the low and broadly rounded sutural laminae continuous across the shallow sinus.

The approximate dimensions are: length 9, width 6 mm.; divergence 105°.

<sup>1</sup> Proc. Malac. Soc., vol. ii, p. 185.

*Hab.*—One specimen amongst material dredged by Mr. R. Henry in 30 fathoms, Dusky Sound.

Type in my collection. With regard to sculpture of the lateral areas this species stands between *C. empleurus* and *C. illuminatus*; the



5

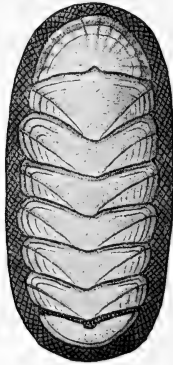
former, however, has 4, the latter only 1 slit on the intermediate valves. In Journ. Malac., xii, p. 65, I stated that the median valves of *C. empleurus* had 3 slits, but 4 is the correct number.

#### CHITON TORRI, n.sp.

Shell small, elongate, smooth, dark brown. Anterior valve with eleven indistinct riblets, obsolete in one specimen, crossed by fine growth-lines, the whole surface minutely wrinkled. Of the intermediate valves the first is twice as long as the others, all of them are broadly rounded, smooth, and beaked, the central areas with minute transverse zigzag wrinkles; jugum smooth; lateral areas slightly raised, with concentric ridges, very distinct near the margins, but gradually disappearing towards the centre, the whole minutely wrinkled. Posterior valve with the mucro central, low, posterior slope strongly convex, a few concentric ridges near the margin, surface wrinkled like the other valves. Girdle with small, rounded, smooth, imbricating scales. Colour dark brown, somewhat lighter on the central and lateral areas; girdle darker brown, nearly black. Interior light brown, sinus microscopically denticulate, sutural laminae moderately high, and broadly rounded. Anterior valve with 11 slits, teeth sharp and pectinate, irregular in size. Intermediate valves with 1 slit on each side. Posterior valve with a low insertion plate, having 12 slits, the teeth thick and blunt, with one or two grooves on the outside. Length 9, breadth 4.5 mm.; divergence 100°.

*Hab.*—Bluff, South Island (Dr. Torr).

Two specimens were found by Dr. W. G. Torr, of Brighton, South Australia, during his travels in New Zealand some years ago, and most kindly presented to me. It is easily distinguished from all other New Zealand species of the genus by the almost total smoothness,

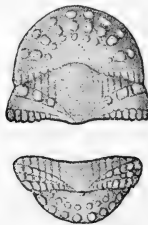


2

the small size, and the microscopic wrinkles. It is nearest allied to *C. Sinclairi*. It affords me great pleasure to unite the name of its discoverer with the species. Type in my collection.

CHITON CLAVATUS, n.sp.

Shell small, elongated oval, acutely raised, surface of all valves minutely shagreened, with nodulous sculpture, colour grey, some



3

valves brown. Anterior valve with 8 radiate ribs, each consisting of three flatly convex nodules, the uppermost small and round, the

following large and squarish, the lowest a little smaller and oblong; posterior margin crenulate. Intermediate valves have the first longer than the others, sharply angled, and slightly beaked; central areas with 5 to 6 deep longitudinal furrows on each side; lateral areas raised, with an anterior and posterior broad rib bearing flatly raised, squarish nodules which are more numerous on the posterior rib; seventh valve having a few central nodules on the lateral areas marking a third rib; sutures strongly and bluntly crenulated. Posterior valve with two concentric rows of round nodules, representing 10 radiate ribs; mucro slightly in front of the middle, small and pointed, posterior slope straight. Girdle with rather large imbricating, convex, and smooth scales, smaller on the inner side. Colour of valves 1, 2, 7, 8 ash-grey, the other valves greyish-brown with white spots along the ridge; girdle uniformly grey. Interior: anterior valve with 8, intermediate valves with 1, and posterior valve with 11 slits; teeth pectinate. Length 14, breadth 9 mm.; divergence  $95^{\circ}$ .

*Hab.*—Rangitoto Island, near Auckland, between tide-marks (H. S.).

Of the New Zealand species *C. limans*, Sykes, is the nearest, from which, however, it is easily separated by the smooth, not sharply raised tubercles, and the rounded, not pointed, and smooth scales. Only one specimen was found, now in my collection.

#### LORICA (s.str.) VOLVOX (Reeve).

In my revision of the New Zealand Polyplacophora<sup>1</sup> I placed the above species amongst those doubtful for New Zealand, as there was then no convincing evidence that the species really lived in New Zealand waters. Two years ago an intermediate valve was dredged in 25 fathoms near Channel Island, Hauraki Gulf, but I could not be quite sure whether it represented *L. volvox* or not. Fortunately some months ago Capt. J. Bollons brought me a good specimen of this species, which he obtained from buoy moorings in 20 fathoms near Whale Rock, Bay of Islands. It agrees with specimens in my collection from South Australia and Port Jackson, but the threads on the central areas are somewhat closer together; otherwise there is no difference. The species has therefore to be added again to the list of the New Zealand fauna.

#### ONITHOCHITON NODOSUS, n.sp.

Shell small, elongately ovate, shining, flesh colour, variegated with white and brown, lateral areas with nodulous ribs. Anterior valve with about 20 radiate nodulous riblets, crossed by four concentric furrows; about 14 radiate rows of minute silvery eyes. Intermediate valves slightly beaked, with the jugum sharply rounded; central areas minutely punctate, with longitudinal ridges in front of the lateral areas, short near the centre, but extending nearly the whole length on approaching the margins; several transverse furrows extend over the central areas and jugum. Lateral areas scarcely raised, with

<sup>1</sup> Proc. Malac. Soc., vol. ii, p. 200.

three nodulous ribs, the two posterior ones close together, sutures slightly crenulated; one row of eyes between the first and second rib. Posterior valve with the mucro terminal, minutely punctate, a concentric marginal row of nodules, interspersed with eyes. Girdle narrow, leathery (dry specimen!), with narrow white stripes below the sutures. Colour light pink over the jugum, minutely dotted with white, margined by rows of triangular white spots; central and lateral areas reddish brown, variegated with white on some of the intermediate valves.

Anterior valve with 10 irregularly spaced slits, teeth pectinate; intermediate valves with 1 slit on each side; posterior valve with a low, smooth, and rounded callus. Length 17, breadth 7 mm.; divergence 70°.

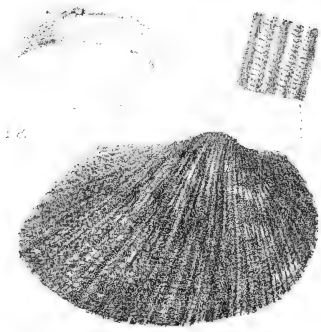
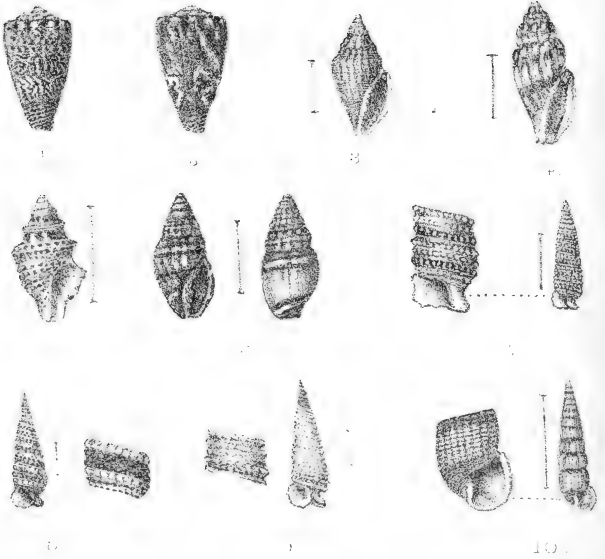


4

*Hab.*—Foveaux Strait, in 18 fathoms (Capt. J. Bollons), one specimen.

The specimen was kindly lent me by Miss Mestayer, of Wellington. As the shell contains the dried-up animal, which I did not venture to remove, the inside could not be described. I have an anterior and intermediate valve dredged in 10 fathoms near Open Bay Island, west coast of the South Island, also obtained from Capt. J. Bollons, which belong to a nearly allied species. The anterior valve has two concentric rows of nodules near the margin, eight radiate rows of eyes, the whole of the smooth surface covered with minute white dots; there are 8 slits, the teeth pectinate. Inside purple in the centre. The intermediate valve is flesh-colour like the anterior valve, minutely dotted with white, central areas with a number of low wrinkles in front of the lateral areas, the latter with two radiate rows of rounded nodules, between which the eyes are situated. Sinus deep, flat, minutely denticulate, sutural laminae short, broadly rounded. One slit on each side, the valve callus distinct, white, the remainder light purple. Divergence 90°. *O. nodosus* is no doubt closely allied to *O. rugulosus*, Angas, from Port Jackson, Australia. Type in Miss Marjorie K. Mestayer's collection.





11.



13.

E. Haverbe, del. et lit.



DESCRIPTIONS OF NEW MARINE MOLLUSCA FROM NEW  
CALEDONIA, ETC.

By G. B. SOWERBY, F.L.S.

Read 12th April, 1907.

PLATE XXV.

CONUS BOUGEI, n.sp. Pl. XXV, Figs. 1, 2.

Testa subcylindræo-turbinata, coronata, postice truncata, antice attenuata, rufo-fusca, maculis albidis diversiformibus ornata; spira brevissima, obtusa; anfractus vix concavi, spiraliter leviter striati, nodose angulati, sutura irregulariter impressa discreti; ultimus levissime convexus, liris distantibus vix conspicuis cingulatus, nodulis pallidis rotundatis circiter 14 ad angulum armatus, basim versus attenuatus, conspicue rotunde liratus; apertura postice angusta, antice paulo latior. Long. 21, diam. 11 mm.

*Hab.*—Monac Island, New Caledonia (Bouge).

An interesting little Cone, somewhat remarkable in character. The spire is very short, and the rounded nodules at the angle are rendered more conspicuous by their light colour; the body-whorl is girdled by very slightly raised, narrow, rather distant ridges; upon a reddish-brown ground, the surface is sprinkled with whitish flake-like spots, which are larger, elongated, and tortuous, somewhat like hieroglyphics, forming a zone below the middle of the whorl.

A second specimen, which I call var.  $\beta$  (Fig. 2), is darker in colour, and has very few spots, and two or three longitudinal whitish flames bordered with light yellowish brown, and the infra-median zone is only indicated by a few quaint hieroglyphics.

These two are the only specimens I have seen of the species, with the exception of a very small imperfect one resembling the type. I have pleasure in naming the species in honour of Monsieur Bouge, who collected the specimens in the Island of Monac, New Caledonia.

CYTHARA STRIATISSIMA, n.sp. Pl. XXV, Fig. 3.

Testa ovato-conoidalis, antice attenuata, postice acuminata, pallide fulva vel straminea, longitudinaliter tenuiter plicata, spiraliter densissime striata; spira acute conica, elatiusecula; anfractus  $7\frac{1}{2}$ , primi (2) læves, rotundati, cæteri obtuse angulati, supra angulum concaviusculi, sutura angustissima discreti; ultimus  $\frac{2}{3}$  totius longitudinis testæ æquans, infra angulum convexiusculus, varice crassa marginatus; apertura oblonga, mediocriter lata, utrinque leviter angustior; labrum acutum, postice late sinuatum, intus denticulatum; columella oblique rectiuscula, plicis minutis numerosis instructa. Long. 9, diam. 4.5 mm.

*Hab.*—New Caledonia (Bouge).

A typical *Cythara*, of a very pale fulvous colour; it is very finely and closely striated; the longitudinal plicæ are narrow, moderately prominent, and number about 20 on the body-whorl.

## CYTHARA OPTABILIS, n.sp. Pl. XXV, Fig. 4.

Testa ovato-fusiformis, alba, maculis aurantiis ornata; spira elata, convexa, ad apicem acutiuscula; anfractus convexi, læviusculi, spiritaliter leviter striati, plicis crassiusculis rotundatis circiter 12 (in anfr. penult.) instructi, sutura profunde canaliculata, crenulata, discreti; penultimus turgidus, maculis aurantiis quadratis super costas uniseriatim ornatus; ultimus  $\frac{3}{4}$  totius longitudinis testæ vix æquans, biseriatim maculatus; apertura  $\frac{1}{2}$  long. testæ æquans, mediocriter lata; labrum extus crassiaricosum, ad marginem acutum, postice rotunde sinuatum, intus denticulatum, sinu antico latiusculo rotundato; columella oblique rectiuscula, plicis numerosis confertis instructa. Long. 11.5, diam. 5 mm.; apert. long. 6 mm.

*Hab.*—New Caledonia (Bouge).

This pretty shell is nearly related to *C. eupacila*, Hervier, but on the penultimate whorl there is only one series of squarish orange spots, and two on the body-whorl; in the type, on the back of the body-whorl, the spots become merged into longitudinal flames, but in some specimens the spots are distinct throughout. The specimens are mostly larger than those of *C. eupacila*, in which the spots are more linear in two series on the penultimate, and three on the body-whorl.

## PLEUROTOMA ABBREVIATA, Reeve, var. LIFUENSIS, nov. var. Pl. XXV, Fig. 5.

Quam *P. abbreviata* typica multo brevior, magis angulata, carina duplicata ad angulum magis prominens. Long. 17, diam. 10 mm.

*Hab.*—Lifu, Loyalty Islands.

This form, which seems peculiar to the Loyalty Islands, has long been known under the name of *P. abbreviata*, but its aspect is so different from Reeve's type from the Philippine Islands that it is worthy of at least a varietal name. I exhibited at the meeting of the Malacological Society, April 12th, a series of specimens of the typical *P. abbreviata* from the Andaman Islands and Mauritius, than which the Lifu variety is of a much shorter form, more angular, with a much more prominent keel.

## MITRA (PUSIA) ACCINCTA, n.sp. Pl. XXV, Fig. 6.

Testa parva, ovato-fusiformis, crassiuscula, lævis, longitudinaliter obtuse plicata, pallide fuscescens, transversim fusco lineata et zonata, zonula albida cincta; spira mediocriter elata, acuta; anfractus 7-8, convexiusculi, sutura distincta discreti, costulis verticalibus parum elevatis rotundatis lævigatis (in penultimo 11-12) instructi, zonula albida versus medium cingulati; ultimus spiram superans, convexus, costulis partim evanidis, prope basim parum contractus, leviter rugosus, lira duplicata latiuscula obliqua albida cinctus, ad basim nigro tinctus; apertura mediocriter lata,  $\frac{1}{2}$  longitudinis testæ æquans, intus fuscescens, lævis; labrum levissime sinuosum, crassiusculum, glabrum, nigro-fusco tinctum; columella rectiuscula, leviter obliqua, tenuiter callosa, nigro-fusca, triplicata, plicis crassiusculis, oblique decrecentibus. Long. 13, diam. 6 mm.

*Hab.*—Monac Island, New Caledonia (Bouge).

This species belongs to the group of *M. luculenta*, Reeve; in colour and banding it somewhat resembles *M. Montrouzieri*, Tapp.-Canefri (*M. tricolor*, Montr.), but it is of a narrower form and the ribs are much less numerous, rounded, smooth, and in some cases almost obsolete on the body-whorl. The specimens present some variation in the disposition of the colour lines and bands, but the most characteristic specimens have, as in the type, two brown lines or narrow zones in the middle of the penultimate and towards the upper part of the body-whorl, with a whitish zone between.

TRIPHORA EUPUNCTATA, n.sp. Pl. XXV, Fig. 7.

Testa sinistrorsa, elongata, convexiuscula, ad apicem acuminata, pallide rufo-fusca, nitens, fusco seriatim punctata; anfractus 16-17, planati, vix convexi, cingulis 3 eximie gemmiferis, cingula tertia gemmis fusco interpunctatis ornati, sutura canaliculata creno-lirata discreti; ultimus brevis, infra obtuse angulatus, ad basin liris 2 angustis crenulatis munitus; rostrum breve, crassum, obliquum; apertura oblique subquadrata. Long. 10, diam. 2.5 mm.

*Hab.*—New Caledonia (Bouge).

Shell light reddish brown, shining, closely and beautifully beaded in three rows on each whorl, spotted with brown between the beads of the lower rows; the whorls are separated by a channelled suture, in which may be observed a crenulated ridge; the last whorl has two narrow crenulated keels at the base.

TRIPHORA FUSCOZONATA, n.sp. Pl. XXV, Fig. 8.

Testa sinistrorsa, elongatula, acute acuminata, nigro-fusco fasciata; anfractus 18, leviter convexi, gemmis rotundatis confertis biseriatis (lira angusta interveniente) ornati, sutura impressa discreti; ultimus curtus, liris 6 minute gemmulatis, prope basin leviter attenuatus, rotunde angulatus; rostrum curtum, crassum, leviter obliquum; apertura parva, oblique subtrigona; labrum tenue, postice sinuatum. Long. 6, diam. 1.5 mm.

*Hab.*—New Caledonia.

This species may be recognised by the dark-brown bands on each whorl; the gem-like nodules common to many species are arranged in two prominent rows, with a narrow intervening crenulated ridge; on the last whorl they are smaller and closer, forming six ridges.

TRIPHORA FUSCOAPICATA, n.sp. Pl. XXV, Fig. 9.

Testa sinistrorsa, elongato-acuminata, ad apicem acutissima, albida, hic illic fusco minute punctata, ad apicem brunnea; anfractus circa 18, embryonales 5-6 planato-declives, læves, sequentes cingulis spiralibus gemmatis 2 (interdum lira minuta interveniente) ornati, sutura impressa discreti; ultimus quadriseriatim gemmatus, infra angulatus, prope aperturam tubulatim forato munitus, ad basin depressus; rostrum crassiusculum, oblique recurvum; apertura parva, subcircularis; labrum tenue. Long. 5.5, diam. 1.12 mm.

*Hab.*—Island of Cebú, Philippines.

The principal feature distinguishing this species is that the embryonic whorls, numbering 5 or 6, are dark brown, showing conspicuously against the whiteness of the subsequent whorls.

*MORMULA EXCELLENS*, n.sp. Pl. XXV, Fig. 10.

Testa elongata, solidiuscula, pallida, zona fusca infra suturam basimque ornata; anfractus 14-15; embryonales sinistrorsum contorti, cæteri planato-convexi, plicis longitudinalibus numerosis confertis planulatis, liris spiralibus densissimis cancellati; penultimus varice latiusculo munitus; ultimus  $\frac{1}{3}$  longitudinis testæ vix æquans, ad basin rotundatus, prope aperturam lativaricosus; apertura subovata, intus lævis, obscure fusco fasciata; columella leviter contorta, vix plicata. Long. 15, diam. 3.3 mm.

*Hab.*—Monac Island, New Caledonia.

A handsome species of the small limited genus *Mormula*. It has somewhat the form of *M. MacAndrewi*, A. Adams, but more whorls, the longitudinal plicæ are closer, and it is distinguished by the bright brown infrasutural band; it has a rather broad varix on the penultimate whorl; the numerous ridges crossing the longitudinal plicæ give them a granular appearance. I have only seen three specimens of this interesting species, of which the type is the largest, a young one showing the curiously contorted apex, and an intermediate one with paler colour-bands.

*SOLETELLINA HEDLEYI*, n.sp. Pl. XXV, Fig. 12.

Testa transversim elongata, elliptica, tenuis, pellucida, alba, concentrice subtilissime irregulariter plicata et striata, postice pallide fulvo-radiata; umbones minuti, conjuncti, post medium locati; margo dorsalis anticus longus, rectiusculus, levissime declivis; posticus brevior, paulo magis declivis, utrinque rotundatus; ventralis leviter arcuatus; ligamentum externum, corneum, elongatum; dentes cardinales valvæ dextræ duo, divergentes, in valva sinistra duo quoque, antico acuto, bifurcato, postico lamellari; sinus pallii magnus, linguæformis. Long. (umbone ad marg. ventralem) 12, lat. 23 mm.

*Hab.*—South Australia.

A transversely, elongated, thin, pellucid shell; faintly rayed posteriorly. The species has long passed muster in Australian collections for *Sanguinolaria vitrea*, Desh., with which it has scarcely any affinity; and I am indebted to Mr. Hedley, of the Australian Museum, after whom I have pleasure in naming it, for confirming my opinion that the species has not hitherto been described.

*ARCA (SCAPHARCA) FULTONI*, n.sp. Pl. XXV, Fig. 11.

Testa transversim elongatula, obliquiuscula, leviter inæqualvis, lateribus superne angulatis, antico infra rotundato, postico oblique rectiusculo, alba, epidermide scabrosa induta, costis radiantibus pernumerosis (circa 47) angulatis, rugosis, sulco angusto divisus instructa; margo dorsalis rectus; area ligamenti angustiuscula; umbones convexi, incurvati, ante medium locati; cardo normalis. Long. (umbone ad marg. ventralem) 35, lat. 50 mm.

*Hab.*—Manila, Philippines.

Distinguished from its congeners by the large number of its radiating ribs, which are rather angular, crenulated, and divided by a central groove. *Arca crebricostata*, Reeve, has almost as many ribs, but they are broader and closer together; that species is also equivalve and so delegated to the section *Anomalocardia*.

## CRYPTODON MURCHLANDI, n.sp. Pl. XXV, Fig. 13.

Testa subtrigono-cordiformis, crassa, depressiuscula, æquivalvis, inæquilateralis, alba, pallide straminea, rugose irregulariter lamellata, prope unbonem lævis, lateribus divergentibus, utrinque obtuse angulata; margo dorsalis arcuatus; umbones acuti, incurvati, antice locati; margo ventralis late arcuatus; area antica (subumbonalis) concave depressa, rugose plicata; cardo crassus, oblique depressus, edentulus, sed infra rugosus; pagina interna sordide alba, corrugata; impressiones musculares elongatæ; sinus pallii obliquus, longus, linguæformis. Long. (umbone ad marg. ventralem) 41, lat. 40 mm.

*Hab.*—St. Vincent, Cape Verd Islands (Murchland).

The form of this remarkable shell (of which I have only seen two specimens) is very like that of *C. flexuosus*, Montagu, but on a gigantic scale, and, unlike that very fragile little species, it is of a solid substance, and particularly thick about the hinge.

I adopt the name of *Cryptodon* (Turton, 1822), as the generic position of the fossil *Axinus* (J. Sowerby, 1821) is very doubtful, the hinge being unknown, and the name *Thyasira* was only given by Leach in manuscript; although quoted by Lamarck in 1818, he gave no description of it. Mr. Edgar A. Smith has pointed out that various large species such as *edentulus*, usually called *Loripes*, should be placed here, the type of *Loripes* being *L. lacteus*, Linn., which has cardinal teeth, while all the *Cryptodons* are edentulous.

## DESCRIPTION OF PLATE XXV.

- FIG. 1. *Conus Bougei*, n.sp.  
 ,, 2. ,, ,, var.  $\beta$ .  
 ,, 3. *Cythara striatissima*, n.sp.  
 ,, 4. ,, *optabilis*, n.sp.  
 ,, 5. *Pleurotoma abbreviata*, Reeve, var. *Lifuensis*, n.var.  
 ,, 6. *Mitra accincta*, n.sp.  
 ,, 7. *Triphora eupunctata*, n.sp.  
 ,, 8. ,, *fuscozonata*, n.sp.  
 ,, 9. ,, *fuscoapicata*, n.sp.  
 ,, 10. *Mormula excellens*, n.sp.  
 ,, 11. *Arca Fultoni*, n.sp.  
 ,, 12. *Soletellina Hedleyi*, n.sp.  
 ,, 13. *Cryptodon Murchlandi*, n.sp.
-

DESCRIPTIONS OF NEW SPECIES OF *DRYMÆUS* FROM PERU,  
MEXICO, ETC.

By S. I. DA COSTA.

Read 12th April, 1907.

PLATE XXVI.

*DRYMÆUS PUNCTATUS*, n.sp. Pl. XXVI, Figs. 1, 1a.

Testa elongata, fusiformis, imperforata, tenuiuscula, lævigata, nitida, lutea vel albida, strigis undatis nigris, albo-punctatis picta, spira conica, apice obtusulo; anfractus 7 planiusculi, ultimus  $\frac{3}{5}$  longitudinis paulo superans; columella vix tortuosa; apertura ovato-oblonga, intus violacea; perist. album, marginibus externo et basali late expansis, columellari subrecto, breviter reflexo. Long. 34, diam. 11 mm.; apertura 16 mm. longa, 8 lata.

*Hab.*—Chanchamayo, Peru.

The reflexion of the columella forms a slight umbilical chink.

There appears to be much variation both in form and colour among the specimens collected of this species, the differences being, however, insufficient to separate them; the writer has therefore decided to describe those that differ from the typical form as varieties, and offers accordingly the following arrangement:—

A. Typical.

B. Var. *albida*. (Pl. XXVI, Figs. 2, 2a.) Shell rather shorter, with narrower and paler stripes on a white ground.

C. Var. *ventricosa*. (Pl. XXVI, Figs. 3, 3a.) Shell shorter and more ventricose, with wavy chocolate stripes on a buff ground, but with less distinct punctation and with three interrupted obsolete bands on the body-whorl.

*DRYMÆUS INCOGNITA*, n.sp. Pl. XXVI, Figs. 4, 4a.

Testa ovato-conica, compressa umbilicata, tenuis, lævigata, nitida, lutea, strigis spadiceis flexuosis albo-punctatis, fasciisque 3 fusciscentibus interruptis ornata; spira conica, acutiusscula, sutura submarginata; anfractus 6 convexiusculi, ultimus  $\frac{3}{5}$  longitudinis æquans; columella medio-criter torta, valde recedens, purpurea; apertura ovalis, basi effusa, intus purpureo-limbata; peristoma tenue, late expansum, ad marginem album. Long. 29.5, diam. 12 mm.; apertura 14 mm. longa, 10 lata.

*Hab.*—Bogota.

The writer received many years ago two specimens of this beautiful shell, one of which differs from the type in having the longitudinal stripes continuous and not arranged in interrupted bands. They appear to bear a resemblance to *D. Pealianus*, Lea, the type of which was destroyed by fire in the museum at Philadelphia.





J. Green del et lith.

NEW SPECIES OF DRYMÆUS.



*DRYMEUS* *BOUCARDI*, n.sp. Pl. XXVI, Figs. 5, 5a.

Testa ovato-conica, subperforata, tenuiuscula, nitida, albida, fusco sparsim strigata et maculata, sub lente striis minutis impressis transversim sculpta; anfractus 6 convexiusculi, ultimus  $\frac{2}{3}$  longitudinis æquans; columella strictiuscula, valde tortuosa; apertura auriformis, intus alba et strigata; peristoma simplex, margine dextro late expanso, albo, columellari brevissime reflexo, perforationem fere claudente. Long. 27, diam. 11 mm.; apertura 14 mm. longa, 7.5 lata.

*Hab.*—Chiriqui.

This shell collected by the late Mr. Boucard bears some resemblance to *D. castus* from Guatemala, but differs from that species in that its columella is strongly twisted, the outer lip more expanded, and its colour white instead of rose.

*DRYMEUS* *PONSONBYI*, n.sp. Pl. XXVI, Figs. 6, 6a.

Testa oblongo-turrita, perforata, solidula, rugose striata et subtiliter malleata, sordide roseo-cornea, fascia unica obsoleta alba cincta; sutura impressa et subrenata; spira acuminata; anfractus  $8\frac{1}{2}$  vix convexiusculi, ultimus  $\frac{1}{2}$  longitudinis subæquans; columella recedens, reflexa; apertura vix obliqua, intus ochracea, ad basim parum attenuata; peristoma simplex, acutum. Long. 33, diam. 12 mm.; apertura 13.5 mm. longa, 5.5 lata.

*Hab.*—Surco, Peru, at an elevation of 2,050 metres.

A shell that somewhat resembles *D. cylindricus*, Da Costa,<sup>1</sup> but differs in having a more tapering form with an extra whorl, and in being malleated throughout.

*DRYMEUS* *CONICUS*, n.sp. Pl. XXVI, Figs. 7, 7a.

Testa pyramidali-conica, minute umbilicata, tenuis, nitida, lævigata, alba, strigis pellucido-corneis, opacis obliquis subdistantibus ornata; anfractus 7 parum convexi, ultimus  $\frac{1}{3}$  longitudinis æquans; spira turrita; apex acutus, rufescens; columella recedens, subrecta, breviter reflexa, appressa; apertura oblongo-ovata; peristoma simplex, acutum, haud expansum. Long. 17.5, diam. 7 mm.; apertura 7 mm. longa, 4 lata.

*Hab.*—Oaxarca, Mexico.

A shell of simple form unlike any other from the same region. It was discovered by the late Mr. Boucard during his travels in Mexico.

## EXPLANATION OF PLATE XXVI.

Figs. 1, 1a.	<i>Drymeus punctatus</i> , n.sp.
2, 2a.	var. <i>albida</i> .
3, 3a.	var. <i>ventricosa</i> .
4, 4a.	<i>incognita</i> , n.sp.
5, 5a.	<i>Boucardi</i> , n.sp.
6, 6a.	<i>Ponsonbyi</i> , n.sp.
7, 7a.	<i>conicus</i> , n.sp.

<sup>1</sup> Proc. Malac. Soc., vol. iv, p. 233, pl. xxiv, fig. 3.

DESCRIPTION OF A NEW SPECIES OF *VALLONIA* FROM SOUTH INDIA.

By G. K. GUDE, F.Z.S.

*Read 12th April, 1907.*

Two specimens of an undescribed form of *Vallonia* were obligingly handed to me for description by Colonel R. H. Beddome, who collected the shells in the early sixties in the interior of the Anamullay Mountains, at an elevation of about 3,000 feet. He states that no European had visited the locality before, and that he sent specimens at the time to Dr. W. T. Blanford, who gave it the manuscript name *Helix miserrima*. These specimens being in the late Dr. Blanford's collection which he bequeathed to the British Museum, have been made the types. Several specimens, so named, were subsequently communicated to various Indian Museums, and for that reason I have thought it advisable to adopt the name.

No *Vallonia* has hitherto been recorded so far south in Asia, but the genus was known to occur in Asia Minor, Persia, Transcaspia, Cashmir, the United Province of India (formerly called the North-West Province), Western Tibet, Siberia, China, and Japan.

A variety of *V. costata* was collected by Blanford at Mazendaran, Persia, as recorded by Nevill in "The Scientific Results of the Second Yarkand Mission," p. 4. The same author also described (*loc. cit.*, p. 4) a variety *asiatica* of *V. costata*, collected by Stoliczka at Wakhan and other places north of Chitral, which he thought was probably the same as the variety recorded by von Martens for Turkestan.<sup>1</sup>

*V. costata* is recorded from Turkish Armenia, Cilicia in Asia Minor, Cashmir, the Province Tchili in China, and Eastern Siberia, whence also a variety *amurensis* has been described. *V. pulchella* is stated to occur in Palestine, Asia Minor, Transcaspia, Turkish Armenia, Cashmir, and Eastern Siberia. *V. pulchella*, var. *persica*, is given for Persia and Transcaspia. *V. Ladacensis*, again, was described by Nevill (*loc. cit.*, p. 4), and figured by von Martens from original specimens received by him from Nevill.<sup>2</sup> This species occurs at Mataian, and Leh, Ladak, in Cashmir; it was also recorded for Narka (?), Western Tibet, by Nevill, and for the Tian Schan Mountains, Turkestan, by von Martens, while Nevill<sup>3</sup> mentions Spiti as habitat. *V. mionecton*, also from Persia; *V. pulchellula*, from Shanghai and Ningkuofu, in China; and *V. tenera*, from Tokyo and Osaka, in Japan, complete the list of known Asiatic species of *Vallonia*. Von Martens mentions<sup>4</sup> *V. japonica*, A. Ad. MS., from Oshima, Yezo, but the species appears never to have been described.

<sup>1</sup> Fedtschenko's Expedition to Turkestan, 1874, p. 9.

<sup>2</sup> Mem. Acad. Petersb., vol. xxx (1882), No. 11, p. 3, pl. iii, fig. 3.

<sup>3</sup> Handlist, i (1878), p. 75.

<sup>4</sup> Preuss. Exped. Ost-Asien: Zoology, p. 18.

## VALLONIA MISERRIMA, n.sp.

Shell widely umbilicated, depressed turbinate, greyish white, translucent; nepionic whorls smooth, the remainder finely and closely ribbed. Spire depressed, apex obtuse, suture deep. Whorls nearly 4, tumid, not sloping towards the umbilicus, increasing regularly, except the last quarter whorl, which widens suddenly, descending deeply in front and dilated behind the peristome. Aperture obovate, oblique; margins convergent, united by a thin callus on the parietal wall;



peristome thin, slightly expanded and reflexed; margins evenly rounded, columellar margin triangularly dilated and impinging upon the wide open umbilicus. Diam. maj. 3, min. 2.5 mm.

*Hab.*—Anamullay Mountains, South India.

Co-types in Colonel Beddome's and my collection. The new species is allied to *V. Ladacensis*, but is more excentric than that species, and the last whorl descends more deeply in front, the whorls are more tumid, the body-whorl is more compressed, the suture deeper, and the last quarter whorl is more dilated, while the umbilicus is more open and the columellar margin more dilated.



## ORDINARY MEETING.

FRIDAY, 10TH MAY, 1907.

E. R. SYKES, B.A., Vice-President, in the Chair.

The following communications were read:—

1. "The Pairing of *Limnæa pereger* with *Planorbis corneus*." By W. D. Lang, F.G.S.
2. "Notes on *Achatina Dennisoni*, Reeve, and *A. magnifica*, Pfr." By E. A. Smith, I.S.O.
3. "Note on an 'Octopus' with branching arms." By E. A. Smith, I.S.O.
4. "Review of the New Zealand Acmæidæ, with descriptions of new species and subspecies." By Henry Suter.

The following specimens were exhibited:—

By J. E. Cooper: Holocene Mollusca from Staines.

By E. A. Smith, I.S.O.: (1) A very large specimen (74 mm. in diameter) of *Pleurodonta (Isomeria) orcas*, Koch. (2) A *Cerithium nodulosum* and a *Murex inflatus* deeply incrustated by Nullipores.By H. B. Preston: Specimens of *Solaropsis Gibboni*, Pfr., and *Solaropsis Amori*, Hidalgo.

## ORDINARY MEETING.

FRIDAY, 14TH JUNE, 1907.

B. B. WOODWARD, F.L.S., President, in the Chair.

The following communications were read:—

1. "The name *Bourcieria*." By E. R. Sykes, B.A.
2. "Descriptions of new species of Australian *Planispira* and *Chloritis*." By H. C. Fulton.
3. "The presence of a double wall in some species of the *Diaphora* group of *Ennea*." By H. C. Fulton.
4. "Nudibranchs from New Zealand and the Falkland Islands." By Sir Charles Eliot, K.C.M.G.

The following specimens were exhibited:—

By C. J. Gabriel: A collection of rare marine Mollusca from Victoria, including the following:—

- |  |   |
|--|---|
| 1. <i>Mitra Vincentiana</i> , Verco.           | 10. <i>C. incertum</i> , Rve.               |
| 2. <i>M. franciscana</i> , T.-Wds.             | 11. <i>Cypræa angustata</i> , Gmel.,        |
| 3. <i>M. Tasmanica</i> , T.-Wds.               | and varieties—                              |
| 4. <i>Conus Segravei</i> , Gatliff.            | <i>piperita</i> , Gray.                     |
| 5. <i>Typhis Yatesi</i> , Crosse.              | <i>Comptoni</i> , Gray.                     |
| 6. <i>Cancellaria Maccoyi</i> , Pritch. & Gat. | <i>bicolor</i> , Gask.                      |
| 7. <i>Scala aculeata</i> , Lam.                | <i>declivis</i> , Sow.                      |
| 8. <i>Marginella levigata</i> , Braz.          | <i>albata</i> , Beddome.                    |
| 9. <i>Calliostoma Hedleyi</i> , Pritch. & Gat. | 12. <i>Clavagella multangularis</i> , Tate. |

- |   |  |
|---|--|
| 13. <i>Chlamys undulatus</i> , Sow.                 | 19. <i>Daphnella excavata</i> , Gatliff.         |
| 14. <i>Cyclopecten Nepeanensis</i> , Pritch. & Gat. | 20. <i>Ancilla Petterdi</i> , Tate.              |
| 15. <i>Modiola arborescens</i> , Chem.              | 21. <i>Acanthochites glyptus</i> , Sykes.        |
| 16. <i>M. Victoriae</i> , Pritch. & Gat.            | 22. <i>Mitra Rosettae</i> , Angas.               |
| 17. <i>Scala Nepeanensis</i> , Gatliff.             | 23. <i>Conus anemone</i> , Lam. (white variety). |
| 18. <i>S. translucida</i> , Gatliff.                | 24. <i>Zenatia Victoriae</i> , Pritch. & Gat.    |

Nos. 1-16 dredged in Western Port Bay; 17-21, Port Phillip Bay; 22-24, Ocean Beach.

Mr. Gabriel also exhibited *Cypræa xanthodon*, Gray, from Queensland, and *Cypræa decipiens*, E. A. Smith, from W. Australia.

By H. C. Fulton: A specimen of *Orthalicus* from Mexico, with a large pearl attached to the inner surface of the last whorl.

By E. A. Smith, I.S.O.: A collection of pearls and photographs of pearls obtained by Mr. Gordon Smith in Japan and China. These included true pearls from *Ihalotis*, *Pecten*, *Pinna*, and *Mytilus*.

By Miss Foster: A deformed specimen of *Cypræa arabica*, with pronounced spire and distorted and thickened lip.

## NOTES.

ON THE PAIRING OF *LIMNÆA PEREGER* WITH *PLANORBIS CORNEUS*. (Read 10th May, 1907.)—On April 14th, at about midday, a specimen of *Planorbis corneus* (Linnæus) was taken from a pond at Harrow, and on it was found a *Limnæa pereger* (Müller) in the act of pairing, the *Limnæa* acting male. The specimens were wrapped in weed, taken home, and placed together in a vessel of water. During the afternoon the *Limnæa* crawled about the shell of the *Planorbis*, and at about 4 o'clock they were again found to be pairing. The next day they were crawling about the vessel indifferent to each other, nor were they subsequently seen to pair. At the beginning of May the *Planorbis* laid a batch of eggs.

For records of pairing between different genera of snails see a note by E. Caziot, Proc. Malac. Soc., 1902, vol. v, No. 1, p. 11.

W. D. LANG.

NOTE ON AN 'OCTOPUS' WITH BRANCHING ARMS.—A specimen of an 'Octopus' has recently been brought from Japan by Mr. R. Gordon Smith, which is very remarkable on account of all the arms, with the exception of one of the dorsal pair, exhibiting one or more furcations. Records of similar abnormalities are extremely rare. It appears to be an abnormal specimen of *Polypus Cephea* (Gray). A descriptive account and figure of it will appear in another publication.

E. A. SMITH.

HOLOCENE MOLLUSCA FROM STAINES. (Read 10th May, 1907.)—Last year Messrs. Kennard & Woodward published a list of Holocene Mollusca from a deposit a mile or so west of Staines (Proc. Geologists' Assoc., vol. xix); those now shown were collected last Autumn close to

Staines Gasworks, where some excavations were in progress. They comprise :—

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| <i>Vitrea crystallina</i> (Müll.).   | <i>L. stagnalis</i> (L.).             |
| <i>V. nitidula</i> (Drap.).          | <i>Amphipeplea glutinosa</i> (Müll.). |
| <i>Zonitoides nitidus</i> (Müll.).   | <i>Planorbis corneus</i> (L.).        |
| <i>Pyramidula rotundata</i> (Müll.). | <i>P. albus</i> , Müll.               |
| <i>Hygromia hispida</i> (L.).        | <i>P. Stroemi</i> , West.             |
| <i>H. rufescens</i> (Penn.).         | <i>P. crista</i> (L.).                |
| <i>Vallonia pulchella</i> (Müll.).   | <i>P. carinatus</i> , Müll.           |
| <i>V. costata</i> (Müll.).           | <i>P. umbilicatus</i> , Müll.         |
| <i>V. excentrica</i> , Sterki.       | <i>P. vortex</i> (L.).                |
| <i>Helix nemoralis</i> , L.          | <i>P. spirorbis</i> (L.).             |
| <i>H. hortensis</i> , Müll.          | <i>P. contortus</i> (L.).             |
| <i>Cochlicopa lubrica</i> (Müll.).   | <i>P. fontanus</i> (Lightfoot).       |
| <i>Jamnia muscorum</i> (L.).         | <i>Physa fontinalis</i> (L.).         |
| <i>Vertigo pygmaea</i> (Drap.).      | <i>Bithynia tentaculata</i> (L.).     |
| <i>V. antivertigo</i> (Drap.).       | <i>B. Leachii</i> (Shepp.).           |
| <i>Clausilia laminata</i> (Mont.).   | <i>Valvata piscinalis</i> (Müll.).    |
| <i>Succinea putris</i> (L.).         | <i>V. cristata</i> , Müll.            |
| <i>S. elegans</i> , Risso.           | <i>Neritina fluviatilis</i> (L.).     |
| <i>Carychium minimum</i> , Müll.     | <i>Sphaerium corneum</i> (L.).        |
| <i>Ancylus fluviatilis</i> , Müll.   | <i>Pisidium amnicum</i> (Müll.).      |
| <i>Aeroloxus lacustris</i> (L.).     | <i>P. Henslowianum</i> (Shepp.).      |
| <i>Limnaea auricularia</i> (L.).     | <i>P. subtruncatum</i> , Malm.        |
| <i>L. pereger</i> (Müll.).           | <i>P. pulchellum</i> , Jenyns.        |
| <i>L. palustris</i> (Müll.).         | <i>P. pusillum</i> (Gmel.).           |
| <i>L. truncatula</i> (Müll.).        | <i>P. Gassiesianum</i> , Dupuy.       |

The *Pisidia*, however, are not fully worked out, so quite possibly the remaining three British species are also represented.

Several species found by Messrs. Kennard & Woodward did not occur in this section; the only two species additional to their list are *Helix hortensis* and *Vallonia costata*. Perhaps the most interesting find was the one example of *Amphipeplea glutinosa*. J. E. COOPER.

NOTE ON THE OCCURRENCE OF PEARLS IN *HALIOTIS GIGANTEA* AND *PECTEN* SP.—Mr. R. Gordon Smith, who has recently returned from a visit to Japan, has presented various interesting zoological collections to the British Museum, and among them are the pearls now exhibited.

It is a well-known fact that pearls are produced by both Gastropods and Bivalves, and that they occur more frequently in the latter. They have already been recorded from the genera *Strombus*, *Turbinella*, *Haliotis*, *Margaritifera*, *Placuna*, *Malleus*, *Mytilus*, *Modiola*, *Pinna*, *Anomia*, *Ostrea*, *Spondylus*, *Arca*, *Tridacna*, *Hippopus*, *Donax*, *Tellina*, *Unio*, and *Anodonta*, and there does not appear to be any special reason why other genera of Pelecypoda should not be pearl-producing if infested by the larvæ of Cestode and other worms. I now have to record the occurrence of pearls in *Haliotis gigantea* and a species of *Pecten*. Experiments with regard to the artificial production of pearls in *Haliotis* have been made by M. Louis Boutan, but their actual natural occurrence in that genus has, I believe, only once been noted hitherto.<sup>1</sup> Some of the *Haliotis* pearls brought home by Mr. Gordon Smith are of beautiful lustre and very large, measuring as much as 24 millimetres ( $1\frac{1}{2}$  inch) in length. They are often bean-shaped, and generally somewhat compressed. They are found in the *Haliotis gigantea* ('Awabi' of the Japanese), and

<sup>1</sup> J. Keep: Nautilus, 1890, vol. iv, p. 15.

frequently the most rugged and irregular specimens are the most productive. Doubtless some of these pearls, on account of their exceptional size and brilliance, must possess a very considerable commercial value. The *Pecten* pearls are semi-transparent white, covered to a great extent with a close opaque white mottling, and are of various shapes and sizes. These are probably not of so much money-value, as they do not exhibit the nacreous lustre of the orient pearl. A magnificent pearl in Mr. Gordon Smith's possession, which he informs me was found in a *Pinna*, is intensely black and almost perfectly spherical. It is very brilliant, unique in size, weighing 55 grains, and is valued at some hundreds of pounds by its possessor.

The *Mytilus* pearls from Japan are beautifully lustrous, more or less round, dark greenish grey or bluish black. We do not know the cause of these pearls in the *Haliotis*, the *Pecten*, or the *Mytilus* from Japan. The origin of them in the European mussel has been traced to the presence of the larval stages of Trematode worms,<sup>1</sup> and therefore it is highly probable that the Japanese pearls may have a similar origin. With regard to the *Haliotis* and *Pecten* pearls we should expect their occurrence to be due to the same or like causes.

Mr. Gordon Smith informs me that the *Haliotis* shells are dived for mostly by women, 18 Japanese fathoms of 5 feet being the limit of the depth attainable by them, though doubtless the shells occur at greater depths. The pearls are exceedingly rare.

E. A. SMITH.

THE NAME *Bourcieria*. (Read 14th June, 1907.)—Recently, working at some operculate land shells, my attention has been called to the genus *Bourcieria*, Pfr. It was proposed by him (Zeitschr. Malak., vol. viii, p. 178) in January, 1852, for *B. helicinaeformis*, Pfr.

Unfortunately Mons. Bourcier had already, in 1850, been honoured by the genus *Bourcieria*, by Bonaparte in Birds—Trochilidæ (see C.R. Ac. Paris, vol. xxx, p. 380).

Both names cannot stand in Zoology, and I propose to rename the Molluscan genus *Pseudhelicina*, taking as type the species proposed by Pfeiffer.

E. R. SYKES.

---

<sup>1</sup> See Jameson, Proc. Zool. Soc., 1902, vol. i, p. 140; also Herdman, "Pearl Production," Report Pearl Oyster Fisheries of the Gulf of Manaar, pt. v (1906).



NOTES ON *ACHATINA DENNISONI*, REEVE, AND *A. MAGNIFICA*,  
PFEIFFER.

By EDGAR A. SMITH, I.S.O.

Read 10th May, 1907.

A FINE series of specimens of *Achatina Dennisoni* have lately been submitted to me for identification. They were collected near Quilichao, Cauca Valley, Colombia, at 5,500 feet, by Messrs. Paine & Brinkley. It is a species figured and described by Reeve which has apparently been entirely overlooked by Professor Pilsbry, both in his monograph of Bulimulidæ and that of the Achatinidæ.

A small specimen of this species has been erroneously figured by Reeve as the *Achatina magnifica* of Pfeiffer.

A comparison of his description and figure of the latter with the type of that species in the Cuming Collection at once shows that the shell he had before him is distinct from that originally described by Pfeiffer. The latter is a thin, smooth shell, with very different coloration, and said to come from Ecuador. Reeve's shell, from the Dennison Collection, was described as rather rough, obscurely finely plicated, and, judging from the figure of it, was coloured like most of the specimens in the series before me. The yellow zones on the body-whorl, and the corresponding white bands within the aperture, are very characteristic.

The type of *A. Dennisoni*, although of full size, appears to have been rather immature, judging from the thinness of the outer lip, and although it lacks the characteristic black columellar callus, the pale zones within the aperture are indicated in the figure. The lip of Reeve's *A. magnifica* is described as "edged with vermilion." This also applies to all the shells just received. Some of them have the three yellow zones on the body-whorl, as depicted by Reeve (fig. 33), whereas others are of the uniform brownish tint shown in fig. 32, with just a trace of the "pale obscure band" at the periphery mentioned by Reeve as occurring in his species (*Dennisoni*).

Although the forms of the two shells, depicted by the figures referred to, are very different, the one being more elongate, with a more acuminate spire, I find in the series of specimens at hand quite as much variation.

The *Liguus* (*Hemibulimus*) *excisus*, Martens, from Popayan, Colombia, seems to me sufficiently distinct to constitute a well-marked variety, although considered by Pilsbry the same as Reeve's *A. magnifica*. It is a much smaller form and quite different in outline, and its apex is described as "minutim granulosus," whereas in the present species (*Dennisoni*) it is perfectly smooth and shining. Moreover, neither in the description nor figure is any trace indicated of the yellow zones upon the body-whorl or the pale ones within the aperture.

The synonymy of this species will stand thus:—

## LIGUUS (HEMIBULIMUS) DENNISONI (Reeve).

*Achatina Dennisoni*, Reeve: Conch. Icon., vol. v, pl. ix, fig. 32;  
Pfeiffer, Monog. Hel., vol. iii, p. 486.

*Orthalicus (Corona) Dennisoni*, Pfeiffer: Nomenclator Hel., Viv., p. 259.

*Achatina magnifica*, Reeve (*non* Pfr.): op. cit., pl. ix, fig. 33.

*Liguus (Hemibulimus) magnificus* (Reeve) (*non* Pfr.): Pilsbry, Man.  
Conch., ser. II, vol. xii, p. 185, pl. xxxvi*a*, fig. 30 (figs.  
31-34 = var. *excisus*, Martens).

Pilsbry's statement that his figure 30 "represents Pfeiffer's type" is incorrect, as that species was described from specimens in the Cuming Collection, now in the British Museum (see Pfeiffer, Proc. Zool. Soc., 1847, pp. 228, 232).

The synonymy of the true *Achatina magnifica* is as follows:—

## LIGUUS (HEMIBULIMUS) MAGNIFICUS (Pfr.).

*Achatina magnifica*, Pfeiffer: Proc. Zool. Soc., 1847, p. 232.

*Orthalicus (Corona) magnificus*, Pfeiffer: Nomenclator Hel., Viv.,  
p. 259 (excluding reference to Reeve's figure).



It is curious that Pfeiffer did not perceive that Reeve's *A. magnifica* was not the same species as that which he himself had originally described. He may have been misled by Reeve's statement that there was "also a specimen in the possession of Mr. Cuming." As the true *A. magnifica* has never been illustrated, I now give a figure of it.

REVIEW OF THE NEW ZEALAND ACMÆIDÆ, WITH DESCRIPTIONS  
OF NEW SPECIES AND SUBSPECIES.

By HENRY SUTER.

Read 10th May, 1907.

PLATE XXVII.

Genus ACMÆA, Eschscholtz.

Subg. *ACMÆA*, s.str.

Formula of teeth of radula, 2 (1 + 0 + 1) 2.

Type, *Acmaea mitra*, Esch.

1. *ACMÆA RUBIGINOSA* (Hutton). Pl. XXVII, Figs. 1-2.

*Fissurella rubiginosa*, Hutton: Cat. Mar. Moll. N. Zeal., 1873, p. 42.

*Patella rubiginosa*, Hutton: Journ. de Conch., vol. xxvi, 1878, p. 38;

Man. N. Zeal. Moll., 1880, p. 110.

*Acmaea rubiginosa*, Hutton: Proc. Linn. Soc. N.S. Wales, vol. ix,  
1884 (1885), p. 372.

*Glyphis rubiginosa*, Hutton: Pilsbry, Man. Conch. (1), vol. xii, p. 216.

*Acmaea lacunosa*, Reeve: v. Martens, Zool. Rec., vol. x, p. 150;

Pilsbry, Man. Conch. (1), vol. xiii, p. 53; Suter, Trans. N. Zeal.

Inst., vol. xxxiv, p. 218; Hutton, Index Faunæ Nov. Zeal.,  
p. 85; not of Reeve.

Shell oval, conoidal, white or light rufous, ribbed. The radiating ribs are very distinct, rounded, their number very variable; there are from 10 to 20 ribs extending from the apex to the margin, besides a number of shorter interstitial ribs, but the total number does generally not exceed 30. The encircling growth-lines are fine and close together. Colour rufous, with the ribs white; dead shells are pure white, the apex brown. The latter is usually situate at the anterior third, sometimes a little nearer the centre; it is small and has the aspect of a callosity filling up a fissureloid perforation. Inside porcellanous, white, with radiating pinkish rays, corresponding to the interspaces between the ribs. Central area more or less clouded with brown; margin slightly crenate.

Length 18, breadth 13, height 6 mm.

„ 13, „ 10, „ 3 „

The dentition is unknown, and I have never had an opportunity of obtaining an animal of this species. From the character of the shell it may be surmised to be the same as in *A. cingulata*.

Type in the Colonial Museum, Wellington.

*Hab.*—Hitherto only known from the Chatham Islands, but lately dredged in 10 fathoms by Capt. J. Bollons, near Taumaki Island, west coast of the South Island.

The number of ribs and the height of the shell are very variable. Most specimens have a thick covering of Nulliporites. The habitat of

*A. lacunosa*, Reeve, is unknown, and it is not identical with *rubiginosa*, *cingulata*, or *corticata* of Hutton, as Mr. E. A. Smith, of the British Museum, kindly informed me after sending him the above-named species for comparison.

Fossil in the Pliocene.

2. *ACMÆA CINGULATA*, Hutton. Pl. XXVII, Figs. 3-5.

*Acmaea cingulata*, Hutton: New Zeal. Journ. Sci., vol. i, 1883, p. 477; Trans. N. Zeal. Inst., vol. xvi, 1883 (1884), p. 215; Proc. Linn. Soc. N.S. Wales, vol. ix, 1884 (1885), p. 372; Pilsbry, Man. Conch. (1), vol. xiii, p. 53; Hutton, Index Faunæ Nov. Zeal., p. 85.

Shell oval, conoidal, moderately solid, white to yellowish brown, with numerous radiating ribs, which are low, rounded, and varying in number from 30 to 50; there are usually 10 to 15 primary ribs and numerous finer riblets in the interstices; a number of concentric ridges sometimes render the ribs slightly crenate. Colour mostly white, sometimes light brown, the ribs nearly white. Apex at the anterior fourth, oval in shape and convex, mostly dark brown; anterior slope nearly straight. Inside white, porcellanous, central area white, rarely with a small brown spot underneath the apex; margin indistinctly crenulate, with a narrow pinkish border.

Length 17, breadth 13, height 6 mm.

„ 16, „ 12, „ 5 „

The dentition was described and figured by Hutton (Trans. N. Zeal. Inst., vol. xvi, p. 215, pl. xi, fig. 5), and a copy of his figure is here reproduced. It is typical, resembling very much that of *A. mitra*, Esch., with short, stout, conical cutting-points.

Type in the Canterbury Museum, Christchurch.

*Hab.*—Dunedin and Lyttelton (Hutton); Lyall Bay (H. S.); East Cape lighthouse. On rocks between tide-marks, not common.

Distinguished from its nearest ally, *A. rubiginosa*, by the more anterior apex, the more numerous and lower ribs, the white interior, and the purplish or pinkish border. Always covered with a thick layer of Nulliporites.

3. *ACMÆA INTERMEDIA*, n.sp. Pl. XXVII, Figs. 6-8.

Shell oval to subcircular, conoidal, thin, light brown, finely ribbed. The fine, equidistant, and equal rounded riblets number from 25 to 50, interstitial riblets are mostly absent; a few concentric distinct growth-lines are commonly present. Colour light brown, the riblets white. Apex at about the anterior third, near the centre in subcircular examples; nucleus very small, oval, dark brown. Inside shining, with the spatula dark brown, the border much lighter in colour.

Length 7.5, breadth 6, height 2.25 mm. (type).

„ 11, „ 9, „ 4.5 „

„ 8, „ 6.5, „ 3 „

The dentition is unknown. None of the specimens contained the animal. Type in my collection.

*Hab.*—Near Bounty Islands, in 50 fathoms. I am indebted to Captain J. Bollons for the specimens.

This species has more equal, equidistant, and finer riblets than *A. rubiginosa* and *cingulata*; there is an almost constant absence of shorter interstitial riblets; no rays on the inside and no marginal border are present, and the sharply defined, uniformly dark-brown spatula is characteristic. It is probable that the shells were washed down from shallower water, as all of them were empty and more or less worn.

4. *ACMÆA ROSEORADIATA*, n.sp. Pl. XXVII, Figs. 9–10.

Shell very small, oval, conical, with broad pinkish radiate rays. The sculpture, which only a good lens will reveal, consists of twenty very indistinct low riblets on the lower half of the shell, each bordering one of the pinkish rays; upper half with about twice the number of microscopic, subobsolete, radiate striæ. The colour of the upper half is light pinkish-brown, of the lower part white, with 10 broad radiate pinkish rays, unequally distanced. Apex sharply pointed, very little in front of the centre. Inside having the central area pinkish, slightly lighter-coloured in the middle; border rayed with pink like the outside; margin sharp. Length 3·5, breadth 2·5, height 1·5 mm.

The dentition is unknown. Type in my collection.

*Hab.*—The type is from 18 fathoms, Port Pegasus, Stewart Island, dredged by Captain J. Bollons, to whose great kindness I owe my specimens; Dusky Sound, South Island, 30 fathoms (R. Henry); Taumaki Island, west coast of the South Island, 10 fathoms (Captain J. Bollons).

This pretty little shell is well characterized and quite distinct from all the other known New Zealand species of the genus.

The four species enumerated seem to form a natural group of the subgenus. The shells are nearly white, opaque, but little coloured. The dentition of *A. cingulata* is typical, and it may be assumed that it is very similar in the other species, *roseoradiata* perhaps excepted.

All the following species of the subgenus have, with a few exceptions, strongly coloured shells, which are sometimes pellucid, and the teeth have hamate cutting-points. There are only three species of which I was unable to examine the radula. These species conveniently form a second group. From the figures supplied it will be seen that for this group the character of the radula can hardly be used for separating the different species.

5. *ACMÆA FRAGILIS* (Chemnitz). Pl. XXVII, Fig. 11.

*Patella fragilis*, Chemnitz: Conch. Cab., vol. xi, 1790, fig. 1921.

*Patelloidea fragilis*, Quoy & Gaimard: Voy. Astrolabe, Zool., vol. iii, 1834, p. 351, pl. lxxi, figs. 28–30.

*Lottia fragilis*, Chemn.: Gray in Dieffenbach's N. Zeal., vol. ii, 1843, p. 240.

*Tectura fragilis*, Quoy: Hutton, Cat. Mar. Moll. N. Zeal., 1873, p. 43; von Martens, Crit. List, 1873, p. 35.

*Acmæa fragilis*, Chemn.: Hutton, Man. N. Zeal. Moll., 1880, p. 88; Proc. Linn. Soc. N.S. Wales, vol. ix, p. 374; Pilsbry, Man. Conch. (1), vol. xiii, p. 59, pl. xxxvii, figs. 14-15; Hutton, Index Faunæ Nov. Zeal., p. 85.

*Patella unguis-almæ*, Lesson: Voy. Coquille, Zool., vol. ii, 1830, p. 420.

*Patella Solandri*, Colenso: Tasm. Journ. Nat. Sci., vol. ii, 1844, pp. 226, 250; Trans. N. Zeal. Inst., vol. xiv, p. 168.

Shell ovate, flattened, membranaceous, pellucid, with concentric bands of brown and greenish-white, the whole surface being sculptured by exceedingly fine, close, subequidistant radiate striæ, cut up into minute oval nodules by incremental lines. Colour dark brown, lighter near the apex, banded with narrow white or light-green concentric lines. Apex anterior, submarginal, exactly in the middle line, sharply pointed and directed forward. Inside with an emerald ring around the muscle impression, margin sharp, with a brown border; spatula showing the concentric bands of the dorsal part of the shell, and having an elongated patch of light emerald in the centre.

Length 15, breadth 12, height 2 mm.

„ 17, „ 13, „ 2.25 mm.

Dentition (Fig. 11): The two central and the two anterior, inner lateral teeth are hamate, the outer posterior two laterals small and conical. A paper on the anatomy has been published by M. A. Willcox in Jenaer Zeitschr., vol. xxxii, 1898, pp. 411-456, pls. xvii-xix.

*Hab.*—Throughout New Zealand and at the Chatham Islands, under stones between tide-marks. It is local in its distribution and one of our most constant species.

6. *ACMÆA SEPTIFORMIS* (Quoy & Gaimard). Pl. XXVII, Figs. 12-14.

*Patelloidea septiformis*, Q. & G.: Voy. Astrolabe, Zool., vol. iii, 1834, p. 362, pl. lxxi, figs. 43-44.

*Acmæa septiformis*, Pilsbry: Man. Conch. (1), vol. xiii, p. 55, pl. xxxvii, figs. 93-94.

*Acmæa scabrilirata*, Angas: Proc. Zool. Soc., 1865, p. 154; Pilsbry, t.c., p. 56.

*Acmæa Petterdi*, Ten.-Woods: Proc. Roy. Soc. Tasm., 1876 (1877), p. 155; Pilsbry, t.c., p. 54.

Pritchard & Gatliff (Proc. Roy. Soc. Vic., vol. xv (N.S.), p. 195), following Tenison-Woods, take *A. cantharus*, Reeve, as a synonym of the species, but I cannot agree with them. Reeve's species I take to be precipitose to New Zealand.

Shell oval, conical to depressed, radiating riblets distinct or nearly obsolete, sometimes tessellated with green and white. The sculpture is very variable; typically the shell is delicately radiately striated, but then specimens occur which have acute, distant, and slightly granulose radiating riblets, whilst others show almost no trace of sculpture. The colour is brown, tessellated with green or white, but uniformly dark-brown examples are also met with. The apex is at about the anterior fourth, but very often submarginal or even marginal; it is pointed forward and obtuse. Inside blue or whitish, lineolate

with brown. In specimens from the Auckland Islands and Campbell Island the whole of the interior is bluish-black, a lighter band around the spatula; it is beautifully iridescent with dark blue, quite an exception in this family. Margin sharp, usually with a brown border, which is sometimes banded with yellow.

Length 14, breadth 12, height 6 mm.

„ 15, „ 11, „ 7 „ (Auckland Islands).

„ 16.5, „ 12.5, „ 4 „ (Chicken Island).

The dentition is very similar to that of *A. fragilis*. Figs. 12-14 show different aspects of the teeth of the radula.

*Hab.* — Chicken Island (C. Cooper); west coast of Manukan (C. Spencer); Dunedin; Auckland Islands (Captains Hutton and Bollons); Campbell Island (Captain Bollons). On rocks between tide-marks. Found also in Australia and Tasmania. The type is from King George's Port, W. Australia.

The variability of this species is very remarkable; the sculpture, the colour, and the shape of the shell differ to such an extent that it would be easy to make about half a dozen apparently well-characterized species. It is only by examining good series of specimens from different localities that the gradual transition of one form into another can be observed. I have also examined the dentition of several of the extreme forms, and found it always the same as in typical examples from New Zealand and Tasmania.

Type in Mus. Hist. Nat., Paris.

7. *ACMÆA PILEOPSIS* (Quoy & Gaimard). Pl. XXVI, Figs. 15-16.

*Patelloidea pileopsis*, Q. & G.: Voy. Astrolabe, Zool., vol. iii, 1834, p. 359, pl. lxxi, figs. 25-27.

*Lottia pileopsis*, Q.: Gray in Dieffenbach's N. Zeal., vol. ii, p. 240.

*Tectura pileopsis*, Q.: Hutton, Cat. Mar. Moll. N. Zeal., 1873, p. 43; v. Martens, Crit. List, 1873, p. 35; Hutton, Journ. de Conch., vol. xxvi, p. 36.

*Acmæa pileopsis*, Hutton: Man. N. Zeal. Moll., 1880, p. 88; Proc. Linn. Soc. N.S. Wales, vol. ix, p. 373; Pilsbry, Man. Conch. (1), vol. xiii, p. 57, pl. xxxvii, figs. 90-92; Hutton, Index Faunæ Nov. Zeal., p. 85.

*Patelloides antarctica*, Hombron & Jacquinot: Ann. Sci. Nat., ser. II, vol. xvi, 1841, p. 190; Pilsbry, t.c., p. 157.

*Patella floccata*, Reeve: Conch. Icon., 1855, fig. 106; Pilsbry, t.c., pl. lxix, figs. 38-39; E. A. Smith, Proc. Malac. Soc., vol. i, p. 59; H. Suter, l.c., vol. vi, p. 354.

Shell comparatively large, ovate-convex, radiately striated, blackish, and dotted with whitish. The sculpture consists of very numerous fine, thread-like, radiate striæ, crenulated by concentric growth-lines. Adult shells may show only the incremental lines, the radiate ornamentation having been worn off. Colour greenish-brown, dotted and netted with white or light green. Specimens from the subantarctic islands are often uniformly brown. Apex anterior, extending as far as the margin, but occasionally situated as far back as the anterior

fourth of the length, slightly hooked; anterior slope concave, seldom straight. Inside white or bluish-white, the spatula chestnut brown; a dark-brown band inside the margin, very often banded with yellowish-brown; margin sharp.

Length	20·25,	breadth	15·75,	height	9 mm.	Type.
"	28,	"	24,	"	10 "	Manukan Coast.
"	30,	"	23,	"	11 "	Auckland Islands.

Dentition: Hutton, Trans. N. Zeal. Inst., vol. xv, p. 127, pl. xv, fig. M. The accompanying Figures 15 and 16 are copied from Hutton.

*Hab.*—Both main islands of New Zealand; Bay of Islands (Q. & G.); west coast of Manukan (C. Spencer); Kawhia (R. Murdoch); French Pass (Q. & G., type); Lyttelton (H. S.); also Snarcs Islands (Captain Bollons); Auckland Islands (A. Hamilton); Campbell Island (Captain Bollons).

All the specimens I have found were fixed to rocks in excavations considerably above high-water mark, and protected against rain. There is considerable variation in the form of the shells, some being elongate-oval, others much more rounded; again, they may be high or much depressed. The situation of the apex is also variable, but in the majority of shells it is marginal. The whitish dots are often small and numerous, or larger, elongate or triangular, and fewer in number; they may be present only toward the margin or altogether absent. Type in Mus. Nat. Hist., Paris.

#### 8. *ACMÆA CANTHARUS* (Reeve). Pl. XXVII, Figs. 17–18.

*Patella cantharus*, Reeve: Conch. Icon., Patella, 1855, fig. 131.

*Nacella cantharus*, Reeve: Hutton, Cat. Mar. Moll. N. Zeal., 1873, p. 46.

*Tectura cantharus*, Reeve: v. Martens, Crit. List, 1873, p. 35; Hutton, Journ. de Conch., vol. xxvi, p. 36.

*Acmea cantharus*, Reeve: Hutton, Man. N. Zeal. Moll., 1880, p. 88;

Pilsbry, Man. Conch. (1), vol. xiii, p. 55, pl. xxxvii, figs. 1–2;

Hutton, Index Faunæ Nov. Zeal., p. 85.

Shell small, ovate, thin; apex anterior, blotched with white. The sculpture consists of fine microscopic radiate striæ; one of my specimens shows a few well-marked distant riblets on the posterior side, but this is an exception; concentric growth-lines are fairly conspicuous. Colour black or brown, blotched and tessellated with white. Apex very anterior, sharp and hooked; anterior slope concave. Inside light blue, occasionally light brown, spatula chestnut brown; the sharp margin having a rather broad brown border, often banded or dotted with yellowish-brown. Length 17, breadth 13·5, height 4·5 mm.

Dentition: The Figures 17–18 show two aspects of one row of teeth.

*Hab.*—The type was collected in New Zealand by Earl, no exact locality given. The species is represented in my collection from the following localities: Oamaru; St. Clair, near Dunedin (H. S.); Grey-mouth; Preservation Inlet; all South Island; Macquarie Island (A. Hamilton).



At first sight this species would seem to be a young *A. pileopsis*, but there are some points which separate the two. First of all *A. cantharus* never attains a larger size than that indicated above; the radial sculpture is visible only under a good lens—that is why Reeve called it smooth, and which it really is to the naked eye. If exceptionally a few ribs are present they are much farther apart than those of *A. pileopsis*. The apex is much sharper and more hooked, also much more constant in its anterior position. The inside between marginal band and spatula is really light blue, not whitish or bluish-white as in *A. pileopsis*. It lives like most other species on rocks between tide-marks, and I have never seen it high up where only the spray of the sea could reach it. Type in the British Museum.

9. *ACMÆA CAMPBELLI* (Filhol). Pl. XXVII, Figs. 19–21.

*Patella Campbelli*, Filhol: Comptes Rendus, vol. xci, 1880, p. 1095; Mission de l'île Campbell, 1885, p. 530; Hutton, Proc. Linn. Soc. N.S. Wales, vol. ix, 1884, p. 373.

Shell small, roundish-oval, conical, subpellucid, finely ribbed, pink. The radiate riblets are very numerous and close together, about 40 reach from apex to margin, and about 20 are interstitial riblets; they are broadly convex and crossed by numerous very fine concentric growth-lines. The colour is uniformly pink. Apex small, rounded, situated at about the anterior third of the length; anterior slope straight, posterior slope very little convex. Inside pinkish-white, with white radiating rays corresponding to the riblets; spatula pink, margin crenulate, with a narrow pink border.

Length 5, breadth 5, height 3 mm. Type.

„ 5.75, „ 4.75, „ 3 „ Auckland Islands.

The dentition is shown in Fig. 21; it does not differ much from that of the other species of this group.

*Hab.*—The type was collected by the late Professor Filhol at the entrance to the north-east bay of Campbell Island. My specimen is from the Auckland Islands, and was collected by Captain J. Bollons.

This shell, quite insufficiently described by Filhol and never figured, has been more or less of a puzzle to New Zealand conchologists for a considerable time, and I am most grateful to Captain Bollons for having brought a specimen with the animal. The species seems to be rare or easily overlooked, as I have never seen it before amongst material collected at the subantarctic islands of New Zealand. Type in Mus. Hist. Nat., Paris.

10. *ACMÆA PARVICONOIDEA*, n.n. Pl. XXVII, Figs. 22–25.

*Acmaea conoidea*, Q. & G.: Hutton, Trans. N. Zeal. Inst., vol. xv, 1882 (1883), p. 132; Proc. Linn. Soc. N.S. Wales, vol. ix, p. 373; Index Faunæ Nov. Zeal., p. 85, not of Quoy & Gaimard.

Shell small, thin, highly conical to depressed, conoidal, oval, with very fine radiate striae and irregular brown bands. Good specimens show indistinct and very low radiate riblets, corresponding to the brown lines, and under a strong lens fine and close radiate threads can

be distinguished, crossed by still finer concentric growth-lines; in most examples this sculpture is, however, lost, the shells being more or less eroded. The colour of the type is light brown, with a few dark concentric bands and spots around the margin; the common conoidal form is dirty white, with radiate brown or black lines which reach up to the apex, or, more commonly extend only over the lower half of the shell, the upper half being tessellated with black and white. Apex at about the anterior third, directed forward and sharply pointed, but very often rounded off by erosion; the slopes are broadly convex posteriorly, straight or distinctly concave anteriorly. Interior light brown to white; spatula dark brown, with patches of a lighter colour, sometimes quite white; margin sharp, with brown dots and lines.

Length 4·5, breadth 4, height 3·5 mm. Type.

„ 9, „ 7, „ 4 „ The common form.

Dentition: Hutton, Trans. N. Zeal. Inst., vol. xv, p. 127, pl. xv, fig. K. The Figs. 24–25 are a copy. The cutting-points are shorter than usual in this group, but they were longer in several examples I examined.

*Hab.*—The type is from Sumner, near Christchurch, where it may be found living on rocks between clusters of *Modiolus ater*. In my collection the species is represented from the following localities: South Island: Sumner, Heathcote Estuary, Lyttelton, Oamaru, Greymouth. Taumaki Island, 10 fathoms. North Island: Cook Strait, Evans Bay, Port Nicholson, East Cape lighthouse, Auckland Harbour, west coast between Manukan and Kaipara. Also Chatham Islands.

The specimens selected as the type by the late Captain Hutton represent really an extreme form of the species, the high conical and rounded form being no doubt due to environment; it has a striking likeness with the figures given by Quoy & Gaimard, but when specimens are compared there is no more doubt that the New Zealand form is quite distinct from the much larger, more solid, and somewhat differently coloured Australian species.

I have specimens from Tasmania which correspond exactly with *A. parviconoidea*. The variability of this species in shape and colouring is considerable. Type in the Canterbury Museum, Christchurch.

*ACMÆA PARVICONOIDEA*, Suter, var. *LEUCOMA*, n.var.

Shell small, thin, opaque, ovate, depressed, conoidal; sculpture, if any, lost by erosion; colour white, apex obtuse, at about the anterior fourth to fifth. Inside white, spatula greenish-white, margin sharp, with a few small brown dots. Length 7, breadth 5·5, height 2·5 mm.

Dentition unknown. Type in my collection.

*Hab.*—Heathcote Estuary, near Christchurch (H. S.).

*ACMÆA PARVICONOIDEA*, Suter, var. *NIGROSTELLA*, n.var. Pl. XXVII, Figs. 26–29.

The young shell (Fig. 26) reveals under a good lens distant, low, radiate riblets and fine concentric growth-lines. The colour is white, the centre being occupied by a purplish-black, four to nine rayed star;

there are sometimes two short posterior marginal rays; round the apex a few concentric rows of small, oval, vivid blue spots. Inside white, spatula purplish-black, sending off four to nine rays towards the margin. The adult shell has lost all its sculpture; the colour-markings on a whitish ground consist of two lateral and two posterior black rays, descending from the apex and extending only over a short distance; the margin is adorned with numerous short, black lines. Inside yellowish-white, the central area occupied by the now distorted star of purplish-black; margin sharp, with a broad border, rayed with black.

Length 10, breadth 7, height 5 mm. Adult specimen.

„ 4, „ 3, „ 1.5 „ Young specimen.

Dentition unknown. Type in my collection.

*Hab.*—Titahi Bay, Cook Strait. Type (Miss M. Mestayer): Taumaki Island, in 10 fathoms (Captain Bollons).

Sand collected by Miss M. Mestayer at Titahi Bay contained a number of young specimens of what I first took to be a new species. However, I found one example of an adult shell which unmistakably showed, though distorted, the central black star, but otherwise it cannot be separated from *A. parviconoidea*. The fact that the very same young shells were dredged by Captain J. Bollons in 10 fathoms goes to show that these small forms live in the laminarian zone, where they most likely never attain a much larger size than that indicated; but specimens reaching the littoral zone will no doubt grow to the full size of the species with its most constant characters. It was most fortunate that I got this adult shell, otherwise I should not have hesitated to describe the young shell as a new species.

11. *ACMÆA DÆDALA*, n.n. Pl. XXVII, Figs. 30–32.

*Acmaea flammea*, Q. & G.: Hutton, Trans. N. Zeal. Inst., vol. xv, 1882 (1883), p. 132; Proc. Linn. Soc. N.S. Wales, vol. ix, p. 373; Index Faunæ Nov. Zeal., p. 85; not of Quoy & Gaimard.

Shell small, oval, depressed, pellucid, radially netted with brown, apex anterior. The sculpture consists of numerous microscopic radiate striæ, crenulated by fine incremental lines. Colour light yellow; numerous light-brown radiate lines give, by anastomosing the whole surface, a net-like appearance. Apex anterior, at about the anterior eighth, slightly pointed; anterior slope concave. Interior bluish-yellow, showing the ornamentation of the outside; spatula indistinctly marked; margin sharp. Length 7, breadth 5.5, height 2 mm. Type.

Dentition: Hutton, Trans. N. Zeal. Inst., vol. xv, p. 128, pl. xv, fig. N. The Fig. 32 is copied after Hutton.

*Hab.*—The type is from Auckland Harbour. My collection supplies the following localities:—North Island: Auckland Harbour, Rakino Island, Cook Strait, Wellington Harbour. South Island: Sumner, Lyttelton, Greymouth. According to Hutton it is found as far south as Dunedin.

In this instance, again, the late Captain Hutton cannot have seen specimens of *A. flammea*, Q. & G., or he would never have assigned our small, fragile, and pellucid shell to that species, which is much larger and solid. This is one of our fairly constant species. Fossil in the Pliocene. Type in the Canterbury Museum, Christchurch.

*ACMÆA DÆDALA*, Suter, subsp. *SUBTILIS*, n. subsp. Pl. XXVII,  
Fig. 33.

This subspecies has the same microscopic sculpture as the species, but it is more transparent, more fragile, smaller, whitish, ornamented with fine, radiate, and narrow brown lines. Interior whitish, showing all the brown lines; spatula slightly greenish, polished, but indistinctly circumscribed.

Length 2.5, breadth 1.5, height 0.05 mm. Type.  
" 6.5, " 4.5, " 1.75 " Taumaki specimen.

Dentition unknown. Type in my collection.

*Hab.*—Between Little Barrier Island and Tiri-Tiri Island in 20 fathoms, type (R. H. Shakespear); Taumaki Island, in 10 fathoms (Captain Bollons).

12. *ACMÆA HELMSI*, E. A. Smith.

*Acmæa Helmsi*, E. A. Smith: Proc. Malac. Soc., vol. i, 1894, p. 58, pl. vii, figs. 4-5; Hutton, Index Faunæ Nov. Zeal., p. 85.

Shell small, depressed, cap-shaped, almost smooth, bluish-grey, ornamented with numerous radiating, reddish-black narrow lines; apex subterminal, anterior slope slightly concave, posterior slope convex, arcuate. Interior greenish, central area white, with a few rufous spots, margin but faintly crenulate; border narrow, yellow, marked all round with reddish-black rays (E. A. Smith). Length 11.5, breadth 9, height 4 mm.

Dentition unknown. Type in the British Museum.

*Hab.*—Greymouth, type (R. Helms); Cape Egmont (R. Murdoch).

13. *ACMÆA SCAPHA*, n. sp. Pl. XXVII, Figs. 34-35.

Shell very small, long and narrow, laterally compressed, sides parallel. Nearly the whole surface of my specimens is eroded, but near the margin traces of radiate fine riblets can be seen. Colour light brown, with a few concentric bands of darker. Apex situated at about the anterior fourth, rounded; side-slopes steep and straight, anterior slope straight, posterior slope convex. Inside with the spatula dark brown, lighter under the apex, a narrow brown border on the margin, space between this and the spatula covered by a whitish callus. Length 4, breadth 1.75, height 1.5 mm.

Dentition unknown. Type in my collection.

*Hab.*—Dunedin (A. Hamilton).

This curiously shaped species resembles somewhat the Californian species *A. paleacea*, Gould, and *A. depicta*, Hinds. Whether in this case the narrow elongated form is an adaptation to an existence on fronds of seaweeds I am unable to say, but it seems very likely.

Subgenus *COLLISELLINA*, Dall, 1871.

Formula of teeth of radula, 2 . 2 (1 + 0 + 1) 2 . 2. Type, *A. saccharina*, L.

14. *ACMÆA STELLA* (Lesson). Pl. XXVII, Figs. 36-37.

*Patella stella*, Lesson: Voy. Coquille, Zool., vol. ii, 1830, p. 421; Hutton, Man. N. Zeal. Moll., 1880, p. 110.

Shell solid, depressed, irregularly oval, strongly ribbed, whitish, margin lacinate. The sculpture consists of 7 radiating angular ribs, rounded above, thick, separated by wide depressions, three in front, four behind the apex; in the interspaces between these main ribs there are one or two smaller ribs; all of these ribs strongly and irregularly denticulate the margin. Strong concentric ridges are mostly present. Colour dirty white or greenish, with black in double interrupted circles. Apex situate at the anterior third. Inside bluish-white, spatula light brown or blue, dotted with brown; the margin with a few dark-brown spots or a continuous brown border, tips of rays white.

Length 21, breadth 19, height 6.25 mm. Type.

„ 21, „ 18, „ 5 „ Specimen figured.

Dentition: Fig. 37 shows the central and lateral teeth typical, and two marginals on each side in addition.

*Hab.*—Heads of Wellington Harbour and Island Bay, Cook Strait (Miss M. Mestayer); Taumaki Island, west coast of South Island, in 10 fathoms (Captain Bollons).

This species is very closely allied to *A. alticostata*, Angas, from Australia and Tasmania.

ACMÆA STELLA (Less.), subsp. CORTICATA, Hutton. Pl. XXVII,  
Figs. 38-41.

*Acmæa corticata*, Hutton: Man. N. Zeal. Moll., 1880, p. 89; Proc. Linn. Soc. N.S. Wales, vol. ix, p. 372.

*A. lacunosa*, Reeve: Hutton, Trans. N. Zeal. Inst., vol. xvi, p. 215; Pilsbry, Man. Conch. (1), vol. xiii, p. 52, pl. xxxvii, figs. 7-11, not of Reeve.

Shell oval, conoidal, ribbed. There are 14 to 22 rounded, roughened, radiate ribs, a few of them short, crossed by incremental ridges. Colour white, nearly always obscured by a layer of Nulliporites. Apex a little in front of the middle, obtuse; slopes straight; margin denticulate. Inside bluish-white, spatula white or brown, sometimes faintly radiately streaked with black; margin with a black border or dark-brown spots.

Length 14, breadth 13, height 9 mm. Type.

„ 13, „ 9.5, „ 5 „ Specimen figured.

Dentition: Hutton, Trans. N. Zeal. Inst., vol. xv, p. 127, pl. xv, fig. L. A copy of Hutton's figure is here reproduced (Fig. 41). Type in the Canterbury Museum, Christchurch.

*Hab.*—The type is from Dunedin; North and South Islands and at the Chatham Islands.

This subspecies is distinguished from the species by the usually smaller size and the disappearance of the seven primary stronger ribs. The margin is not lacinate, and the ribs are more numerous and equal.

#### 15. ACMÆA OCTORADIATA (Hutton).

*Patella octoradiata*, Hutton: Cat. Mar. Moll. N. Zeal., 1873, p. 44.

*P. stellaris*, Q. & G.: Hutton, Journ. de Conch., vol. xxvi, p. 37, non Quoy & Gaimard.

*Acmæa saccharina*, L., var. *perplexa*, Pilsbry: Man. Conch. (1), vol. xiii, p. 50, pl. xxxvi, figs. 69-71.

*Acmæa octoradiata*, Hutt.: Hedley, Proc. Linn. Soc. N.S. Wales, 1904, p. 188; Hutton, Index Faunæ Nov. Zeal., p. 1904.

Shell depressed, star-shaped, whitish. There are 5 large rounded ribs behind and 3 in front of the apex, reaching far beyond the margin; they and their interspaces are all ornamented with fine radiate riblets. Colour white or creamy, with fine radiating reddish-brown lines. Apex at about the anterior third, obtuse. Interior white, with a few flesh-coloured spots; border very narrow, dotted with rufous; spatula indistinct. Length 16, breadth 14, height 3 mm.

Dentition unknown. Type in the Colonial Museum, Wellington.

*Hab.*—West coast of the South Island (type); Bluff (A. Hamilton); Chatham Islands.

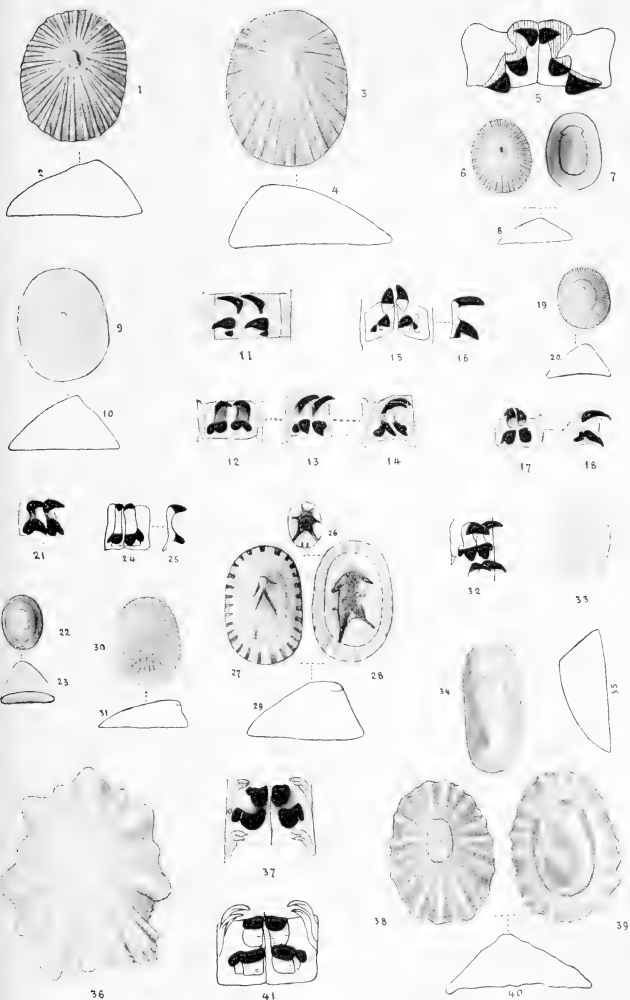
Although the dentition is unknown, there can be no doubt that this species belongs to the subgenus *Collisellina*. At the instigation of Mr. Hedley the late Captain Hutton expressed the opinion that his *P. octoradiata* and Pilsbry's var. *perplexa* are identical.

*Acmæa Chathamensis*, Pilsbry: Man. Conch. (1), vol. xiii, 1891, p. 56, pl. xxxv, figs. 43-46.

A specimen in my collection fully agrees with the diagnosis and the figures given by Pilsbry, except the apex being more anterior, the interior distinctly iridescent, with a silvery lustre, and the spatula cream-colour. The dimensions are almost exactly those given by Pilsbry for the larger specimen. I have not the least hesitation in assigning this species to *Helcioniscus radians*, Gmel., subsp. *affinis*, Reeve, of which it represents an extreme form. (The dimensions given for *Helc. affinis* in these Proceedings, vol. vi, p. 349, should read: 33 × 27 × 7 mm.)

#### EXPLANATION OF PLATE XXVII.

FIGS.	1-2.	<i>Acmæa rubiginosa</i> (Hutt.).	
"	3-4.	" <i>cingulata</i> , Hutt.	
FIG.	5.	" "	teeth of radula, magnified. After Hutton.
FIGS.	6-8.	" <i>intermedia</i> , Sut.	
"	9-10.	" <i>roseoradiata</i> , Sut.	
FIG.	11.	" <i>fragilis</i> (Chemn.),	teeth of radula, magnified.
FIGS.	12-14.	" <i>septiformis</i> (Q. & G.),	" "
"	15-16.	" <i>pileopsis</i> (Q. & G.),	" " After Hutton.
"	17-18.	" <i>cantharus</i> (Reeve),	" "
"	19-20.	" <i>Campbelli</i> (Filhol).	
FIG.	21.	" "	teeth of radula, magnified.
FIGS.	22-23.	" <i>parviconoidea</i> , Sut.	Type.
"	24-25.	" "	teeth of radula, magnified. After Hutton.
"	26-29.	" "	v. <i>nigrostella</i> , Sut.
"	30-31.	" <i>dædala</i> , Sut.	Type.
FIG.	32.	" "	teeth of radula, magnified. After Hutton.
"	33.	" "	subsp. <i>subtilis</i> , Sut.
FIGS.	34-35.	" <i>scapha</i> , Sut.	
FIG.	36.	" <i>stella</i> (Less.).	
"	37.	" "	teeth of radula, magnified.
FIGS.	38-40.	" "	subsp. <i>corticata</i> , Hutton.
FIG.	41.	" "	teeth of radula, magnified. After Hutton.



H. Suter del.





## NUDIBRANCHS FROM NEW ZEALAND AND THE FALKLAND ISLANDS.

By Sir C. N. E. ELIOT, K.C.M.G.

Read 14th June, 1907.

## PLATE XXVIII.

THESE notes on New Zealand nudibranchs are based partly on material kindly sent to me by Mr. Henry Suter and Mr. Charles Cooper, and partly on P. Abraham's type-specimens preserved in the British Museum and most courteously placed at my disposal by Mr. E. A. Smith. Abraham described very imperfectly a number of old specimens. In some cases they are so decayed and the descriptions so deficient in definitely formulated characters that his names can be set aside. In other cases such as *Doris muscula*, *D. lanuginata*, etc., the characters of the labelled specimens, if not those given in the descriptions, are sufficiently clear and the names must be respected.

In the nudibranch fauna of both New Zealand and the Falkland Islands one is struck by the fact that similar or identical forms occur in the Pacific as well as in the Atlantic on both sides of the equator outside the tropics, although they are absent or scarce within the tropics. Thus *Acanthodoris pilosa* is recorded from the North Atlantic, the North Pacific, and New Zealand, and *Æolidia papillosa* (or *Æ. serotina*, a very similar form) from the North Atlantic, North Pacific, and Falkland Islands. But I think that in cases where the identity is not absolute, it is better to create or recognize separate species. Considering how greatly preserved nudibranchs change their colour and shape, a considerable assumption is always involved in identifying an alcoholic specimen from the southern hemisphere with a species from the Northern Atlantic, and, if any points of difference are found, it seems to me safer to emphasize them, though they may be minute. Identifications of northern and southern species are generally accepted without criticism and made the basis of important theories. The creation of a new species challenges re-examination and really contains less of the speculative element.

Nevertheless, there can be no doubt that these southern seas contain a considerable number of forms which are either specifically identical with northern forms, or so closely allied to them, that they must be supposed to be sprung from the same immediate ancestors. The same is true of Antarctic Pteropods (see my report on the collection made by the 'Discovery'), but the coincidence is less noticeable in the case of Antarctic nudibranchs, which offer many new types that have not yet been found elsewhere.<sup>1</sup> For drawing any general conclusions the nudibranchs of New Zealand should probably not be regarded as

<sup>1</sup> *Archidoris tuberculata* is recorded from 65° 5' S. (Vayssière), and perhaps *Doto antarctica*, Eliot, is *Doto fragilis* (Forbes).

representing a separate province, but be taken in conjunction with the nudibranchs of South Australia and Tasmania. This fauna seems to show much the same characters as the New Zealand fauna.

In classification I follow the arrangement of Bergh, but this system was based chiefly on an examination of forms from the Northern Atlantic and Pacific, the Mediterranean, and Indo-Pacific, hardly any specimens from the Southern Atlantic or Southern Pacific being available. But recent investigations (particularly Bergh's account of the Opisthobranchiata of South Africa in the Transactions of the South African Philosophical Society, vol. xvii, 1907) show that these southern forms necessitate both additions and rearrangement. As explained elsewhere,<sup>1</sup> I think wider generic definitions advisable and in particular I should wish both for convenience and correctness of nomenclature to revive the old name *Doris* and to recognize *Staurodoris*, *Archidoris*, *Anisodoris*, and *Homoiodoris* as subgenera of it. To these subgenera I add in this paper a new one, *Ctenodoris*, proposed for *Doris flabellifera*, Cheeseman, and *Staurodoris pecten*, Eliot, both characterized by a peculiar arrangement of the branchiæ.

The following is a list of New Zealand nudibranchs. It makes no pretension to bibliographical completeness and merely endeavours to give the names of such forms as are known with sufficient certainty to warrant conclusions being drawn as to their distribution. The forms marked with \* are described below:—

NAME.	DISTRIBUTION.
1. * <i>Stiliger felinus</i> , Hutton ... ..	An allied form, <i>St. bellulus</i> (= <i>St. Mariæ</i> ), is found in the N. Atlantic.
2. <i>Hervia</i> (?) <i>Corfei</i> , Hutton... ..	Genus recorded from N. Atlantic, Mediterranean, Ceylon, Amboina, E. Africa.
3. * <i>Facelina</i> sp. ... ..	Genus recorded from Atlantic, Mediterranean, E. Africa, and California.
4. * <i>Antiopella</i> (= <i>Janus</i> ) <i>Novozelandica</i> , n.sp.	Genus recorded with certainty only from N. Atlantic. <i>Janus sanguineus</i> of Angas is uncertain. The allied <i>Janolus</i> is recorded from California and the Arafura Sea.
5. * <i>Alloiodoris lanuginata</i> (Abr.) ... ..	Allied and possibly identical species from Tasmania and S. Australia.
6. * <i>Archidoris Wellingtonensis</i> (Abr.) ... ..	Species not recorded from elsewhere. Genus probably cosmopolitan, but most abundant in temperate seas.
7. <i>Archidoris violacea</i> , Bergh ... ..	} Perhaps identical with E. African forms.
8. <i>Archidoris nanula</i> , Bergh ... ..	
9. * <i>Ctenodoris flabellifera</i> (Cheesem.) ... ..	Genus recorded from the Maldivé Islands.
10. <i>Homoiodoris</i> (?) <i>Novozelandiæ</i> , Bergh ... ..	Genus recorded from Japan.
11. <i>Atagema carinata</i> (Q. & G.) ... ..	Not recorded from elsewhere.
12. * <i>Rostanga muscula</i> (Abr.) ... ..	} Genus recorded from N. Atlantic, Mediterranean, and California.
13. <i>Rostanga rubicunda</i> (Cheesem.) ... ..	

<sup>1</sup> Notes on some British Nudibranchs in Journal of Marine Biological Association for June, 1906, p. 336.

NAME.	DISTRIBUTION.
14. * <i>Gargamella Novozealandica</i> , n.sp. ...	Genus recorded from S.W. Atlantic.
15. * <i>Aphelodoris Cheesemani</i> , n.n. (= <i>D. luctuosa</i> , Cheesem.) ...	Genus recorded from W. Indies and Tasmania.
16. <i>Aphelodoris</i> (?) <i>purpurea</i> , Bergh ...	
17. * <i>Aphelodoris affinis</i> , n.sp. ...	
18. * <i>Chromodoris amana</i> , Cheesem. = <i>Chr. figurata</i> , Bergh ...	The genus is specially characteristic of the tropical Pacific, but extends to Puget Sound and Japan. It also occurs in the tropical Atlantic, in the Mediterranean and S. African waters.
19. * <i>Chromodoris aureo-marginata</i> , Cheesem. ...	Perhaps identical with a Polynesian form.
20. <i>Chromodoris atopa</i> , Bergh ...	
21. * <i>Doridopsis mammosa</i> , Abr. ...	The genus has much the same distribution as <i>Chromodoris</i> .
22. * <i>Doridopsis citrina</i> , Cheesem. ...	Closely allied to <i>D. fulva</i> from California and perhaps identical.
23. <i>Goniodoris castanea</i> , A. & H. ...	The same species is recorded from the N. Atlantic and Mediterranean. The genus is also represented in the Indian Ocean.
24. * <i>Goniodoris punctata</i> , Bergh ...	
25. <i>Euplocamus pacificus</i> , Bergh ...	The genus is also recorded from the N. and S. Atlantic, the Mediterranean, and Japan.
26. <i>Acanthodoris pilosa</i> , var. <i>pallida</i> , Bergh ...	The species is recorded from the N. Atlantic and N. Pacific. The genus is characteristic of the colder seas, and is not recorded from the tropics.
27. * <i>Acanthodoris mollicella</i> , Abr. ? = <i>Ac. pilosa</i> , var. <i>Novozealandica</i> , Bergh ...	
28. * <i>Acanthodoris globosa</i> , Abr. ...	Nearly allied to <i>A. metulifera</i> from Tasmania or identical.
29. <i>Tritonia incerta</i> , Bergh ...	Genus probably cosmopolitan, but specially frequent in colder seas.

It would appear from the above list that the nudibranch fauna of New Zealand contains at least three elements. (1) A tropical element, represented by such genera as *Chromodoris* and *Doridopsis*, which are particularly abundant in the Equatorial Indo-Pacific. (2) Forms which are characteristic of the colder seas. In some cases, such as *Archidoris*, these genera appear to be cosmopolitan, though they are more noticeable in colder waters; in others, such as *Acanthodoris*, they are not recorded at all from the tropics, but are abundant in temperate climates both to the north and south. The close agreement in species is very remarkable. *Goniodoris castanea* is found in the North Atlantic, Mediterranean, and New Zealand seas. The distribution of *Acanthodoris pilosa* has already been mentioned. In a list of New Zealand Nudibranchs kindly sent me by Mr. Suter is *Archidoris tuberculata*. I have not seen myself specimens of this form from the Southern seas, but Vayssière (Expéd. Antarct. Française, Moll. Nudib., 1906, p. 4), records it from Wandel Island. It is found in the North Atlantic, Mediterranean, and N. Pacific. It is noticeable that forms

which are either identical or very closely allied occur on the coasts of California and New Zealand, e.g., *Doridopsis citrina* and *D. fulva*, *Rostanga muscula* and *R. pulchra*. (3) There is a small element which appears to be peculiar to New Zealand and the adjacent waters of Australia, as far as our present records go. It is represented chiefly by the remarkable genus *Alloiodoris*. *Atagema* also is not recorded from elsewhere, but has less decided characters. On the other hand, none of the remarkable Antarctic forms which have been recently described, such as *Bathydoris*, *Charcotia*, *Notæolidia*, *Tritoniella*, and *Tritoniopsis*, have yet been recorded from New Zealand.

I have added to this paper a description of a fine species of *Archidoris* from Australia which seems new.

#### STILIGER FELINUS (Hutton).

*Calliopæa felina*, Hutton : Trans. New Zeal. Inst., vol. xv, p. 133, 1882.

Eight specimens from Te Onepoto, South Island. They vary greatly in colour, ranging from uniform dirty white to almost unbroken dark brown of various shades. The foot, anal papilla, and at least in part the rhinophores are white in all specimens. In a dark specimen, which appears to have preserved the natural coloration, the dorsal surface and the inner side of the larger anterior cerata are of a deep, rich, purplish brown, almost black. The outer sides of the larger cerata, the whole of the posterior cerata, and the sides of the body are lighter brown. At the tip of each of the cerata is a lighter but not very conspicuous spot. Conspicuous, however, and bright white are the anal papilla and the tips and under-sides of the rhinophores. From each rhinophore a band runs downwards; the two bands meet and form a white border across the head. In the lighter specimens, either from alcohol or from natural variation, the cerata and sides of the body have become much lighter, while the back retains more or less dark pigment. Two specimens are quite white.

The largest specimens are about a centimetre long, 4.5 mm. broad, and 3.3 mm. high. The largest cerata are about 3.5 high, with a maximum breadth of nearly 2.5. They are set in from 6 to 10 transverse rows, consisting of from 2 to 3 cerata each, but the third longitudinal line of cerata is not perfectly developed in any specimen. The inner cerata are considerably larger than the outer, and in some specimens one or two of them are markedly larger than the others. In most specimens there is visible a large bare area down the centre of the back. The pericardium is large and prominent. From it there runs in all specimens a conspicuous, long bladder-like prolongation or ridge, extending to nearly the end of the body. The rhinophores are distinct, but not large; entire, not perfoliated or grooved. The white band which runs from them to the mouth appears in some specimens to be a ridge. They point outwards, right and left, and do not stand vertically. The anal papilla is dorsal, behind the pericardial prominence, and slightly to the left of it. The genital opening is just behind the rhinophores. The foot is fairly broad, white, truncated in front, not grooved or notched, and not produced into tentacular

processes at the corners. Its margins are not expanded at the sides, and it is prolonged into a short flat tail behind the body.

The integuments are very thin, and allow the follicles of the hermaphrodite gland to be seen through the foot, sides, and back. These follicles are white and fill up almost the whole of the internal cavity, and it is only with difficulty that the alimentary canal and other organs can be distinguished between them. The buccal mass is small, of the shape usual in the genus, and without jaws. In the specimens dissected the radula was consistently composed of 5 teeth in the ascending portion, 8 in the descending, and about 10 in the sac, still retaining a spiral arrangement, though somewhat in disorder. The teeth are, as usual, in the Ascoglossa: they are rather large, colourless, spoon-shaped, indented in the back, and not denticulate in any part. No dilatation of the alimentary canal sufficient to be called a stomach was found. The bases of the cerata are connected by colourless tubes from which they rise, and which run between them under the dorsal integuments, being presumably part of the hepatic system.

The central nervous system is small, and apparently consists of seven ganglia, arranged as usual in the Elysioida. The spermatheca is large, full, and irregularly pear-shaped. In spite of a careful search, no spine was found in the male genitalia. The mucus gland is large and diffused among the other organs.

This species is allied to the *Stiliger bellulus* (= *St. Mariae*) of European waters, but differs in having more cerata and a ridge-like prolongation of the pericardium visible on the back, perhaps also in the absence of a spine in the genitalia.

#### FACELINA sp.

One specimen from Dunedin Harbour, of a uniform dull olive, as preserved. Long and narrow (length 13, breadth 3 mm.), with a tapering tail and curved tentacular projections on the anterior margin of the foot. Oral tentacles very large and stout; rhinophores stout, deeply ringed. Cerata sparse and small. Many have been lost, but they seem to have been set in four groups. Radula: a single series of 18 teeth of the usual horse-shoe shape, with a long prominent central cusp and four very distinct denticles on either side of it. Jaws decayed, but apparently bearing a single row of irregular and not very clear denticles. Penis armed with numerous small prominences or spines.

This seems to be a typical *Facelina*. The dentition agrees with *F. Stearnsi*, recorded from California, but without more data as to the colour and appearance of the living animal identification is impossible.

#### ANTIOPELLA NOVOZEALANDICA, n.sp.

One specimen. It is stoutly built (length 14, breadth 6, height 4 mm.), and greyish in colour. Down the middle of the back, both before and behind the rhinophores, runs a purplish stripe which becomes dissolved into a multitude of dots posteriorly. In the middle of this stripe, just behind the rhinophores, is a lozenge-shaped,

light-coloured area. The rhinophores are grey with purplish spots, large (4 mm. high), and have between them a large crest of the same colour. Both the rhinophores and the crest are so amply and deeply perfoliate that the whole arrangement superficially resembles the branchial rosette of a Dorid. The anal papilla is large, prominent, medio-dorsal, and nearly terminal, with a crenulated edge.

The cerata are very numerous, often flattened as preserved, but apparently originally fusiform. The innermost are the largest and as much as 6.5 mm. high. They are not set in regular rows, but in a reticulate pattern which is generally 4-6 mm. deep transversely. Two or three lines of small cerata extend round the head in front of the rhinophores. The hepatic diverticula within the cerata are of irregular shape and often conspicuously granulate or folliculate, but not bifid or branched. Some parts of them are much darker than others and spotted with purple.

Below the anterior mantle-edge is a small oral veil bearing two distinct purple tentacles. The foot is broad, with expanded lateral margins which are not, however, broader than the body. Its anterior margin is bilobed and connected with the mouth, but not grooved or produced into tentacular processes. The genital orifices are rather far back, 6 mm. from the anterior end. The tail is very short.

The central nervous system consists of three very distinct pairs of symmetrical ganglia which are all strongly granulated. The pedal ganglia lie a little lower than the others at the sides of the œsophagus, and are connected by a very short commissure.

The buccal mass is very large. The jaws are long, but narrow, bright yellow, but darker near the hinge and edges. There are accessory pieces near the hinges. There appears to be some denticulation on the cutting-edge, but it is not large or distinct. Possibly the jaws have been injured. The radula consists of 23 rows (of which three are undeveloped) of white transparent teeth. The maximum formula is  $37 + 1 + 37$ . The central tooth is not conspicuous, and differs from the others only in its central position and in being smaller. The teeth are hamate, not denticulate, and increase in size outwards. Only the outermost of all is smaller.

The stomach is rather large and laminated internally. As far as could be ascertained, it receives two main hepatic ducts in front. They are ramified and transparent, but speckled. The intestine issues posteriorly. No armature was found on the genitalia, and the verge is not very long. The mucus and albumen glands extend far forward and lie under the mouth. At the sides of the back beneath the cerata is a spongy layer composed of minute tubes out of which rise the hepatic diverticula contained in the cerata.

This species appears to have the characters of a typical *Antiopella*, except that the jaws are not distinctly and strongly denticulate. It differs from the British *A. cristata* in its colour and in the size of the rhinophores and crest, perhaps also in the jaws.

For the synonymy *Antiopella* = *Antiopa* = *Janus*, see Eliot, Notes on some British Nudibranchs, Journ. Mar. Biol. Assoc., vol. vii, p. 373, 1906.

## ALLOIODORIS, Bergh, 1904.

This remarkable genus was created by Bergh for specimens from Tasmania in which the hermaphrodite gland is not spread over the liver as in nearly all known Dorids, but is collected into a separate mass. The teeth are denticulate, a labial armature is sometimes present, the male genitalia are armed with spines, and the back is covered with small tubercles. This peculiar conformation of the hermaphrodite gland also occurs in *Bathydoris* and *Trevelyana*, but it seems impossible to associate *Alloiodoris* (which in other respects is a normal cryptobranchiate Dorid) with either of those forms. The condition in which the hermaphrodite gland is a separate mass is probably older than the condition in which it is a mere layer spread over the liver, and it would seem that very different families of the Dorididæ sporadically preserve or revert to the older arrangement. Abraham's *Doris lanuginata*, of which I have examined the type and also more recent specimens sent by Mr. Suter, proves to belong to this genus, which thus contains:—

1. *Alloiodoris marmorata*, Bergh.
2. *A. lanuginata* (Abraham).

*A. lanuginata* possesses a not very solid labial armature, which is not recorded of *A. marmorata*, but I do not think this character justifies the creation of a new genus.

ALLOIODORIS LANUGINATA (Abraham). Pl. XXVIII, Figs. 1, 2.

*Doris lanuginata*, Abraham: Proc. Zool. Soc., p. 255, pl. xxix, figs. 15–17, 1877.

*Alloiodoris marmorata*, Bergh: Malac. Untersuch. in Semper's Reisen, vi, p. 42, 1904. Basedow & Hedley: Trans. R. Soc. South Austr., vol. xxix, p. 152, 1905.

The following description is based upon fresh material sent me by Mr. Suter, because the type-specimen, described by Abraham, is old, and has naturally suffered in the lapse of time. It is, however, certain that it is an *Alloiodoris*, and hardly less certain that it is the same species as the *Alloiodoris* sent by Mr. Suter. (1) Allowing for the loss of colour and the flabbiness produced by decay, the external characters are the same. (2) The radula and the peculiar shadowy labial armature are exactly the same. (3) So are the armature of the vas deferens and of the verge, as well as the arrangement of the hermaphrodite gland, which is the chief character of the genus.

I have examined Abraham's type-specimen preserved in the British Museum, and two recent specimens from New Zealand, one from Cook Strand and one from Takapuna. These agree, except in colour. With the Takapuna specimen is a note saying: "The ground colour, which is gone, was a dirty red with numerous white pustules." By a curious change it has become greenish grey with blackish mottlings. The specimen from Cook Strand is 50 mm. long, 33 broad, and 16 high. The dorsal surface is flesh-coloured, with 25 scattered brownish spots. There are also a few spots on the under-side of the mantle, near the junction with the foot. The consistency is firm, but soft

and fleshy. The mantle-edge is thick. The back is entirely covered with small tubercles, which extend to the pockets of the rhinophores and branchiæ, but are not specially large there. They are about .75 mm. high and stiffened by spicules, four of which usually project from the tip. The tubercles are not tapering, but either of uniform diameter or larger at the top. Under the microscope it can be seen that their sides bear minute projections. They are all whitish, the dark colour of the spots residing entirely in the level dorsal surface.

The openings of the rhinophores form gently swelling hillocks, but are not protected by raised sheaths. The large rhinophores are yellowish with darker mottlings, and bear at least 30 deep perfoliations. The branchial pocket has a slightly raised, crenulate rim. The branchiæ, which are deeply retracted, are tri- and in places quadripinnate. There is one separate plume in front, and at the sides two groups of two plumes each, so that the branchiæ can be counted as 5 or 9 according as these groups are regarded as two plumes or a bifid plume. They are greenish with darker mottlings.

The tentacles as preserved are long and flat, furrowed on the upper surface, and almost auriculate. The foot is very large, being nearly as long and wide as the body. In front it is grooved, and the thin upper lamina is divided by a median notch.

The blood-gland is white, fairly large, and lies in two divisions, one before and one behind the central nervous system, which is yellow and distinct. Seen from above the divisions between the ganglia are not very marked, but they are plain from below. The cerebral ganglia are continuous with the pleural and bear the sessile eyes in front. The pedal ganglia are separable and roundish; the buccal are fairly large, round, close together, and bear the small gastro-cesophageal ganglia. The salivary glands are large and band-like. No ptyaline glands were found, but some hardened tissues adhering to the buccal mass may have originally been glandular.

On the labial cuticle is an armature (Fig. 1*a*), which, though large enough to be seen by the naked eye, is curiously shadowy, being, not a compact plate, but a loose collection of rods, almost transparent in some places, thicker in others. But though so unsubstantial it is fairly definite in outline, consisting of two plates prolonged into tail-like appendages. The elements (Fig. 1*b*) are longish rods, often wavy and transversely striated, sometimes but not consistently hooked at the tip. The radula consists of 26 rows containing 40-45 teeth on either side of the rhachis. There is no rhachidian tooth, but the first laterals (Fig. 2*a*) project into the rhachis and almost meet. They have a few denticles on the outside and on the inside a jagged prominence bearing 1 to 3 denticles. The second tooth (Fig. 2*b*) has a small prominence near the base on the inner side and denticles on the outer side. The succeeding teeth increase rapidly in size until they assume the normal form. This is short, stout, and strongly hamate; on the outer side of each tooth is a ridge terminating above in a rather blunt point; in the first 10-15 teeth this ridge bears several (generally about 6) very irregular (Fig. 2*c*) denticles; after the fifteenth tooth these denticles disappear, and only the point remains as a single denticle (Fig. 2*d*). It



is found in all the teeth except the last three, which are thin and irregular in shape, but not serrulate. The œsophagus is thin and rather wide. The large stomach lies in front of the liver, and is not at all enclosed in it. In the British Museum specimen its upper wall is strongly laminated. Beneath the stomach lies the rather large gall bladder. The liver is shorter than in ordinary Dorids, and abruptly truncated in front where the stomach and hermaphrodite gland fit into it.

The hermaphrodite gland does not form a layer over the liver as usual in Dorids, but is a separate yellowish mass about 15 mm. long and 10 broad. The ampulla of its duct is moderately large; the vas deferens is not much convoluted, but lies in one long loose coil. The part nearer the bifurcation of the male and female branches is soft and glandular, but not dilated. The lower part is muscular and begins with a very small swelling. The end of the vas deferens and the glans penis are armed with minute hooks, rather thick in shape, but often with pointed tips. The verge terminates in a sharply defined tip, which may perhaps have been a hard tube in life. The spermatheca is spherical, greyish, with thin walls and a short duct, whereas the spermatocyst, which rises close to it, is yellow, with thick tough walls and a rather long duct.

This species is undoubtedly an *Alloiodoris*, and Abraham's specific name has in any case priority. Bergh's *A. marmorata* is perhaps a distinct species. The first lateral tooth is differently formed; no labial armature was found, and it is not mentioned that the tentacles are grooved. It is not clear that the animal figured by Basedow & Hedley is either *A. marmorata* or *A. lanuginata*. It differs somewhat in coloration, and they state that the teeth were not denticulate. They say nothing about the hermaphrodite gland.

#### ARCHIDORIS WELLINGTONENSIS (Abraham).

Abraham: Proc. Zool. Soc., pp. 211, 259, pl. xxix, fig. 27, 1877;  
 Eliot, Proc. Malac. Soc., vol. vi, pp. 236-238; Hutton, Trans.  
 New Zealand Inst., vol. xiv, p. 166, 1881.

One specimen almost rolled up into a ball, but with external characters corresponding, as far as they can be seen, with previous descriptions. It is labelled *Doris Wellingtonensis*, and as preserved is 27 mm. long and 25 mm. broad.

The central nervous system is pinkish and much concentrated, the separate ganglia being hardly distinguishable either from above or below. The eyes are sessile. The blood-gland is pinkish white, much branched before and behind. The salivary glands are band-like and very long. The radula consists of 33 rows, of which the first three are fragmentary and the last two imperfectly developed. There are from 55 to 65 teeth on either side of the rhachis. There is no rhachidian tooth, as erroneously stated by Hutton. The first 15 teeth on either side are rather low, with long bases and short, strongly bent shafts. The rest are more erect, slender, with long shafts hollowed out on each side near the base, so that the lower part of the back is a mere lamina. The three outermost are thinner and smaller.

None are denticulate. The stomach is rather large and not enclosed by the liver. Its upper wall is laminated internally, one fold being much larger than the others. Near the pyloric end is a diverticulum of roughly cylindrical shape.

The liver is covered with a fairly thick layer of the hermaphrodite gland. The duct of this gland is long; the ampulla not large. The vas deferens is soft, extremely long, and convoluted. It exhibits no dilatation which can be called a prostate until the end, when it enters a spongy elongate cone, which seems to be the penis-sac, with glands adhering to it. No armature was found.

Abraham observes that mantle spicules are absent, and I was not able to find any. Otherwise the species seems to be a typical *Archidoris* and does not belong to the section *Anisodoris*. Hutton's statement that there is a central tooth cannot be correct, for, even if the identity of the present specimen is disputed, it is absent in the type-specimen of the British Museum (see Eliot, l.c., 1905). Hutton must either have examined a wrongly labelled specimen or have been misled by the way that the first laterals project into the rhachis.

#### ARCHIDORIS FULVA, n.sp.

Two specimens kindly sent me by Dr. Hoyle from the Manchester Museum. They are labelled "E coll. Prof. Spencer, Australia. B.," and preserved in formaline. The largest is 54 mm. long, 37 broad, and 22 high. The other is a little smaller.

Both are plump and of a remarkable texture like a stiff jelly, except for the hard excrescences noticed below. These excrescences are white, but the colour is otherwise a dull brownish orange, rather deeper on the under than on the upper side. The branchiæ and rhinophores are paler than the body.

The back is covered with low soft tubercles of various sizes, the largest about 2 mm. broad, but the majority smaller. All round the dorsal margin, extending inwards as much as 20 mm. in some places, are hard excrescences, looking like a deposit of some white salt. They spread over the tubercles, which they partly conceal. They do not form lumps, but a layer with prominences not exceeding granulations. There are similar excrescences, but fewer, on the under-side of the mantle, on the sides of the foot and even on the sole, but there are none in the centre of the back. Professor Palmer Wynne, Professor of Chemistry in the University of Sheffield, who has courteously examined them for me, says that they consist of calcium carbonate and are not of the same composition as the spicules found in the integuments, which do not effervesce in contact with hydrochloric acid, but dissolve. The excrescences look to me as if they were found on the animal in its natural state, but it is conceivable, particularly in view of their occurrence on the sole of the foot, that they are a deposit due to the chemical action of the fluids with which it has been treated. They occur on both specimens, but are more numerous on one than on the other.

The foot is nearly as long as the body, broad (28 mm.), with a thick

expanded margin. The anterior margin is divided by a groove which runs a long way back on either side, but there is no median notch.

The tentacles are two lumps on either side of the mouth, much as in *Archidoris tuberculata*, and slightly furrowed. The rhinophore pockets are not raised or large. They are surrounded by tubercles similar to those found on other parts of the back and not specially modified. The rhinophores are retracted, thick at the base, somewhat tapering at the top, and bearing 20-25 perfoliations. In one specimen the white excrescences extend to the rhinophores.

The branchial pocket also is not raised and is surrounded by tubercles not specially modified. The rim is bent into about six indistinct undulations. There are nine branchial plumes, of which one is much larger than the rest, and there seem to be some rudimentary, subsidiary plumes round the central anal papilla. The branchiæ appear to be tripinnate, not very ample, but prettily shaped and coloured. The stems are stout and reddish, the tips whitish. Nearly all the internal organs are pinkish orange. The blood-gland is large, composed of two clearly separate divisions, each subdivided into 3-4 not very distinct lobes. The ganglia of the central nervous system are elliptical in shape and separate, the cerebral portion being distinctly divided from the pleural portion. Below the buccal mass are two elliptical buccal ganglia.

The buccal mass is moderately large and not very broad. At its posterior end enter two long (15 × 3 mm.) salivary glands, not ramified but thin, wavy and somewhat folliculate. There is a strong labial cuticle, containing a few scattered rods, but nothing that can be called a labial armature. The radula consists of about 45 rows, containing 65-70 teeth on either side of the rhachis, which lies in a furrow over which the teeth close, so that it is difficult to see. Owing to the innermost laterals being crowded, some of them appear to be in the median line, but they are of the same shape as the rest and do not seem to be real rhachidian teeth. The teeth have large bases and erect cusps slightly bent and moderately stout. The innermost are smaller. The 2-3 outermost are small, but not denticulate.

The œsophagus is rather wide (15 mm.) and is not very long. After a contraction it enters the lower side of the stomach rather far back. Its walls are thin; those of the stomach are much thicker and bear rather strong laminae inside. The stomach measures 15 mm. by 12, and lies in a cleft in the fore-part of the liver, but is not enclosed in the liver. The pear-shaped gall-bladder (8 × 3 mm.) lies below the stomach. The liver is large (33 × 22 mm.), pinkish white outside and yellowish inside. In parts, but not everywhere, it is covered by the reddish-orange hermaphrodite gland. It is deeply cleft in front, and shows traces of bilobation behind.

The heart and pericardium are large and distinct.

The genitalia are well developed, particularly the large mucus gland, which in one specimen extends from the branchiæ right up to the anterior end of the body above the buccal mass. The duct of the hermaphrodite gland is very thin, and its ampulla about 2 mm. broad and 30 mm. long if stretched out. After the bifurcation the female

branch is narrower and pinker than the ampulla, which is white. The mucus gland is much diffused, semi-transparent, viscous, and hardly solid. Inside it is the white albumen gland, harder and smaller (about  $10 \times 8$  mm.). It is spread in ramifying tubes before it enters its main duct. The spermatheca is purplish and measures about  $7 \times 3$  mm.; a duct 4 mm. long leads to the spermatocyst, which is whitish, pear-shaped, and about half the size. The vagina is wide, with strong walls bearing ridges and lumps.

The male branch consists of a pinkish vas deferens, about 10 mm. long as it lies, but three or four times as much if stretched out. It is at most one millimetre wide. It passes into a sausage-shaped sack about 18 mm. long and 5 broad, bent at nearly right angles. The upper part is a spongy mass traversed by the narrow winding tube of the vas deferens, but does not appear to be a prostate as described for *Anisodoris* by Bergh. By a prostate I understand either a gland attached to the vas deferens or a glandular swelling in its course, after which it contracts again into a thin muscular portion. But in the present animal the vas deferens remains constant in size, only before entering the sheath of the penis (which forms the lower part of the sausage-shaped sack) it passes through a spongy mass. The glans penis itself is small, and no spines or other armature were found on it or on the rest of the genitalia. As preserved, the genital orifices open into a large striated chamber with folds or laminae on the walls, but this structure may be the result of contraction and not natural.

This form appears to have all the characters of the section *Archidoris*. It is impossible to say whether the white excrescences are found on the living animal or are an artificial deposit on these specimens, but the species is characterized by its colour and peculiar texture, which seem to be natural features and should render it easily recognizable. It offers many resemblances to *Anisodoris (Montereina) nobilis*, MacFarland, from Monterey, California, but the colour is not mottled, the tentacles are not digitiform, and there are differences in the radula and in the genitalia; also the animal, which seems mature, is much smaller, *A. nobilis* being as much as 20 centimetres long.

#### CTENODORIS, n.subgen.

As explained above, I regard *Staurodoris*, *Archidoris*, etc., as subgenera or sections of *Doris*, L. (type *Staurodoris verrucosa*), and now propose *Ctenodoris* as a new subgenus parallel to them, to include—

1. *Ctenodoris pecten*, Eliot. (See *Staurodoris pecten* in Eliot, Nudibranchiata of the Maldives, p. 557.)
2. *Ctenodoris flabellifera* (Cheeseman).

These forms have the ordinary characteristics of the Archidorididæ. The back is tuberculate, the teeth simply hamate, and there is no armature on the labial cuticle or genitalia. But the structure of the branchial apparatus is remarkable. Not only are the plumes simply pinnate as in *Staurodoris*, but they are arranged in a line or crescent, and the upper lip of the pocket shuts down over them like a single valve.

## CTENODORIS FLABELLIFERA (Cheeseman).

*Doris flabellifera*, Cheeseman: Trans. New Zealand Institute, vol. xiii, p. 222, 1880.

Three specimens marked "*Doris flabellifera*, Hauraki." Two are of a uniform yellowish white. One has two irregular rows of brown spots. The largest specimen is 21 mm. long, 13 broad, and 5 high; the foot is 12 mm. long and 7 broad. The mantle-margin is ample, and in places as much as 5 mm. broad.

The back is covered with low inconspicuous warts of various sizes. The edges of the rhinophorial pockets are not protected by distinct tubercles and only slightly raised. The rhinophores are large and stout. The branchial pocket is bilobed. The upper and anterior valve or flap is bow-shaped; the posterior valve is somewhat more rounded, and the two enclose a fairly wide space shaped like a crescent, with the ends pointing forward. The pocket is very shallow, and is not protected by any special tubercles; its membranous floor is raised in a dome-like elevation. From either corner of the anterior valve a nearly straight row of thin, simply pinnate branchiæ extends towards the middle, slightly increasing in size, the two median plumes being the largest and lying just above the anal papilla. There are 22 plumes in all. The foot is rather small, grooved, but not notched in front. The large buccal mass is protruded; on either side of it is a flat tentacular fold with traces of a groove.

The central nervous system is strongly granulated, and the ganglia are not distinctly separated. The eyes are sessile and rather large. No armature was found on the labial cuticle. The radula consists of 40 rows (of which three are rudimentary) with a formula of about 50 . 0 . 50. The teeth are white, strongly hamate, not denticulate, and with long bases. There is no median tooth, but the first laterals project into the rhachis one behind the other. The inner teeth, particularly the first 6-7, are smaller than the rest. Then the size goes on increasing until almost the end of the row. The last three, especially the outermost of all, are smaller, but not much degraded and not denticulate.

The stomach is entirely outside the liver and is lamellated longitudinally inside. It contains gastropod shells, one 1.5 mm. long. The hepatic mass is whitish externally, pinkish within. The genitalia are small and undeveloped, but appear to be of the type usual in *Stauodoris*. No hooks or spines were found, but the vagina bears strong zigzag folds. The verge is conical, but somewhat bent at the tip.

## ROSTANGA MUSCULA (Abraham). Pl. XXVIII, Fig. 3.

*Doris muscula*, Abraham: Proc. Zool. Soc., p. 256, pl. xxix, figs. 6-7, 1877.

*Rostanga pulchra*, MacFarland: U.S. Bull. of Bureau of Fisheries, vol. xxv, p. 119, 1905. Cheeseman: Trans. Inst. New Zeal., vol. xiii, p. 222, 1880.

Through the kindness of Mr. E. A. Smith I have been allowed to examine the type-specimen of this form preserved in the British Museum.

The external features are as described by Abraham, and the length is about 13 mm. The colour is greyish, with an indistinct brownish longitudinal band extending from the rhinophores to the branchiæ, and bordered on either side by a bluish band, the colour being due to pigment disposed between the dorsal tubercles in a reticulate pattern, but not on them. These tubercles are minute, cylindrical, twice as long as they are broad, and crammed with straight granulated spicules, which are often swollen in the middle. The borders of both the rhinophorial and branchial pockets are flattened, but appear to have been raised in life and to have borne small pointed tubercles. The branchiæ are small and retracted. They appear to be 9, and simply pinnate or bipinnate. The oral tentacles are distinct, linear, and rather flat. The foot is grooved in front and the upper lamina notched.

In the central nervous system the eyes are large and distinct. The ganglia are granulated and fused into one mass, in which no division is visible, though three lateral projections seem to indicate the cerebral, pleural, and pedal portions.

Small granules or columns were found in the labial cuticle, but they are not arranged in a plate. The formula of the radula is  $69 \times$  about  $82.0.82$ . The innermost lateral (Fig. 3*a*) is hamate, and bears on the inside numerous (30 or more) fine, comb-like denticles. The second to the eighth laterals (Fig. 3*b*) are also hamate; the shaft is slender and pointed, the base stout with a large projection. These teeth gradually pass into the third form, which prevails from 9 to 36 (Fig. 3*c*). The shaft gradually grows longer and the base smaller, until the whole tooth has the shape of a hook on a pedestal. In the remaining 45 teeth (Fig. 3*d*) the base is still smaller, the shaft is longer, and the end is split into 2-4 long denticles, forming a brush at the tip. These teeth resemble filaments rather than the ordinary teeth of Dorids. As preserved they lie in bundles on the top of the other teeth, being apparently set higher up on the sides of the buccal cavity. Their bases are so close together that they seem to be fused, but this is not really the case: each tooth is separately attached to the basal membrane. The genitalia seem small and immature. No armature was found. The hermaphrodite gland is spread over the anterior part of the liver only, and was not visible in sections of the posterior part.

The dentition of this species is remarkable, but appears to be much the same as that of *Rostanga pulchra*, MacFarland, from California. Cheeseman's *Doris rubicunda* seems also to be a *Rostanga*, and is perhaps identical with this species, in which case Abraham's name has priority. The present specimen does not look as if it had ever been scarlet, but Cheeseman's statement that *D. rubicunda* has sometimes a darker line down the centre of the back makes the identification probable, though it is curious that he does not describe the remarkable features of the radula more fully. MacFarland states

that *R. pulchra* loses its scarlet in alcohol, but though it is nearly allied to this species the two are probably distinct specifically. Among other points of difference it has only 8-11 denticles on the first lateral tooth, whereas *R. muscula* has about 30. *R. muscula* appears to have no regular labial armature, but it is possible that the cuticle has decayed and the plate become decomposed.

GARGAMELLA NOVOZEALANDICA, n.sp.

(Cf. Bergh on *G. immaculata*: Bull. Mus. Comp. Zoology, Harvard, p. 175, 1894.)

One small specimen, about 16 mm. long and 7 broad, marked "Auckland Harbour." The dorsal surface is bluish grey and covered with minute, elongate, soft tubercles, the texture being villous rather than warty or granulate. Under the microscope a minute brown reticulation can be seen between the tubercles. The rhinophore openings lie in little hillocks, but are not protected by sheaths. The branchiæ are 10 in number, compressed, and pyramidal in shape. They seem to be pinnate and in places bipinnate. The margin of the branchial pocket is not raised. The integuments and especially the tubercles are full of spicula, straight or slightly undulated, with a granulated surface. They project from the tips of the tubercles. The oral tentacles are small, linear, but distinct. The anterior margin of the foot is deeply grooved and expanded into ample flaps, as in *Kentrodoris*.

The central nervous system is rather large and dark in colour, especially the large common commissure, which is dark brown. The cerebro-pleural ganglia are united in a large pear-shaped mass in which two divisions can be distinguished. The pedal ganglia are separate, round, and dark brown. Dark pigment was found on the labial cuticle, but no armature. The radula is small, the maximum formula being  $18 \times 20 . 0 . 20$ , and most of the rows are smaller. The teeth are simply hamate with long bases. The innermost are low and have on the inner side a slight projection hardly amounting to a denticle. The teeth increase in size up to the middle of the row, and the two or three outermost are small and thin.

The genitalia are small and hardened, but it was ascertained that what seems to be the vas deferens was armed with transparent disks with central spots and spines exactly like those of *G. immaculata* figured by Bergh (l.c., pl. vi, figs. 14, 15).

The specimen is probably immature, but seems referable to *Gargamella*, which is distinguished from *Thordisa* only by possessing an armature on the genitalia, and is perhaps merely a subgenus. This species is, however, distinct from *G. immaculata*, Bergh (from Cape Delgada<sup>1</sup>), and differs in colour as well as in the radula and branchiæ.

APHELODORIS, Bergh.

This genus was created by Bergh in 1879 for *Aphelodoris antillensis* from the West Indies. The shape is as in *Chromodoris*, the back

<sup>1</sup> On the Atlantic coast of Patagonia (Argentine Republic), 42° 25' S., 61° 38' W.

smooth, the branchiæ tripinnate, the tentacles grooved, the teeth hamate, and a prostate is present; there is no armature on the labial cuticle or genitalia. The genus appears to comprise the following species:—

1. *Aphelodoris antillensis*, Bergh.
2. *A. Cheesemani*, n.n. (= *Doris luctuosa*, Cheesem.).
3. *A.* (?)<sup>1</sup> *purpurea*, Bergh.
4. *A.* (?)<sup>1</sup> *pallida*.
5. *A. luctuosa*, Bergh.
6. *A.* (??)<sup>1</sup> *brunnea*, Bergh.
7. *A. affinis*, n.sp.

The two species (*A. Cheesemani* and *A. affinis*) now added to the genus have the typical characteristics as defined by Bergh in describing *A. antillensis*, but it might be useful to enlarge the definition of the genus and make it a convenient, if temporary, receptacle for forms with a smooth dorsal surface, hamate teeth, and no armature on the labial cuticle or genitalia such as the *Doris pseudida*, *D. perplexa*, and *D. glabella*, described by Bergh in his Opisthobranchs of South Africa.

#### APHELODORIS CHEESEMANI, n.n.

*Doris luctuosa*, Cheeseman: Trans. New Zeal. Inst., vol. xiv, p. 218, 1882.

? = *Archidoris varia*, Basedow & Hedley: Trans. R. Soc. S. Australia, vol. xxix, p. 150, 1905. See also Bergh, *Aphelodoris luctuosa*: Mal. Unt. in Semper's Reisen, vi, 2, p. 75, 1905.

One specimen labelled "*Doris luctuosa*, Cheeseman—Auckland harbour." It has the general appearance and high, thickset shape of a stout *Chromodoris*. The colour is uniform pale yellow; the length 33.5 mm., the breadth 16 mm., and the height 15.5 mm.

The texture is quite smooth, and not granulate. The dorsal surface, as preserved, shows various wrinkles and swellings, but they are perhaps not natural. The sheaths of the rhinophores are 2.5 mm. high, plain and entire, not tuberculate or denticulate. The branchial pocket is surrounded by a flap which may have formed a raised border in life, but as preserved is reflexed and flattened. Near the pocket are some lumps, but these too may perhaps be due to distortion. The branchiæ are white outside, dull dark-green inside. The two hindmost on either side are deeply cleft, and according as they are reckoned as one bifid plume or two plumes the whole number will be 5 or 7.

The tentacles are thick with a short distinct groove at the tip, and are connected with the foot by a fold. The foot is broad. Its anterior margin is entire and not grooved; the lateral margin ample; the tail short. The mantle-edge is rather narrow and turned upwards, so as to show the sides of the body.

The blood-gland is thick and white. The central nervous system is enclosed in a thick capsule, granulated, and so concentrated that the divisions between the ganglia are only faintly marked. The commissures are thick and short.

<sup>1</sup> The notes of interrogation are as marked by Bergh.



The labial cuticle shows a white granulation here and there, but no armature. The radula consists of 36 rows, of which the three or four in front are short and broken. The rest contain 50-60 hamate teeth on either side of the naked rhachis. The innermost teeth are smaller with long bases and low hooks. The hook of the first lateral is often flat and irregularly-shaped, but no distinct denticulation was seen. The teeth increase in size up to nearly the end of the row; the last 3-4 are lower, but not denticulate and not much degraded. The salivary glands are rather short and thick, with thin ducts. The oesophagus is thin and leads into an ample stomach, which has thin walls and lies wholly outside the liver. This latter is covered by the light-yellow hermaphrodite gland, which is thick and spread all over it, above and below. The substance of the liver is rather darker than the gland and is more diffuse than usual, containing many hollows.

The spermatheca is large and yellow, but broken. The spermatocyst could not be found, and was perhaps confused with the fragments. There is a large prostate lying on the mucus gland. The vas deferens consists of a couple of loose coils and bears many prominences internally, but no hooks or spines were found.

There is no reason to doubt the correctness of the label which describes this animal as Cheeseman's *Doris luctuosa*. It was caught in the same place, and Cheeseman's statements about the external characters and the radula are substantially applicable to the present specimen.

It has also all the characters of the genus *Aphelodoris*, and agrees very closely with the type species *A. antillensis*, except that the first lateral has not a distinct denticle. But it has the chromodoridiform shape, smooth back, raised rhinophore sheaths, grooved tentacles, a prostate, and a radula as described for the genus. It might therefore be called *Aphelodoris luctuosa* (Cheeseman). But Bergh has already described (l.c.) under the name *luctuosa* an *Aphelodoris* from Tasmania which can hardly be the same species, since it is black and differs in various details. It would seem that article 35 of the international rules of nomenclature is applicable here. Although Cheeseman's *D. luctuosa* dates from 1882, still, at the time when it is referred to *Aphelodoris*, viz. 1907, there is already an *Aphelodoris luctuosa* (1905) and Cheeseman's name must be rejected. The animal may be renamed *Aphelodoris Cheesemani*.

It is possible that this may be the animal described and figured by Basedow & Hedley as *Archidoris varia*, which has a somewhat similar coloration, a smooth back, grooved tentacles, elevated rhinophore sheaths, and a similar radula (23 x 70 . 0 . 70). The shape, however, appears to be different. In any case *A. varia* seems to me to be an *Aphelodoris* rather than an *Archidoris*, for it is one of the characters of the Archidorididæ that the back is tuberculate, or at least granulate.

#### APHELODORIS AFFINIS, n.sp.

One specimen marked Great Barrier Island: 14 mm. long, 8 broad, 8.5 high. It is shaped somewhat as *Chromodoris*: the sides are high and the mantle-edge small. The colour is dirty white with irregular

mottlings of dark reddish-brown. The epidermis peels off very readily, and it is possible that the brown mottlings may have been much more extensive or even that the dorsal surface may have been wholly brown. It is quite smooth and presents no trace of warts or granulations. The foot is large, and the anterior margin is not grooved. The oral tentacles are white: large, flat, and distinctly grooved. The rhinophores are purplish-brown and provided with sheaths 1.5 mm. high. The rim of the branchial pocket is flattened as preserved, but was probably raised in life. The branchiæ are purplish-brown, but the outside of the stems is whitish. They are tripinnate, much contracted, and apparently consist of five or six plumes, the division in one place not being clear.

The intestines are yellow, much hardened, and not well preserved, but the arrangement of the alimentary tract, which is remarkable, is quite plain, and appears to be natural and not the result of distortion. The rather long and straight œsophagus runs to the hinder part of the stomach and enters it on the right side. The stomach, which is somewhat elongate, lies parallel to the œsophagus on its left side; the long intestine issues from the anterior part of the stomach, runs across and above the œsophagus, and then describes a large loop along the right side of the liver. It may possibly be more correct to regard the slight swelling at the base of the œsophagus as the true stomach, but the natural description of the organ seems to me to be that given above. The stomach lies partly in a cleft of the liver, but is not enclosed by it. The œsophagus is lined with soft laminae, and the upper wall of the stomach bears very ample laminae which almost fill it. They are collected in groups so as to form seven ridges. They are strongest near the exit of the intestine, where they seem to act as valves.

A blood-gland was found and two small elliptical salivary glands. They enter the buccal mass in the usual place through their short ducts, and also seem to taper into a thread-like process at the distal ends. In the central nervous system the cerebro-pleural ganglia are distinctly divided into two parts. The pedal ganglia are large and round.

The labial cuticle is darker in some places than in others, but presents nothing that can be called a labial armature. The formula of the radula is about  $23 \times 60 . 0 . 60$ . The innermost teeth have long bases and lower hooks than the rest. The teeth increase in size up to the middle of the half-row, where they are large, simply hamate, and rather erect. Towards the end of the half-row they decrease in size, and have low, strongly bent, irregular hooks, but are not denticulate. No spines or other armature could be found in the genitalia, which were, however, too much hardened to admit of a proper examination.

#### DORIS GRANULOSA, Abraham.

*Doris granulosa*, Abraham: Proc. Zool. Soc., p. 253, pl. xxix, figs. 1-3, 1877.

Several specimens of this form are in the British Museum, and appear to correspond with Abraham's description of the external characters. I opened two, but found the internal organs, including

the ribbon of the radula, entirely decayed. Only scattered teeth of the ordinary hamate type remained.

The form is probably a small *Archidoris*, perhaps *A. nanula*, Bergh, but its appearance in life is unknown, and the preserved specimens present no characters which would justify identification. The species can accordingly be neglected.

#### DORIS LONGULA, Abraham.

(Abraham: same paper and page as above.)

The same may be said of this form. Like *Doris granulosa* it has lost its colour, the intestines are decayed, and it can only be said that it had rather stout hamate teeth.

Hutton (Trans. New Zeal. Inst., vol. xiii, p. 203, 1881) doubtfully identifies with *D. longula* specimens deposited by him in the Canterbury Museum, but his description is not full, and it is difficult to say whether his animal is really the same as Abraham's or to what genus either are referable.

#### CHROMODORIS AMÆNA, Cheeseman.

*Chromodoris amæna*, Cheeseman: Trans. New Zeal. Inst., vol. xviii, p. 137, 1885.  
= *Chr. figurata*, Bergh: Mal. Unt. in Semper's Reisen, vi, 2, p. 71, 1905.

Four specimens from Whangarei Head, about 80 miles north of Auckland, sent by Mr. Cooper. The general colour of the dorsal surface, including the rhinophores and branchiæ, is greyish-white. The margin is marked by a rather broad stripe of lemon-yellow, in which are seen imbedded a row of round bodies. There are 2-3 rows of lemon-yellow spots on the sides of the body under the mantle and traces of coloured areas on the back, which, though now grey and white like the rest, were perhaps differently coloured in life.

The shape is high and stout, much as in *Chr. Semperi*. The length of the largest specimen is 23 mm., the height 10 mm., the breadth 10.5 mm. The free tail is 6 mm. long. The margins of the rhinophorial and branchial pockets are very slightly raised. The branchiæ vary from 8 to 10 in number. In one specimen they are bipinnate, being divided into 2-4 plumes at the tip. The tentacles are retracted and represented by two pits.

The buccal mass is very large. The labial armature is yellowish-green, and consists of rods somewhat bent or curved at the tip, which in some parts of the armature is bifid, in others entire. The radula consists of 88 rows, of which four are undeveloped and shadowy, and there are 100-120 teeth on either side of the rhachis. The rhachis bears a median tooth with a long base and a low cusp, which is not denticulate, though of somewhat irregular outline. The first lateral is of the shape usual in the genus and is denticulate on both sides, bearing on the inner side about 4 denticles. The other laterals are denticulate only on the outer side, the number of denticles being at least 6. Near the end of the rows the main cusp diminishes and the first denticle increases, so that the tooth appears bifid.

The liver is large and greyish ; there is no stomach outside it.

There can, I think, be little doubt that Bergh's *Chr. figurata* (1905) is the same as the earlier *Chr. amana* (1885) of Cheeseman. The agreement in colour and external features is as complete as can be expected in two descriptions made, one from living and the other from preserved specimens. Cheeseman's account of the radula, though slight, is not inconsistent with the identification, though he describes it as smaller ( $65 \times 70 . 1 . 70$ ). A rough sketch sent by Mr. Cooper with the specimens represents a pale pinkish *Chromodoris*, with orange blotches on the back and yellow spots on the sides. The rhinophores and the 10 simply pinnate branchiæ are violet-coloured.

#### CHROMODORIS AUREO-MARGINATA, Cheeseman.

*Chromodoris aureo-marginata*, Cheeseman: Trans. New Zeal. Inst., vol. xiii, p. 223, 1880.

? = *Chr. marginata*, Pease: Proc. Zool. Soc., p. 30, 1860; and Bergh, Siboga Expeditie, Opisthobranchiata, p. 150, 1905.

One small specimen from Takapuna, labelled *Chr. aureo-marginata*, juv. It is therefore probable that when alive it agreed with Cheeseman's description in coloration (pellucid white with a narrow golden border), as it still does in other respects. It is 12.5 mm. long and 5.5 broad, flattish in shape, with the mantle fairly wide at the sides and amply expanded over the head. There seem to be traces of small low tubercles on the back. The margins of the rhinophorial pockets are somewhat raised. The branchial pocket is closed and forms a small papilla. It contains 10 small, simply pinnate branchiæ; the fifth plume on either side is minute. The foot is rather narrow, with a simple groove in front. On either side of the mouth is a knob-like tentacle.

The labial armature is rather faint. It is an imperfect ring composed of close-set, short, mace-like rods, swollen and bent at the tips. The radula consists of 50 rows, three of which are imperfectly developed, containing about 45 teeth on either side of the rhachis, which bears inconspicuous thickenings. The first lateral is broad and appears trifid, but the prominence on the inner side bears 2-3 denticles. The second lateral is also broad, but lacks this prominence on the inner side. Apart from its greater breadth it has the same shape as the other teeth, namely, two large prongs at the apex, and below them 3-6 denticles, which diminish in size downwards. The outermost teeth bear about four denticles on the tip.

This form is nearly allied to *Chr. marginata* (Psc.), and perhaps merely a variety of it. The coloration is very similar and the radula is rather narrow in both species,  $50 \times 45 . 1 . 45$  in this specimen, and  $54 \times 35 . 1 . 35$  in that examined by Bergh. But the similarity in coloration is not complete, and there is a difference in the shape of the teeth. In *Chr. marginata* Bergh found them simply hamate and denticulate, but in this species the upper denticles are strongly developed, and the teeth appear bifid as in *Chr. hilaris* and *Chr. pantherina*.

## DORIDOPSIS MAMMOSA, Abraham.

*Doridopsis mammosa*, Abraham: Proc. Zool. Soc., p. 266, pl. xxix, figs. 20-21, 1877.

Three specimens marked by Mr. Suter, "*Doridopsis mammosa*, Abraham, Hauraki Gulf." The largest is 46 mm. long, 26 broad, and 14 high. They are all soft, smooth, and flabby, pale yellow with black markings. Traces of brighter colour seem to indicate that the animal is really bright lemon-yellow when alive.

The dorsal surface bears soft tubercles, both large and small. As preserved, most of them are flattened, but the normal arrangement seems to be that there are 8 tubercles about 6 mm. high, one between the rhinophores, one behind the branchiæ, and two rows of three each on either side between the rhinophores and branchiæ. These larger tubercles are surrounded by rings of smaller ones, and there are 2-3 lines of smaller ones near the mantle-edge. The back also bears three rows of lozenge-shaped or irregularly polygonal figures, boldly outlined in black and contrasting with the yellow surface. The space inside the black outline is yellow like the rest of the back, and there is a spot in the centre. There are 3-4 of these figures in the centre of the back between the two lines of large tubercles and 5 on the outer side of each line near the mantle-edge. The last figures are behind the branchial pocket and imperfectly developed.

The branchial pocket is shallow, with a few black spots on the floor. Its edge is distorted in all the specimens, but seems to have had six lobes, marked by tubercles. The branchiæ are 6, tripinnate, yellow, but the rhachides of the extreme ramifications are black. The rhinophorial sheaths are thin, about 1.5 mm. high, not divided or lobed. The rhinophores are rather large, reflexed, and bear about 30 deep perfoliations. The mantle-edge is fairly ample. The foot has ample lateral margins, is pointed in front and not grooved. Over the mouth are two rather broad flat tentacles.

The intestines are mostly yellow. The blood-gland is very large and yellowish. It lies as preserved not over the central nervous system but on the right, towards the genitalia. The interior of the buccal chamber is bluish-black. Out of the buccal cone issues a thin tube with muscular walls about 4 mm. long and 1 mm. broad. This tube passes into a sausage-shaped dilatation with thinner walls, about 6 mm. long and 3.5 broad, which is bent so as to form a circular loop with the anterior and posterior ends close together. This dilatation is followed by a constriction and a longish tube about 20 mm. long, and of irregular diameter (about 3 mm.) on an average, which dilates again and then enters the liver. The walls of this longish tube are very thin, and in places reticulate with large irregular meshes, like those shown in Hancock's figure of *Doridopsis*.

No salivary glands of the usual type were found, but under the anterior part of the buccal tube lies a large many-lobed yellow gland. It has five principal divisions, but it enters the buccal tube by a single duct.

The central nervous system forms a complete ring surrounding the end of the thin part of the buccal tube. The ganglia form

a granulate mass and are not separately distinguishable. The buccal ganglia seem to be as in *Doridopsis*, not as in *Doriopsilla*.

The stomach is entirely enclosed in the liver, which is yellow within and without, not very compact, cleft behind, and attached to the floor of the body-cavity by a muscular strap. The hermaphrodite gland does not differ from the liver conspicuously in colour. The heart is as usual in the genus. At the point where it is attached to the pericardium is the so-called pericardial gill—a line about 6 mm. long of yellowish lamellæ, each about 2 mm. wide.

The ampulla of the hermaphrodite gland is stout and brownish. After about 10 mm. comes the bifurcation. The male branch at first covers the spermatheca with thick soft coils; this part of it would probably be about 60 mm. long if stretched out. It then passes into a thinner portion with strong muscular walls, which enters the penis sac. The presence of an armature was not satisfactorily demonstrated. Some rather large transparent prominences were found on the lower vas deferens, but could not be isolated, nor is it certain that they were hard. In the female branch a thin tube runs from the bifurcation to the spermatheca, which is very large and almost sessile on the duct. It is full of spermatozoa and has very thin walls. The spermatocyst is small. It is in all probability naturally pear-shaped, but the contents are squeezed up into the top so as to make it appear globular. It has a very long duct. On the vagina is a vestibular gland.

#### DORIDOPSIS CITRINA, Cheeseman.

*Doridopsis citrina*, Cheeseman: Trans. New Zeal. Inst., vol. xiii, p. 223, 1880.

Seven specimens. The largest is 24 mm. long, 7.5 high, and 18 broad, but the real breadth is greater, the mantle-margin being folded. The animals are flattish in appearance, moderately soft, and of a uniform pale yellow.

The back is covered with numerous well-developed tubercles of rather irregular shape and size, and sometimes confluent; near the margin the tubercles are smaller and the intervals between them larger. The rims of the rhinophorial and branchial pockets are slightly raised, thin, and not tuberculate. The branchiæ are 5 and tripinnate. The mantle-margin is fairly ample, and in places shows spicules arranged in a reticulate pattern, but the integuments are thick and not very transparent. The spicules are of various sizes and shapes, such as straight and smooth; straight with a projection on one side, V-shaped and Y-shaped. The foot is fairly broad, not much pointed before or behind. In some specimens, but not in all, a groove can be seen on its anterior margin.

The central nervous system is as in *Doridopsis*, not as in *Doriopsilla*. The buccal ganglia are set at some distance behind the main mass of the nerve-collar. From the buccal cone issues a tube which describes a fairly large loop to the left and then contracts. At this point are the buccal ganglia united to the anterior nerve centres by fairly long connectives which run across the end of the loop. The tube does not

present the abrupt transitions seen in *Doridopsis mammosa*, and is of a more uniform breadth, but its essential structure seems to be the same. It shows one constriction at the point where the buccal ganglia are set and a second just before it enters the liver. After this second constriction comes a small globular dilatation.

The intestines are pale yellow. The liver is very large, cleft behind, and extending right into the anterior part of the body, where it lies under the buccal organs. It is somewhat lighter outside owing to the layer of the hermaphrodite gland which covers it. The genitalia are small. A prostate is present. The vas deferens and glands penis are very thickly covered with minute, slightly bent spines, resembling the hamate teeth of Dorids, but rather more elongate.

This form closely resembles *Doridopsis fulva* of MacFarland (Nudib. Moll. of Monterey Bay in Bull. of Bureau of Fisheries, Washington, vol. xxv, p. 130, 1905). If they are identical, Cheeseman's name (1880) has priority.

#### GONIODORIS PUNCTATA, B.

*Goniodoris punctata*, Bergh : Mal. Unt. in Semper's Reisen, vi, 2, p. 91, 1905.

Two specimens from Akaroa Harbour, near Lyttelton, in the South Island. They are about 6.5 mm. long and of a uniform yellowish-green without any trace of the red spots found in Bergh's specimens. The dorsal margin has a jagged appearance, as it is marked by a line of 7-10 simple lancet-shaped processes on each side. Similar processes are found on the frontal margin. On the dorsal surface are scattered tubercles, about 5 in front of the rhinophores and 20 between the rhinophores and branchiæ. The part behind the branchiæ is smooth. The tubercles form three extremely irregular rows, of which that in the middle is most definite. Bergh describes it as a *Kamm*, but it is evidently not so well developed in my specimens as in those which he examined. The head is produced into a blunt projection on either side. The foot is not grooved in front and not produced at the corners. The rhinophores are rather large; they bear about 10 perfoliations and show no trace of sheaths or pockets. The branchiæ are 5 or 6, scanty and bipinnate.

The internal organs are as described by Bergh. On the labial cuticle is a ring (apparently consisting of two semicircles which nearly meet) composed of small rods with tips sometimes entire and sometimes divided. The formula of the radula is  $31 \times 2.0.2$ . The teeth are transparent. The inner tooth is large and bears at least 20 denticles. The outer tooth is a small plate, bearing in most cases a single low but distinct cusp.

#### ACANTHODORIS MOLLICELLA, Abraham.

*Acanthodoris mollicella*, Abraham : Proc. Zool. Soc., p. 262, pl. xxx, figs. 1-4, 1877.

One of Abraham's specimens examined. The external characters are as described by him. The dorsal papillæ are somewhat longer than usual. Two of the denticulations on the rhinophore sheath are

long and flat. The colour is a uniform olive-brown. The lateral ends of the oral veil are large and free. The spines in the integuments are much bent and irregular, but not branched.

The labial armature with its cuticular blades is as usual in the genus. It is composed of little columns split into three or four denticles at the top, and presents a very rough surface, almost like a radula. The formula of the radula is about  $24 \times 6 + 1 . 0 . 1 + 6$ . The first laterals are large with rather blunt tips and bear 4-5 denticles. The second, third, and fourth laterals are erect, and retain the hamate form. The fifth and sixth are plates. The vas deferens is long and bears a transparent armature which is difficult to see, but is apparently composed of disks bearing spines.

I think that this is probably the *A. pilosa*, var. *Novozealandia*, of Bergh (Mal. Unt. in Semper's Reisen, vi, 2, p. 94, 1905), but doubt if it is really the same species as *A. pilosa*, though undoubtedly nearly allied. The dorsal papillæ are longer, and there are differences in the rhinophore sheaths, labial armature, and radula.

#### ACANTHODORIS GLOBOSA, Abraham.

*Acanthodoris globosa*, Abraham: Proc. Zool. Soc., p. 262, pl. xxx, figs. 5-9, 1877.

One of Abraham's specimens examined. The external characters are as described by him, but it looks to me as if the animal had originally been black or bluish. The integuments are very thin, the dorsal tubercles sparsely scattered, and two of the processes on the rhinophore sheaths are larger than the others. The underside of the mantle is marked with reddish lines formed by spicules.

The internal organs are not well preserved, but the buccal parts are clear. Contrary to Abraham's statement, the labial armature with the two blades is quite distinct. It is formed of mace-like elements, swollen below the tip, but ending in a point and not denticulate or divided. They are set in unusually regular rows. The formula of the radula is about  $34 \times 7 + 1 . 0 . 1 + 7$ . The first lateral is of the usual shape and bears 3-4 denticles. The second to the sixth laterals are all erect, and, though much smaller than the first, retain something of the hamate shape. The seventh is a flat plate. No armature could be found in the genitalia. The vas deferens is long.

This is possibly identical with *A. metulifera*, Bergh (Mal. Unt. in Semper's Reisen, vi, 2, p. 98, 1905), described from a single specimen obtained in Tasmania, but there are differences of detail in the radula and labial armature.

#### NUDIBRANCHS FROM THE FALKLAND ISLANDS.

The small collection of Nudibranchs here described were all collected by Mr. Valentine, and, it would seem, all in Stanley Harbour, Falkland Islands. Two of them had been deposited in the Museum of Manchester University and were given me by Dr. Hoyle; for the rest I am indebted to Mr. Valentine himself.

The species are as follows:—



NAME.	DISTRIBUTION.
1. <i>Æolidia serotina</i> , Bergh (? = <i>Æ. papillosa</i> )...	An identical or closely allied species is recorded from the N. Atlantic, the N. Pacific, and Chile.
2. <i>Cratena Valentini</i> , n.sp. ... ..	Genus probably cosmopolitan: abundant in N. Atlantic and recorded from Chile.
3. <i>Galvina Falklandica</i> , n.sp. ... ..	Closely allied to <i>G. flava</i> from the N. Atlantic or identical.
4. <i>Coryphella Falklandica</i> , n.sp. ... ..	Closely allied to <i>C. lineata</i> from N. Atlantic or identical.
5. <i>Tritonia Challengeriana</i> , Bergh ... ..	Off the coast of Chile.
6. <i>Diaulula vestita</i> (Abraham)... ..	W. coast of Patagonia and Straits of Magellan, closely allied form from California.
7. <i>Staurodoris Falklandica</i> , n.sp. ... ..	The genera are well represented in the N. Atlantic.
8. <i>Acanthodoris Falklandica</i> , n.sp. ... ..	

The Falkland Islands are considerably farther south than New Zealand (Stanley is about 50° S.), and it is therefore natural that there should be no tropical element in the fauna. Two points are noticeable in the short list given above. Firstly, all the genera but one (and that a very doubtful identification) are characteristic of the North Atlantic, and three of the species are closely allied to and possibly identical with British forms. Secondly, two of the species are recorded from the coast of Chile, so that the east and west sides of the more southern portion of South America must have, to some extent at least, a common fauna.

#### ÆOLIDIA SEROTINA, Bergh.

*Æolidia serotina*, Bergh: Beitr. zur Kennt. der Acolidiaden, i, p. 619, 1874; id., "*Æolidia* (? var.) *pacifica*, n.sp.?" Nudib. of North Pacific, part i, p. 127, 1879; part ii, p. 131; id., *Æolidia papillosa* (= *Æ. serotina*), in Bull. of Mus. Comp. Zool. Harvard, p. 127, 1894; id., *Æolidia serotina*, Zool. Jahrb. Supp. IV, Fauna Chilensis, Bd. i, p. 541, pl. xxxi, figs. 26-31.

Three specimens, one marked Stanley Harbour.

The largest is grey and 30.5 mm. long, but is evidently much bent and contracted. It measures 30 mm. across the pericardium. The foot is strongly grooved in front, but not produced into projecting angles. In the middle of the back there are 15 distinct rows of cerata, set upon well-marked ridges. In all there seem to be about 40 rows, but they are much crowded near the rhinophores and tail. The bare space on the back is large and measures 12 × 5.5 mm. in the best preserved specimen, which is not the largest, and only 19 mm. long and 15 broad. The cerata are flat and not transparent. The anus is dextro-dorsal. The rhinophores are fairly long and stout in the best preserved specimens; wrinkled, but not perfoliate. The oral tentacles are also stout, and set far apart on the sides of the head.

The jaws are strong and bear no denticles. The radula consists of a single row of 18 teeth of the usual pectinate shape; the largest is about 1.5 broad. The basal strip is narrow from top to bottom, and not strongly curved or arched. The smallest bear 24 denticles, the

largest 38-40. There is no trace of bilobation, except that the middle of the tooth is generally marked by two denticles set in a V shape. The denticles are often broken or blunted, and it would appear that even when perfect they do not slope symmetrically to a point. The teeth are much like those of the *Æolidia serotina* found by Plate in Chile, and figured by Bergh (Opisth. Plate, Taf. xxxi, 26-31).

With that animal the present specimens seem to be identical. The large bare space on the back, the absence of projecting corners to the foot, and the shape of the teeth are points of resemblance. The radula was much longer in Plate's specimen, but about the same (22) in the one from Valparaiso described by Bergh in 1874.

Is this species identical with *Æolidia papillosa*? Bergh (see the references above) seems to have held different opinions on this point, but in his latest notice of the form (1898) he registers it as a distinct species. In this, as in other cases, it is perhaps safest to separate specimens coming from such widely different localities and known only in their preserved condition.

On the other hand, the three known species of *Æolidia* (*Æ. papillosa*, *Æ. serotina*, Chile and Falkland Islands, *Æ. herculea*, California) show few decided differences, and Bergh considers that the true *Æolidia papillosa* is found on the west coast of North America. *Æ. serotina* is said to be reddish when alive, but this need not be a specific difference, for I have seen large specimens of *Æ. papillosa* at Plymouth of a fine rosy-gray with greenish cerata.

CRATENA VALENTINI, n.sp. Pl. XXVIII, Figs. 4, 5.

Several specimens. As preserved they are white or brownish. A coloured figure (Fig. 5) by Mr. Valentine represents a mottled *Æolid* of stiff and irregular appearance, characters also found in the preserved specimens.

The larger specimens are about 10 mm. long, 3 broad, including the cerata, and 2.5 high to the top of the pericardium. The body looks tuberculate, especially at the sides, but this is due merely to the hermaphrodite gland showing through. There is no tail to speak of distinct from the body. The foot is apparently without natural projections at the anterior corners, but as preserved it varies greatly. The rhinophores and tentacles are of moderate size, wrinkled, but not really perfoliate. The cerata are not set opposite one another, which gives the whole animal an irregular appearance. There are 5-6 large ovate cerata, and at the base of each, generally a little behind it, a very small one. The hepatic diverticula are yellowish, not much branched, but bearing knobs. The anus lies on the right side, just below the dorsal margin; a little in front of it is the renal pore.

Three radulæ examined consisted of a single row of 22, 24, and 25 colourless transparent teeth respectively (Fig. 4). They have a moderately large central cusp bearing 7-8 denticles in the front teeth and 9 in those behind. The edge bearing these denticles forms a shelf distinctly on a lower level than the median and hinder part of the teeth, and only the first denticles are set on the same level as the central cusp.

The yellow membranous jaws bear a row of large irregular denticles. The tips are generally square and blunt, but sometimes split or fringed.

From a series of sections made it appears that there is a chitinous armature on the penis, but whether it is a spine or a tube could not be determined.

This species seems intermediate between *Amphorina* and *Cratena*. It has ovate cerata and a style or tube on the penis, features which ally it to *Amphorina*, but on the other hand the radula is not, as usual in that genus, long and tapering. It may perhaps be referred to *Cratena*. It does not seem to be *Cr. Cavanee* or *Cr. pusilla* recorded from Chile.

GALVINA FALKLANDICA, n.sp. Pl. XXVIII, Fig. 6.

Three specimens and also some spawn consisting of small white coils attached to hydroids. The coils are short and stout, semicircular or imperfectly circular, but never more complicated.

The animals are elongate, the largest 8 mm. long and 2 broad. The height is 2.75 to the tip of the pericardium, and the foot extends 2 mm. behind the last cerata. The first is white and the integuments colourless, but the whole animal appears yellow or fawn-coloured, owing to the hepatic diverticula and hermaphrodite gland showing through.

The foot is rounded in front, without lateral projections, and apparently connected with the head. The rhinophores (3 mm.) are much longer than the oral tentacles (about 1 mm.), wrinkled, but not really perfoliate. Behind them are visible two black eyes. The cerata are long (2.75-3 mm.), and longer in the smaller than in the larger specimens. They are rather stout, but hardly ovate, very erect, and somewhat as in Trinchese's figure of *Galvina flava* (*Æolidiæ* del Porto di Genova, vol. ii, pl. xxix, figs. 2-3). The plan of arrangement is not plain, but they are apparently set in about 6 groups, each containing 4 cerata as a maximum. The anus is lateral and rather far forward.

The jaws bear a single row of coarse denticles. In two specimens dissected the radula was found to consist of forty rows, tapering considerably, and each containing three teeth. The median tooth (Fig. 6a) bears a central cusp with four denticles on either side. The central cusp is much depressed, so that its point lies below the level of the lateral denticles, with the result that from certain points of view the tooth appears to be bilobed with no central cusp at all. It can, however, be found by focussing in all the rows. The side teeth (Fig. 6b) are of the shape usual in the genus, but rather thin and tall. Their outline is curved, not rectangular.

The dentition of this species is not unlike that of *G. flava*, *G. viridula*, and *G. rupium*, and it is possible that it may be identical with the first of these, but until further information about the living animal is forthcoming I think it safer to register it as a separate species.

## CORYPHELLA FALKLANDICA, n.sp. Pl. XXVIII, Fig. 7.

Cf. *C. lineata*, A. & H.: Monograph., Fam. 3, pl. xvi; Vayssière, Ann. du Mus. d'Hist. Nat. de Marseille, p. 73, 1886.

Three specimens seem referable to this form. The largest is 16 mm. long, 9 wide across the cerata and pericardium, with a bare space on the back measuring  $9 \times 4$  mm. In colour they are uniformly yellowish or greenish white, with traces of white lines on the tail of one specimen.

As preserved, the animals are probably less elongate than in life. The head and foot are broad; the tail short, but distinct and without cerata; the margins of the foot and mantle well developed; the anterior margin of the foot slightly bilobed, and grooved with short but distinct projections at the corners. The rhinophores and tentacles are thick, the latter set rather far back, in many cases showing artificial wrinkles, but not really perfoliate. The largest cerata are inside, as much as 6 mm. long; the outermost are mere tubercles. No clear arrangement in transverse rows can be made out, but the cerata are set all along the side of the back in 4-6 irregular longitudinal lines. They vary greatly in transparency; the hepatic diverticula within them, when visible, are yellowish, smooth, and extend almost to the tip. The larger cerata are somewhat sunken in the middle and pointed at the tip, but not very symmetrical in shape. The genital orifice is just under the rhinophores; the anus lies about half-way between the head and tail, immediately under the mantle-margin. The eyes are minute and invisible externally.

The jaws have a bright metallic lustre, and bear at least 10 rows of small pyramidal denticles. The radula consists of 11-12 rows, each containing three teeth of the shape usual in the genus. The median tooth (Fig. 7a) has a horse-shoe base and a central cusp with 6-8 lateral denticles. The usual number is 7, but they vary both in number and shape. On some teeth they are much more curved than on others, and their edge is sometimes finely striated. In all cases there are two denticles rather high up, but sometimes the cusp rises smooth and clear-cut above them, in others it bears an extra pair of denticles. The lateral teeth (Fig. 7b) are thin and straight; the base is hollowed out, and the tip is sometimes bent a little back. They bear 14-16 (usually 14) saw-like denticles on the inside. This serrulation is often irregular and rudimentary, ill-formed denticles being found among more perfect ones.

This form is nearly allied to several species from the Northern Atlantic and Mediterranean, and may even be identical with *C. lineata*, but the colour and markings of the living animal are unknown, and I register it provisionally as a new species.

## TRITONIA CHALLENGERIANA, Bergh.

*Tritonia Challengeriana*, Bergh: Challenger Reports, vol. x, pt. 26, Nudibranchiata, p. 45.

Eight specimens from the Falkland Islands. The notes allude to one being red and one white. Most of them are obviously bent and

distorted, but the real shape is probably linguiform with a tail, and the largest, if straightened out, would be about 45 mm. long and 17 wide. As preserved, some are white and some are green; the back is covered with low soft warts, which are clearest near the tail. The rhinophore sheaths are of moderate size, reflexed and not digitate. The frontal veil bears 10-15 processes. On either side of the body is a continuous row of 16-19 small branchial tufts, but the number is not always identical on the two sides. The tufts consist of 2-3 main stems bearing secondary branches, with small tertiary branches here and there. The jaws are olive-green, with 7-8 rows of very distinct denticles. The radula examined consisted of 42 rows with a maximum formula of  $45 + 1 + 1 + 1 + 45$ . The median teeth are tricuspid and hollowed out behind, the first lateral stout and rather clumsy, the rest rather elongate and curved near the tips.

#### DIAULULA VESTITA (Abraham).

*Doris vestita*, Abraham: Proc. Zool. Soc., p. 252, pl. xxviii, figs. 5, 6, 1877. = *Diaulula Sandiegensis*, var. *pallida*, Bergh: Bull. of Mus. of Comp. Zool. Haryard, p. 172, 1894.

I have examined two specimens of this form, one obtained by Mr. Valentine in the Falkland Islands and one from the Straits of Magellan, preserved in the British Museum and described by Abraham as *Doris vestita*. The specimens agree in both external and internal features, but the intestines are somewhat decayed in both.

The larger (Mr. Valentine's) is 45 mm. long, 22 broad, and 18 high, but the real breadth was probably much greater, as the ample mantle-edge (9 mm. broad in some places) is turned inwards. In both specimens there are rents in the mantle which make it probable that autotomy was commencing when the animals died. The texture is spiculous, much harder and rougher in one specimen than the other. The colour is whitish with here and there a yellowish tinge.

There is no trace of a dorsal ridge or keel, but the back is covered with small, flat-topped tubercles of various sizes, the largest not more than .75 mm. high and .5 mm. broad. They are full of spicules, about seven of which project from the top of each and form a sort of crown. These spicules, which are also found in great quantities in the rest of the integuments, are long, colourless, slender, and fairly straight, not branched or swollen. The rhinophorial pockets are closed, but appear to have been protected by rather high sheaths with denticulate edges. The margin of the branchial pocket shows indistinct undulations or jags, five in one specimen, nine in the other. The branchiæ are much contracted, short, stout, and bi- or tripinnate. They may be counted as either nine or five, according as the smaller plumes are reckoned as independent or as subdivisions. The foot is grooved and notched in front. The tentacles are small and digitate.

The intestines are yellowish. On the labial cuticle is a collection of granules forming a grey strip, which has not, however, in either specimen the usual appearance of a labial armature, and does not contain rods or hooks. The radula is small, consisting of 20 and 22 rows, which contain respectively 31 and 26 yellowish teeth on

either side of the rhachis, as a maximum. The innermost are low with blunt tips. The teeth increase in size outwards: the first 5-6 are small, the rest rather large; about the middle of the half row are generally one or two teeth markedly taller than the rest. The one or two outermost are thin and erect, but not tall.

The stomach is not enclosed in the liver, and is laminated internally. The central nervous system is as in *Archidoris*. The pedal ganglia are round; the cerebral and pleural divisions are not very distinctly separated; the buccal ganglia are elliptical, strongly granulated, and united by a short commissure; the gastro-oesophageal ganglia are united to them by short connectives and irregularly globular. The genitalia also seemed much as in *Archidoris*, and entirely without armature. The upper part of the vas deferens is soft and much coiled; the lower part is straighter and muscular. The spermatheca is large and round; the spermatocyst elongate. A distinct prostate was not found, but its absence cannot be considered certain.

I consider the type-specimen of Abraham's *Doris vestita* as undoubtedly the same species as the animal found by Mr. Valentine in the Falkland Islands, and both of them as probably identical with the *Diaulula Sandiegensis*, var. *pallida* of Bergh from Cape Delgada on the east coast of Patagonia (Argentine Republic), 42° 24' S., 61° 38' W. It seems to me, however, safer to treat the form provisionally as a new species, and not as a mere variety. *D. Sandiegensis* is marked with dark rings which are totally absent in the specimens from the Atlantic side and the Straits of Magellan, and there may be other differences of detail. The resemblance in the radulæ is striking, but I could not demonstrate the existence of a large prostate,<sup>1</sup> although the vas deferens has a thick prostatic portion. But one specimen was old and the other much hardened.

The animals also agree in many details with *Trippa* (?) *hispida*, Bergh, from the coast of Chile (Bergh, *Opisthobranchier der Sammlung* Plate, 1898, p. 52). In fact, they differ in hardly any point except that they have no trace of a dorsal ridge. They even seem to have glandular masses attached to the outer surface of the tube leading into the buccal cavity, as figured by Bergh for *T. hispida* (l.c., pl. xxxi, fig. 1), but the state of preservation makes it impossible to be sure of the character of these organs. The animal, which is referred by Bergh to *Trippa* with a query, seems to me to be practically a *Diaulula* with a median dorsal ridge. Much the same may be said of *Atagema* (Gray, 1850). Bergh describes the back of *A. carinata* as "ganz fein chagriniert," but Quoy & Gaimard say that it was covered with "petits poils rudes," which they represent in their figure.

*Diaulula Capensis*, Bergh, also seems in many ways an allied species.

#### STAURODORIS FALKLANDICA, n.sp.

One specimen obtained by Mr. Valentine and given me by the Manchester University Museum. It is soft, almost globular, and as

<sup>1</sup> Also in these specimens the stomach seems to be external to the liver, whereas in the typical *D. Sandiegensis* it is included in it.

preserved about 19 mm. long, 18 high, and 16 broad, but is bent and was probably considerably longer in life.

The dome of the back is purplish grey with traces of yellow on the tubercles. There are also traces of bright yellow near the rhinophores, on the branchiæ, and on the foot. The back is covered with round, flattish tubercles, the largest 3 mm. wide, but most not more than a third of that size. About 12 of the largest are disposed in an irregular series so as to form three not very clear lines. In the intervals between them are smaller tubercles which become still smaller and more crowded near the edges of the mantle.

The tentacles are flat. The margin of the foot is grooved, but not notched. Round each of the rhinophorial openings are set about seven tubercles, but they are not differentiated from the others on the dorsal surface. The rhinophores are yellow and bear about 15 perfoliations. The margin of the branchial pocket is marked by a line of inconspicuous tubercles. They resemble those of the rhinophores and dorsal surface generally, and do not look as if they could in any circumstances close over the pocket, which is of an unusual construction. It is very shallow, especially behind and at the sides; a little, but not much deeper in front. It can hardly be doubted that the animal is a crypto-branchiate Dorid, but the pocket, as preserved, is merely a special area a little lower than the dorsal surface. A somewhat similar phenomenon is seen in several species of *Doridopsis*. The branchiæ consist of 12-13 small bright-yellow plumes, mostly bipinnate, but some simply pinnate.

The main colour of the intestines is a bright deep purple. The central nervous system lies far forward, but the position is perhaps not natural. The three pairs of ganglia are distinct; the pleural portion of the cerebro-pleural ganglia rather large; the eyes sessile.

The labial cuticle is strong and brown, but without armature. The radula is rather small, consisting of 25 rows with a formula of 24. 0. 24. The teeth are colourless, simply hamate, small inside, and increasing up to the middle of the row. The outermost shorter, but not much degraded, and not denticulate. The œsophagus is long and describes a complete circle behind the buccal mass. The stomach lies in the anterior cleft of the liver. Its upper wall is much laminated internally; the intestine is long. The gall-bladder is purple, and so is the liver both within and without, but in places the colour is somewhat dimmed by the sparse, greenish hermaphrodite gland.

The genitalia are also purplish. The duct of the hermaphrodite gland is rather long. The mucus and albumen glands are not large. The spermatheca is purple, large, and globular, but the spermatocyst rises so close to it as almost to form a swelling on its side. The duct dilates, and the two receptacles rise together. Something similar is seen in Bergh's figures of *St. Januarii* (in Semper's Reisen, Supp. ii, pl. c, fig. 23). The vas deferens is tough and strong. No prostate was found and no armature.

This form also resembles *St. Januarii* (which is probably a variety of *St. verrucosa*) in its yellowish colour and red intestines, but the arrangement of tubercles round the branchiæ and rhinophores is

different, the radula is much smaller, and the structure of the branchial pocket is very peculiar. It is hard to say if the appearance of this organ as preserved is natural. It seems best to register the form provisionally as a new species, which may be intermediate between *Staurodoris* and *Ctenodoris*.

ACANTHODORIS FALKLANDICA, n.sp. Pl. XXVIII, Fig. 8.

One specimen from Manchester Museum. No notes, except a label saying that it forms part of Mr. Valentine's collection from the Falkland Islands.

The shape is somewhat triangular or linguiform. The length 25 mm., the maximum breadth 18, the height 13. The animal seems well preserved, except for a rent in the right side which has carried away some of the genitalia. It is plump and soft, yellowish brown in colour, with a pinkish or purplish tint in places owing to the intestines showing through the semi-transparent integuments. The rhinophores and branchiæ are lighter and more distinctly yellow than the rest of the dorsal surface, the foot yellow, the orifice of the genitalia bright yellow.

The back is covered with papillæ of various sizes, not set very closely. They are hyaline, but appear white in some lights. On the under-side of the mantle are vein-like lines produced by spicules seen through the integuments. These spicules are abundant everywhere on the dorsal surface and mantle-margin. They are brownish, irregular and undulated in outline, but always in one piece and never branched. Their surface is often granulate, and they are sometimes jointed. Among them are found numerous roundish granules.

The rhinophore pockets are bounded by a raised hyaline edge bearing two processes in front and three behind. These processes are not conspicuous as preserved, but are perhaps contracted. The rhinophores have a long stalk and about 25 perfoliations. The branchial area is not a pocket, and bears papillæ like the rest of the back, from which it is hardly differentiated. The plumes are 7 or 8, two being close together and bipinnate, but as the main axis lies flat and is attached to the back for most of its length they appear simply pinnate in many places. The foot is triangular, pointed behind, and with a rather long tail (8 mm.). The anterior margin is slightly grooved, but not notched. Over the mouth are two flaps which can be described either as an oral veil deeply bilobed or as unusually large strap-like tentacles. But perhaps the bilobation is not natural. The mantle-edge is ample, and bears above the mouth and also above the tail hard brownish accretions, somewhat resembling those of *Archidoris fulva*-except in colour.

On opening the body the genitalia are seen to be highly developed. The whole of the right side is filled by the large white mucus gland, and the light-yellow follicles of the hermaphrodite gland are plentifully spread over the top and side of the liver, but do not extend far on the under-side. The liver itself is greenish, not bifid behind, and hollowed out on the right-hand side to receive the genitalia. The intestine issues near its anterior end and turns backwards at once.



In the central nervous system the pleural ganglia form a very distinct round swelling at the base of the cerebral. The pleural lie below. The buccal ganglia were not found. The blood-gland is small. The salivary glands of moderate size and band-like.

The buccal mass is surmounted by the sessile *ingluvies buccalis*, which is divided into two longitudinal halves striped transversely. The labial armature consists of two small yellowish plates, perhaps really united into a ring, formed of short rods or columns with a point at the top, so that when seen from above they appear as disks with a dot in the centre. The radula consists of 33 rows with a maximum formula of 7 . 1 . 0 . 1 . 7. The first lateral (Fig. 8*a*) is large, of the shape usual in the genus, with a varying number of denticles at the side. Sometimes there are none; usually 4-5 distinct, with 2-3 others less distinct below, occasionally as many as 12. The second lateral (Fig. 8*b*) has a distinct cusp, and traces of it remain even in the last tooth (Fig. 8*e*). Not more than seven teeth were seen with certainty in any row.

The male genitalia appear to be armed, not with hooks, but with elongate granulate scales, but the rent in the side has injured these organs so much that it is impossible to say if these scales are really on the vas deferens. The vagina is long and thin, and has an accessory flocculent gland. The spermatheca and spermatocyst are large, but flattened and empty.

This specimen does not seem referable to any of the species already described. The structure of the branchiæ is not very plain, but they are smaller and simpler than is usual in the genus. The *Acanthodoris Vatheleti* of Rochebrune & Mabille (Mission Scientifique du Cap Horn, 1882-3, p. 11) may perhaps be this animal, but the description is so slight that it is not even certain that it represents an *Acanthodoris*.

#### CALYCIDORIS, Abraham.

I examined the type-specimens of this genus preserved in the British Museum, under the impression that they probably came from New Zealand or Chile. The habitat is unknown, but the collector had also been in Bering Straits, and the affinities of the form make it possible that it was collected there. I append some notes on it, as Abraham's description is not correct in all respects.

#### CALYCIDORIS GÜNTHERI, Abraham. Pl. XXVIII, Fig. 9.

*Calycidoris Güntheri*, Abraham: Ann. Mag. Nat. Hist., vol. xviii, p. 132, pl. vi, figs. 1-1*c*, 1876.

Through the kindness of Mr. E. A. Smith I have been allowed to examine the type-specimens of this interesting form. They are three in number, and in spite of their age, which must be considerable, well preserved externally. The external features are correctly described by Abraham. The foot is triangular, with a fairly broad margin all round. Anteriorly the sole is terminated by a shallow furrow; beyond this is another furrow, and beyond that a fleshy ridge of the same breadth as the foot, with a cleft for the mouth, which is ventral,

in the middle, and slightly developed tentacular projections at the end. The whole organ has the appearance of being part of the foot rather than an oral veil.

The branchiæ are as described by Abraham. In the specimen which I dissected they consist of 22 simply pinnate laminæ, set in a cavity 1.5 mm. deep. It does not seem probable that this pocket can ever close over the branchiæ, but still it is a distinct cavity and not merely a differentiated part of the dorsal surface.

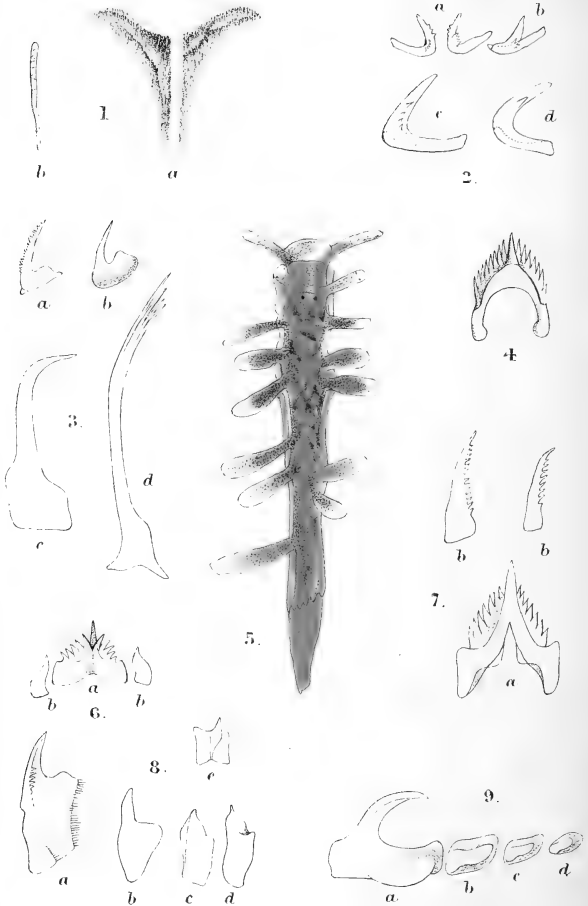
The intestines are of a uniform yellow colour. On the top of them lies a dendritic organ, probably the kidney. The blood-gland is single. In the central nervous system (which is somewhat decayed) the pedal ganglia seem to be large and round, and the cerebro-pleural ganglia divided into two fairly distinct parts, both of them triangular and elongate. The eyes are set on short stalks.

The buccal mass is fairly large. The top part of it is formed by a sessile crop, divided into two halves longitudinally. No striation is visible, but it may have disappeared. The labial armature is distinct, and composed of bent rods with rather wavy outlines and swollen ends. Two blade-like thickenings or projections are developed on the cuticle. Abraham's description of the radula is not correct. The formula is  $26 \times 3 + 1 . 0 . 1 + 3$ . The first lateral (Fig. 9a) is dark-brown and large, much as in *Adalaria proxima*, simply hamate, not denticulate; the base is very large in proportion to the shaft. The three outer teeth (Figs. 9b-d) are roughly oval plates, decreasing in size outwards, and each bearing a ridge. The liver cavity seems to act as the stomach. The intestine describes a very short coil in front and then runs backwards.

The genitalia are somewhat decayed, but some features are still plain, particularly the extraordinary length of both the male and female ducts. The vas deferens, which is rather thick, seems to wind under the buccal mass. It is armed with minute transparent scales, which under the highest power are seen to bear a small prominence. The spermatheca is large, the spermatocyst smaller and round. They arise from an elaborately coiled duct, which surrounds them with ample convolutions and apparently passes into the vagina. The hermaphrodite gland seems to be spread over the liver in the usual way.

I think it possible that this species is identical with the animal subsequently described by Aurivillius (Vega Expedition, vol. iv, pp. 372 and 380) as *Doris (Adalaria) Siberica*, and by Krause (Mollusken von Ostspitzbergen, in Zool. Jahrb., 1892, p. 364) as *Doris (Acanthodoris) Siberica*. The agreement in the buccal parts is remarkable, and Krause says "die Vagina war sehr lang, 40 mm. bei dem grössern Stück." But neither observer notices the gill-cavity, though they mention that the gills are more numerous than is usual in *Acanthodoris*. Yet the said cavity is perfectly plain in all three specimens of *Calycidoris*, and looks like a natural and conspicuous feature. The habitat of *Calycidoris* is unknown, but according to the records of the British Museum it was obtained by J. O. Goodridge, a surgeon in the Royal Navy, who is known from other entries to have collected in Bering Straits and on the west coast of South America.





J. Green lith. et imp.

NUDIBRANCHS FROM NEW ZEALAND  
& THE FALKLAND IS.

I think the genus *Calycidoris* had better be maintained, unless it can be shown that the peculiar branchial cavity is not a natural and permanent arrangement. It differs from *Acanthodoris* in the presence of this cavity, in having numerous simply pinnate branchiæ, and no denticles on the first lateral tooth. It is thus in some ways intermediate between *Acanthodoris* and *Adalaria*.

## EXPLANATION OF PLATE XXVIII.

- FIG. 1.—*Alloiodoris lanuginata*: *a*, labial armature; *b*, a single rod from the same.  
 ,, 2.—*Alloiodoris lanuginata*: radula: *a*, two first laterals; *b*, second lateral; *c*, a tooth from the inner part (3-15) of the half row; *d*, a tooth nearer the end of the row.  
 ,, 3.—*Rostanga muscula*: radula: *a*, first lateral; *b*, second to eighth laterals; *c*, ninth to thirty-sixth laterals; *d*, thirty-seventh to eighty-second laterals.  
 ,, 4.—*Cratena Valentini*: a tooth.  
 ,, 5.—*Cratena Valentini*: living animal.  
 ,, 6.—*Galvina Falklandica*: a row of the radula: *a*, median; *b*, lateral teeth.  
 ,, 7.—*Coryphella Falklandica*: a row of the radula: *a*, median; *b*, lateral teeth.  
 ,, 8.—*Acanthodoris Falklandica*: *a*, first lateral; *b*, second lateral; *c*, third lateral; *d*, fourth and fifth laterals; *e*, sixth and seventh laterals.  
 ,, 9.—*Calycidoris Güntheri*: *a*, first lateral; *b*, second; *c*, third; *d*, fourth.
-

DESCRIPTIONS OF NEW SPECIES OF AUSTRALIAN *PLANISPIRA*  
AND *CHLORITIS*.

By HUGH C. FULTON.

Read 14th June, 1907.

*PLANISPIRA* (*TRACHIOPSIS*) *ACUTICOSTATA*, n.sp.

Shell depressed globose, umbilicus a little less than 3 mm. in width, sub-transparent, shining, light-horn colour; whorls 5, moderately convex, lower two with close-set, oblique riblets or costæ, upper whorls smoother; aperture subcircular, water-white within, peristome white, slightly expanded, columella triangularly dilated at point of insertion. Maj. diam.  $15\frac{1}{2}$ , alt. 11 mm.

*Hab.*—Dalrymple, Queensland.



Very similar in coloration to *T. Delessertiana*, Le Guillou, but easily distinguished by its more globular form and its sharply produced costæ, both above and below. In *Delessertiana* the costæ are very obtuse on the under side.

Mr. Chas. Hedley, to whom I sent for examination the types of this and the following species, informs me that they have specimens of both species in the Australian Museum; he also kindly informs me that *Delessertiana* does not occur so far south as the locality of *acuticostata*.

*CHLORITIS* (*AUSTROCHLORITIS*) *HEDLEYI*, n.sp.

Shell subglobose, moderately thin, light brown, umbilicus narrowly open to about 1 millim. at widest part and partly covered by the columella, without the lens apparently smooth, except for some



few indistinct lines of growth, under the lens the earlier whorls are seen to have oblique, blunt striæ, and the lower whorls are covered with irregularly arranged hair-scars; whorls 5, moderately convex, the front of the last having a very faint indication of angularity; aperture subcircular, pellucid within; peristome whitish, thin,

slightly expanded, margins connected by a thin callus; columella expanded at point of insertion. Maj. diam. 17, alt. 13 mm.

*Hab.*—Scrubs, Herbert River, Queensland.

The nearest species to this known to me is *C. Blackhalli*, Braz., but *Hedleyi* can be readily separated by its much less numerous hair-sears; in *Blackhalli* they are quite four times as numerous as in *Hedleyi*; the latter has also a slightly higher spire and rather more convex whorls.

Mr. G. K. Gude, who has been kind enough to examine this shell, writes: "This does not match with anything, though it comes nearest to my *exilis*; the hair-sears are, however, much less crowded."

---

THE PRESENCE OF A DOUBLE WALL IN SOME SPECIES OF THE  
*DIAPHORA* GROUP OF *ENNEA*.

By HUGH C. FULTON.

Read 14th June, 1907.

UPON breaking open a specimen of *Ennea* (*Diaphora*) *Möllendorffi*, Hid., in order to examine its internal structure, I found that from about the fifth whorl from the apex down to about the eleventh there is a double wall, thus reducing the size of the cavity occupied by the mollusc. Of other species of this group examined by me the following have the same structure: *Ennea* (*Diaphora*) *pleistogyra*, Mölldff., and *E. Morleti*, Hidalgo.



I was unable to find this double wall in *E. (Diaphora) dicraspedia*, Mölldff., *Locardi*, Hid., *Quadrasi*, Mölldff., and *tuba*, Mölldff.; in the last-named species the earlier whorls are cut off from the latter ones by a septum.

*Diaphora* was created by Albers in 1850 for *Cylindrella Cumingiana*, Pfr., a species that does not appear to have been found again by recent collectors.



# INDEX TO VOL. VII.

A † is prefixed to the names of fossil species.

	PAGE		PAGE
<i>Acanthodoris Falklandica</i> , n.sp. (fig.) . . . . .	358	<i>Antiopella Novozealandica</i> , n.sp. . . . .	331
— <i>globosa</i> , Abraham . . . . .	350	<i>Apheloris affinis</i> , n.sp. . . . .	343
— <i>mollicella</i> , Abraham . . . . .	349	— <i>Cheesemani</i> , n.n. . . . .	342
<i>Achatina Dennisoni</i> , Reeve . . . . .	313	Aplysiidae, anatomy . . . . .	51
— <i>Greyi</i> , n.sp. (fig.) . . . . .	226	<i>Arca</i> ( <i>Scapharca</i> ) <i>Fultoni</i> , n.sp. (fig.) . . . . .	302
— <i>Jacobi</i> , n.sp. (fig.) . . . . .	11	<i>Archidoris fulva</i> , n.sp. . . . .	336
— <i>magnifica</i> , Pfeiffer (fig.) . . . . .	313	— <i>Wellingtonensis</i> (Abraham) . . . . .	335
— <i>obscura</i> , n.sp. (fig.) . . . . .	227	† <i>Aviculopecten rugulosus</i> (McCoy) (fig.) . . . . .	289
— <i>ovata</i> , n.sp. (fig.) . . . . .	226	<b>B.</b>	
— <i>subovata</i> , n.sp. (fig.) . . . . .	227	Beddome, R. H., 'Notes on Indian and Ceylonese species of <i>Glessula</i> ' . . . . .	160
— <i>transparens</i> , n.sp. (fig.) . . . . .	226	Bednall, W. T., and Matthews, E. H. V., 'On new species of Polyplacophora from South Australia' . . . . .	91
— <i>virgulata</i> , n.sp. (fig.) . . . . .	227	† Belemnite, Arms of (fig.) . . . . .	269
— <i>zebrina</i> , n.sp. (fig.) . . . . .	227	Blanford, W. T., obituary notice and portrait . . . . .	64
<i>Acmaea Campbelli</i> (Filhol) (fig.) . . . . .	321	Bloomer, H. H., 'On the Anatomy of <i>Ensis macha</i> , <i>Solen Fonesii</i> , and <i>S. viridis</i> ' . . . . .	18
— <i>cantharus</i> (Reeve) (fig.) . . . . .	320	— 'On the Anatomy of <i>Tagelus gibbus</i> and <i>T. divisus</i> ' . . . . .	218
— <i>cingulata</i> , Hutton (fig.) . . . . .	316	<i>Bourcieria</i> . . . . .	312
— <i>dædala</i> , n.n. (fig.) . . . . .	323	Bourne, G. C., 'Note, to correct the name <i>Jousseaumia</i> ' . . . . .	260
— <i>dædala</i> , subsp. <i>subtilis</i> , n. subsp. (fig.) . . . . .	324	Bridgman, F. G., 'Description of a new species of <i>Oliva</i> ' . . . . .	17
— <i>fragilis</i> (Chemnitz) (fig.) . . . . .	317	— 'Note on a new variety (var. <i>longispira</i> ) of <i>Oliva ispidula</i> ' . . . . .	195
— <i>intermedia</i> , n.sp. (fig.) . . . . .	316	Bullen, R. A., 'On some Land and Fresh-water Mollusca from Sumatra,' Part I . . . . .	12
— <i>parviconoidea</i> , n.sp. (fig.) . . . . .	321	— 'Notes on a Holocene deposit at Harlton, Cambs' . . . . .	85
— <i>parviconoidea</i> , var. <i>leucoma</i> , n.var. . . . .	322	— 'On some Land and Fresh-water Mollusca from Sumatra,' Part II . . . . .	126
— <i>parviconoidea</i> , var. <i>nigrostella</i> , n.var. (fig.) . . . . .	322	<i>Bullia cinerca</i> , n.sp. (fig.) . . . . .	34
— <i>pileopsis</i> (Q. & G.) (fig.) . . . . .	319		
— <i>roseoradiata</i> , n.sp. (fig.) . . . . .	317		
— <i>rubiginosa</i> (Hutton) (fig.) . . . . .	315		
— <i>scapha</i> , n.sp. (fig.) . . . . .	324		
— <i>septiformis</i> (Q. & G.) (fig.) . . . . .	318		
— <i>stella</i> (Lesson) (fig.) . . . . .	325		
— <i>stella</i> , subsp. <i>corticata</i> , Hutton (fig.) . . . . .	325		
Acmaeidae of New Zealand . . . . .	315		
<i>Æliodia serotina</i> , Bergh . . . . .	351		
<i>Alloidoris lanuginata</i> (Abraham) (fig.) . . . . .	333		
<i>Amalthea lissa</i> , Smith (fig.) . . . . .	82		
<i>Amphicyclotus Chanapoyasensis</i> , n.sp. (fig.) . . . . .	9		
<i>Amphorina pallida</i> , n.sp. (fig.) . . . . .	155		
Ancey, C. F., obituary notice . . . . .	245		

	PAGE		PAGE
Burne, R. H., 'Notes on the Anatomy of South African Aplysiidae, with descriptions of two new species'	51	<i>Chloritis Moellendorffi</i> , Ancey (fig.)	44
<i>Burtoa Nilotica</i> (Pfr.), anatomy	197	— <i>muuda</i> , n.sp. (fig.)	229
C.			
<i>Cadlina Clarae</i> , von Ihering, juv. (fig.)	144	— <i>norocambrica</i> , n.sp. (fig.)	49
<i>Cadulus campylus</i> , n.sp. (fig.)	80	— <i>obnubila</i> , n.sp. (fig.)	232
<i>Calliostoma Formosensis</i> , n.sp. (fig.)	205	— <i>Ponsonbyi</i> , n.sp. (fig.)	42
<i>Callochiton sulcatus</i> , n.sp. (fig.)	294	— <i>Poorei</i> , n.sp. (fig.)	231
<i>Calycidoris Guntheri</i> , Abraham (fig.)	359	— <i>rufofasciata</i> , n.sp. (fig.)	109
† <i>Camptonectes curvatus</i> (Geinitz) (fig.)	284	— <i>silenus</i> , Angas (fig.)	47
<i>Capulus lissus</i> , Smith	81	— <i>subtilis</i> , n.sp. (fig.)	44
† — <i>margarita</i> , G. S. Boulger (fig.)	287	— <i>Sykesi</i> , n.sp. (fig.)	110
<i>Cardium (Trachycardium) Waitakense</i> , n.sp. (fig.)	209	— <i>teres</i> , n.sp. (fig.)	106
<i>Cassidaria rugosa</i>	67	— <i>Thales</i> , n.sp. (fig.)	232
<i>Cearella</i> , n.n.	68	— <i>ungulina</i> , Martens, var. <i>fusca</i> , n.var.	41
<i>Cerithiopsis Mathildaeformis</i> , n.sp. (fig.)	71	<i>Chromodoris amæna</i> , Cheeseman	345
<i>Chiton aureomaculatus</i> , n.sp. (fig.)	91	— <i>aureo-marginata</i> , Cheeseman	346
— <i>clavatus</i> , n.sp. (fig.)	296	<i>Clathrella Marshalli</i> , n.sp. (fig.)	186
— <i>Torri</i> , n.sp. (fig.)	295	— <i>nivea</i> (Monterosato) (fig.)	187
<i>Chloritis</i> (Gude)	40	— <i>pseudohystrix</i> , n.n.	187
— list of species	111	<i>Clausilia robustior</i> , n.sp. (fig.)	127
— <i>Ætinaensis</i> , n.sp. (fig.)	233	— <i>Sumatrana</i> , Martens (fig.)	127
— <i>Agamemnon</i> , n.sp. (fig.)	108	<i>Coliolum thrix</i> , n.sp. (fig.)	224
— <i>astæus</i> , n.sp. (fig.)	108	<i>Columbella (Seminella) comisteæ</i> , n.sp. (fig.)	75
— ( <i>Austrochloritis</i> ) <i>Hedleyi</i> , n.sp. (fig.)	362	<i>Conus Bougei</i> , n.sp. (fig.)	299
— <i>Beaddomei</i> , n.sp. (fig.)	105	Cooper, J. E., 'Holocene Mollusca from Staines'	310
— <i>brevipila</i> , n.sp. (fig.)	48	<i>Corneoeyclas Aucklandica</i> , n.sp. (fig.)	211
— <i>Challengeri</i> , n.sp. (fig.)	108	<i>Coryphella Falklandica</i> , n.sp. (fig.)	354
— <i>cognata</i> , n.sp. (fig.)	231	<i>Cratena Valentini</i> , n.sp. (fig.)	352
— <i>conjuncta</i> , n.sp. (fig.)	47	<i>Crepidula fornicata</i> (L.)	62
— <i>conomphala</i> , n.sp. (fig.)	229	Crick, G. C., 'On the Arms of the Belemnite'	269
— <i>Cumingi</i> , n.sp. (fig.)	48	<i>Crossea eryma</i> , n.sp. (fig.)	70
— <i>disjuncta</i> , n.sp. (fig.)	49	Crossland, C.	131
— <i>Eduardi</i> , n.sp. (fig.)	41	<i>Cryptodon Murchlandi</i> , n.sp. (fig.)	303
— <i>eurychasma</i> , n.sp. (fig.)	110	<i>Crystallopsis tricolor</i> (Pfr.) (fig.)	234
— <i>exigua</i> , n.sp. (fig.)	48	<i>Ctenodoris</i> , n.subgen.	338
— <i>exilis</i> , n.sp. (fig.)	230	<i>Ctenodoris flabellifera</i> (Cheeseman)	339
— <i>fausta</i> , n.sp. (fig.)	45	<i>Curvella alabastrina</i> , n.sp. (fig.)	99
— <i>fraterna</i> , n.sp. (fig.)	47	— <i>minuta</i> , n.sp. (fig.)	99
— <i>fraudulenta</i> , n.sp. (fig.)	107	<i>Cyclophorus (Amplus) eximius</i> , var. <i>Rouyeri</i> , n.var. (fig.)	12
— <i>heteromphalus</i> , Pilsbry (fig.)	196	<i>Cyclostrema charmophron</i> , n.sp. (fig.)	24
— <i>holoserica</i> , n.sp. (fig.)	106	— ( <i>Delphinoidea</i> ) <i>Prestoni</i> , n.sp. (fig.)	29
— <i>lanuginosa</i> , n.sp. (fig.)	230	— <i>euchlopteron</i> , Melv. & St. (fig.)	25
— <i>Layardi</i> , n.sp. (fig.)	49	— <i>cumares</i> , Melv. (fig.)	25
— <i>macrostoma</i> , n.sp. (fig.)	42	— <i>novem-carinatum</i> , n.sp. (fig.)	22
— <i>Mansonensis</i> , n.sp. (fig.)	109	— <i>placens</i> (Melv. & St.) (fig.)	25
— <i>Martensi</i> , Pfr. (fig.)	41	— <i>quinque-carinatum</i> , n.sp. (fig.)	24
— <i>micromphala</i> , n.sp. (fig.)	231	— <i>solariellum</i> , Melvill (fig.)	24
— <i>misella</i> , n.sp. (fig.)	232	Cyclostrematide	21
		<i>Cylichna collyra</i> , n.sp. (fig.)	79

	PAGE
<i>Cypræa cruenta</i> , var. <i>tortirostris</i> , var. nov. (fig.) . . . . .	39
† <i>Cyprina lineolata</i> (J. Sowerby) (fig.) . . . . .	284
<i>Cythara optabilis</i> , n.sp. (fig.) . . . . .	300
— <i>striatissima</i> , n.sp. (fig.) . . . . .	299
D.	
Da Costa, S. I., 'Descriptions of new species of <i>Drymæus</i> , <i>Amphicyclotus</i> , and <i>Neocyclotus</i> , from South and Central America' . . . . .	7
— 'Description of a new species of <i>Achatina</i> from Mash- onaland' . . . . .	11
— 'Descriptions of new species of land shells from Peru and Colombia, and two new species of <i>Curvella</i> from the Philippine Islands' . . . . .	97
— 'Descriptions of seven new species of <i>Achatina</i> from the Congo Free State' . . . . .	226
— 'Descriptions of new species of <i>Drymæus</i> from Peru, Mexico, etc.' . . . . .	304
<i>Daphnella</i> ( <i>Pleurotomella</i> ) <i>Alcestitis</i> , n.sp. (fig.) . . . . .	78
— — — — — <i>itama</i> , n.sp. (fig.) . . . . .	78
— — — — — <i>Sabrina</i> , n.sp. (fig.) . . . . .	77
<i>Dentatium</i> ( <i>Episiphon</i> ) <i>arenarium</i> , n.sp. (fig.) . . . . .	214
<i>Diala trilirata</i> , n.sp. (fig.) . . . . .	71
<i>Diaulula vestita</i> (Abraham) . . . . .	355
<i>Diplodon Menziesi</i> (Gray), n.subsp. <i>acuta</i> (fig.) . . . . .	239
<i>Discodoris</i> sp. (fig.) . . . . .	139
<i>Doridopsis citrina</i> , Cheeseman . . . . .	348
— — — — — <i>mammosa</i> , Abraham . . . . .	347
<i>Doto obscura</i> , n.sp. (fig.) . . . . .	152
<i>Drillia Thisbe</i> , n.sp. (fig.) . . . . .	77
<i>Drymæus acuminatus</i> , n.sp. (fig.) . . . . .	8
— — — — — <i>alabastrinus</i> , n.sp. (fig.) . . . . .	98
— — — — — <i>angustus</i> , n.sp. (fig.) . . . . .	9
— — — — — <i>bellus</i> , n.sp. (fig.) . . . . .	8
— — — — — <i>Boucardi</i> , n.sp. (fig.) . . . . .	305
— — — — — <i>castaneo-strigatus</i> , n.sp. (fig.) . . . . .	98
— — — — — <i>conicus</i> , n.sp. (fig.) . . . . .	305
— — — — — <i>incognitus</i> , n.sp. (fig.) . . . . .	304
— — — — — <i>notabilis</i> , n.sp. (fig.) . . . . .	7
— — — — — <i>notatus</i> , n.sp. (fig.) . . . . .	7
— — — — — <i>Ponsonbyi</i> , n.sp. (fig.) . . . . .	305
— — — — — <i>Prestoni</i> , n.sp. (fig.) . . . . .	9
— — — — — <i>pseudo-fusoides</i> , n.sp. (fig.) . . . . .	8
— — — — — <i>punctatus</i> , n.sp. (fig.) . . . . .	304
— — — — — <i>punctatus</i> , var. <i>albida</i> (fig.) . . . . .	304

	PAGE
<i>Drymæus punctatus</i> , var. <i>ventri- cosa</i> (fig.) . . . . .	304
— — — — — <i>Rosenbergi</i> , n.sp. (fig.) . . . . .	98
— — — — — <i>spadiceus</i> , n.sp. (fig.) . . . . .	97
— — — — — <i>Sykesi</i> , n.sp. (fig.) . . . . .	7
<i>Dyakia striata</i> (Gray), var. (fig.) . . . . .	93

E.

Eliot, C. N. E., 'Report upon a collection of Nudibranchiata from the Cape Verd Islands, with notes by C. Crossland' . . . . .	131
— — — — — 'Nudibranchs from New Zealand and the Falkland Is- lands' . . . . .	327
<i>Ennea</i> ( <i>Diaphora</i> ) <i>Möllendorffi</i> , Hid., with a double or inner wall (fig.) . . . . .	364
<i>Ensis macha</i> , anatomy . . . . .	18
<i>Eulima nisonida</i> , n.sp. (fig.) . . . . .	71
— — — — — <i>rhæba</i> , n.sp. (fig.) . . . . .	72
<i>Euspira venusta</i> , n.sp. (fig.) . . . . .	215
<i>Eustomopsis</i> , n.sect. . . . .	112
Evolutionary processes in the Mollusca . . . . .	246
† <i>Exilia Dalli</i> , n.sp. (fig.) . . . . .	209

F.

<i>Favorinus carneus</i> (A. & H.) (fig.) . . . . .	158
<i>Fistulana munia</i> , perforating <i>Dosinia</i> (fig.) . . . . .	203
— — — — — reparation (fig.) . . . . .	203
<i>Flammulina</i> ( <i>Allodiscus</i> ) <i>Cooperi</i> , n.sp. (fig.) . . . . .	237
— — — — — <i>tholoides</i> , n.sp. (fig.) . . . . .	238
— — — — — ( <i>Phenacohelix</i> ) <i>leptalea</i> , n.sp. (fig.) . . . . .	237
<i>Fossarus</i> ( <i>Couthouyia</i> ) <i>eudmetus</i> , n.sp. (fig.) . . . . .	71
† Fossil shells, coloration (fig.) . . . . .	280
Fulton, H. C., 'Descriptions of new species of Australian <i>Planispira</i> and <i>Chloritis</i> ' . . . . .	362
— — — — — 'The presence of a double wall in some species of the <i>Diaphora</i> group of <i>Ennea</i> ' . . . . .	364

G.

Gabriel, C. J., Mollusca from Victoria, exhibit . . . . .	309
<i>Galvina Falklandica</i> , n.sp. (fig.) . . . . .	353
<i>Gargamella Novozealandica</i> , n.sp. . . . .	341
<i>Geitodoris reticulata</i> , n.sp. (fig.) . . . . .	140
<i>Glessula</i> , Indian and Ceylonese species . . . . .	160
— — — — — <i>Canarica</i> , n.sp. (fig.) . . . . .	164
— — — — — <i>gracilis</i> , n.sp. (fig.) . . . . .	170

	PAGE		PAGE
<i>Glossula Jeyporensis</i> , n.sp. (fig.) . . .	167	Kennard, A. S., and Woodward,	
——— <i>parabilis</i> (Benson) . . .	204	B. B., 'Notes on the Post-	
——— <i>pusilla</i> , n.sp. (fig.) . . .	171	Pliocene Mollusca of the Mylne	
——— <i>subfilosa</i> , n.sp. (fig.) . . .	171	Collection' . . . . .	261
——— <i>subinornata</i> , n.sp. (fig.) . . .	164	——— 'Notes on some Holocene	
——— <i>subjerdoni</i> , n.sp. (fig.) . . .	170	Shells from Ightham' . . . . .	264
——— <i>subperrotteti</i> , n.sp. (fig.) . . .	163	Kenyon, A. F., 'On <i>Conus</i>	
——— <i>subserena</i> , n.sp. (fig.) . . .	166	<i>Waterhousea</i> , Brazier, var.' . . .	5
Godwin-Austen, H. H., 'On a		——— 'On <i>Voluta papillosa</i> ,	
species of the land Molluscan		Swainson, var.' . . . . .	6
genus <i>Dyakia</i> from Siam' . . .	93		
<i>Goniodoris punctata</i> , Bergh . . .	349	L.	
<i>Goniotomus subhybridus</i> , n.sp.		<i>Lagochilus bicarinatus</i> , n.sp. (fig.)	238
(fig.) . . . . .	97	——— <i>Chiltoni</i> , Suter, n.subsp.	
† <i>Gryphæa columba</i> , Lamarck		<i>septentrionalis</i> (fig.) . . . . .	238
(fig.) . . . . .	283	Lang, W. D., 'On the Pairing of	
Gude, G. K., 'Critical remarks on		<i>Limnæa pereger</i> with <i>Planorbis</i>	
certain forms of <i>Chloritis</i> , with		<i>cornueus</i> ' . . . . .	310
descriptions of twelve new		<i>Laoma (Phrixgnathus) filicosta</i> ,	
species' . . . . .	40	n.sp. (fig.) . . . . .	236
——— 'Further remarks on the		——— <i>pæcilosticta</i> (Pfr.), n.subsp.	
genus <i>Chloritis</i> , with descrip-		<i>conicula</i> (fig.) . . . . .	236
tions of eleven new species' . . .	105	† <i>Lapparia Parki</i> , n.sp. (fig.) . . .	207
——— 'A further contribution to		<i>Latirus (Peristernia) Sowerbyi</i> ,	
our knowledge of the genus		n.sp. (fig.) . . . . .	217
<i>Chloritis</i> , with descriptions of		<i>Lepidopleurus Matthevsiannus</i> , n.sp.	
eleven new species' . . . . .	228	(fig.) . . . . .	92
——— 'Description of a new		<i>Leptomya lutea</i> (Hutton) (fig.) . . .	213
species of <i>Papuina</i> , and illus-		<i>Limnicolaria Ponsonbyi</i> , n.sp. (fig.)	89
trations of some hitherto un-		——— <i>Smithi</i> , n.sp. (fig.) . . . . .	89
figured shells' . . . . .	234	<i>Limnæa Bongsonensis</i> , n.sp. (fig.)	14
——— 'Description of a new		——— ( <i>Bulinus</i> ) <i>egregia</i> , n.sp.	
species of <i>Vallonia</i> from South		(fig.) . . . . .	36
India' . . . . .	306	Liotiidae . . . . .	27
		<i>Lydiopsis</i> , n.subgen. . . . .	25
H.			
Haynes, T. H., 'Pearl Oyster		M.	
Culture and Pearl Fishing' . . .	61	<i>Malluvium</i> , n.subgen. . . . .	81, 122
Hedley, C., 'A Pteropod Alias' . . .	5	<i>Mangilia Beckeri</i> , n.sp. (fig.) . . .	38
† Holocene Mollusca from Staines	310	——— <i>biplicata</i> , n.sp. (fig.) . . . . .	77
† ——— shells from Ightham . . .	264	——— <i>eburnea</i> , n.sp. (fig.) . . . . .	35
Hutton, F. W., obituary notice . . .	66	<i>Marginella substava</i> , n.sp. (fig.) . . .	35
		——— ( <i>Volvaria</i> ) <i>amydrozona</i> ,	
I.		n.sp. (fig.) . . . . .	76
Ihering, H. von, 'On the name		——— <i>eumorpha</i> ,	
<i>Pilsbryella</i> ' . . . . .	68	n.sp. (fig.) . . . . .	76
<i>Ischnochiton luteoroseus</i> , n.sp. (fig.)	293	<i>Martensia Bowkeræ</i> , n.sp. (fig.) . . .	88
——— <i>resplendens</i> , n.sp. (fig.) . . .	91	Matthews, E. H. V. . . . .	91
		<i>Melania Browni</i> , n.sp. (fig.) . . . . .	266
J.		——— <i>curvicosta</i> , var. <i>Pres-</i>	
<i>Joussecaumia</i> . . . . .	260	<i>toniana</i> , n.var. (fig.) . . . . .	15
<i>Joussecaumiella</i> , n.n. . . . .	260	——— <i>Kelantanensis</i> , n.sp. (fig.)	267
		——— <i>Melvilli</i> , n.sp. (fig.) . . . . .	267
K.		——— <i>Novæ-Hiberniæ</i> , n.sp. (fig.)	266
Kennard, A. S., and Woodward,		——— <i>Sykesi</i> , n.sp. (fig.) . . . . .	15
B. B., 'On the occurrence of		Melville, J. C., 'A revision of the	
<i>Vertigo parcedentata</i> , Al. Braun,		species of Cyclostrematidae and	
in Holocene deposits in Great		Liotiidae occurring in the Persian	
Britain' . . . . .	119	Gulf and North Arabian Sea' . . .	20

	PAGE		PAGE
Melville, J. C., 'Descriptions of <i>Cyclostrema Prestonii</i> and <i>Nassa Tindalli</i> , n.spp., from Ceylon'	29	<i>Oliva Smithi</i> , n.sp. (fig.)	17
— 'Descriptions of thirty-one Gastropoda and one Scaphopod from the Persian Gulf and Gulf of Oman'	69	<i>Onithochiton Ashbyi</i> , n.sp. (fig.)	92
— 'Capulus <i>lissus</i> , Smith, as type of a proposed new subgenus ( <i>Malluvium</i> ) of <i>Amalthea</i> , Schumacher'	81	— <i>nodosus</i> , n.sp. (fig.)	297
— 'Description of a new species of <i>Latirus</i> '	217	† <i>Orthoceras anguliferum</i> , Arch. & Vern. (fig.)	290
<i>Mitra Brettinghami</i> , n.sp.	124	† <i>Ostrea curvirostris</i> , Nilsson (fig.)	282
— ( <i>Pusia</i> ) <i>accincta</i> , n.sp. (fig.)	300	P.	
<i>Mopalia australis</i> , n.sp. (fig.)	215	<i>Paludestrina Jenkinsi</i> (Smith)	203
<i>Mormula excellens</i> , n.sp. (fig.)	302	<i>Papuina complanata</i> , n.sp. (fig.)	234
† <i>Mourlonia carinata</i> (J. Sowerby) (fig.)	287	<i>Parastrophia filum</i> , n.sp. (fig.)	80
<i>Mueronalia bizonula</i> , n.sp. (fig.)	72	Pearl oyster culture and fishing (Haynes)	61
— <i>lepada</i> , n.sp. (fig.)	73	Pearls in <i>Haliotis</i> and <i>Pecten</i>	311
<i>Mumiola epibathra</i> , n.sp. (fig.)	72	<i>Phidiana longicirrho</i> , n.sp. (fig.)	156
† Mylne Collection, Post-Pliocene Mollusca	261	Pilsbry, H. A., 'On <i>Chloritis heteromphalus</i> , Pilsbry'	196
N.		— <i>lirata</i> , n.sp. (fig.)	206
<i>Nassa (Alectryon) jactabunda</i> , n.sp. (fig.)	76	<i>Planispira (Trachiopsis) acuticostata</i> , n.sp. (fig.)	362
— ( <i>Hima</i> ) <i>Tindalli</i> , n.sp. (fig.)	29	<i>Planorbis Sagocensis</i> , n.sp. (fig.)	129
— <i>Nevilliana</i> , n.sp. (fig.)	34	† <i>Platystomella Scotoburdigalensis</i> , R. Etheridge, jun. (fig.)	287
† <i>Natica cincta</i> , Phillips (fig.)	284	<i>Pleurotoma abbreviata</i> , Reeve, var. <i>Lifuensis</i> , nov. var. (fig.)	300
† <i>Naticopsis harpula</i> (J. de C. Sowerby) (fig.)	290	† — <i>Pareoraensis</i> , n.sp. (fig.)	208
<i>Neocyclotus depressus</i> , n.sp. (fig.)	9	<i>Pleurotomella (?) bullioides</i> , n.sp. (fig.)	178
— <i>Peruvianus</i> , n.sp. (fig.)	98	— <i>gregaria</i> , n.sp. (fig.)	180
<i>Neptunea antiqua</i>	68	— <i>lusitanica</i> , n.sp. (fig.)	181
† <i>Neritina concava</i> , J. de C. Sowerby (fig.)	282	<i>Plocamopherus Madereæ</i> (Lowe) (fig.)	150
Newton, R. B., 'Note on Swainson's genus <i>Volutilithes</i> '	100	Polyplacophora of New Zealand	293
— 'Relics of Coloration in Fossil Shells'	280	† <i>Polytropina helicina</i> (Lindström) (fig.)	291
Nudibranchs from Falkland Is.	350-361	Ponsonby, J. H., 'Description of two new species of Helicoid Land-Shell from German New Guinea'	224
— from New Zealand	327-350	'Porcupine' Mollusca	173
O.		Preston, H. B., 'Descriptions of four new species of marine shells, probably from Ceylon'	34
Obituary notices	64, 66, 67, 245	— 'Description of a new species of <i>Limnaea</i> from North-West Australia'	36
<i>Octopus</i> with branching arms	310	— 'On a small collection of land and fresh-water shells from Uganda, with descriptions of a new species of <i>Martensia</i> and two new species of <i>Limnicolaria</i> '	88
<i>Odostomia (Miralda) ima</i> , n.sp. (fig.)	75	— 'Description of a new subgenus and species of <i>Alyceus</i> from Ke-lan-tan'	206
— ( <i>Pyrgulina</i> ) <i>hervierioides</i> , n.sp. (fig.)	74	— 'Descriptions of four new species of <i>Melania</i> from New Ireland and Ke-lan-tan'	266
— <i>tenerrima</i> , n.sp. (fig.)	74		
— <i>thelxinoæ</i> , n.sp. (fig.)	75		
<i>Oliva ispidula</i> , var. <i>longispira</i> , n.var. (fig.)	195		

	PAGE		PAGE
<i>Pseudhelicina</i> , n.n. . . . .	312	<i>Staurodoris atypica</i> , n.sp. (fig.) . . .	134
† <i>Pseudomelania Heddingtonensis</i> (J. Sowerby) (fig.) . . . . .	285	— <i>Falklandica</i> , n.sp. . . . .	356
<i>Pterocyclus aspersus</i> , n.sp. (fig.) . . .	129	<i>Stiliger felinus</i> , Hutton . . . . .	330
R.			
Reynell, A., on <i>Cassidaria rugosa</i> . . .	67	† <i>Strebloptera sublobata</i> (Phillips) (fig.) . . . . .	289
— 'On <i>Burtoa Nilotica</i> (Pfr.) and its relationship to <i>Achatina</i> , etc.' . . . . .	197	Suter, H., 'Descriptions of some Tertiary Shells from New Zealand' . . . . .	207
<i>Rhytida Bednalli</i> , n.sp. (fig.) . . . . .	224	— 'Descriptions of six new species of shells and of <i>Leptomya lutea</i> , Hutton, from New Zealand' . . . . .	211
Rimmer, R., obituary notice . . . . .	67	— 'Descriptions of new Non-Marine Shells from New Zealand' . . . . .	236
<i>Rostanga Evansi</i> , n.sp. (fig.) . . . . .	144	— 'Notes on New Zealand Polyplacophora, with descrip- tions of five new species' . . . . .	293
— <i>muscula</i> (Abraham) (fig.) . . . . .	339	— 'Review of the New Zea- land Acaemidae, with descriptions of new species and subspecies' . .	315
S.			
<i>Scalaria canephora</i> , n.sp. (fig.) . . . . .	70	Swanton, G. W., 'On the locality of the Melanotic <i>Helicigona</i> <i>arabustorum</i> ' . . . . .	5
— ( <i>Cissotrema</i> ) <i>bona</i> , n.sp. (fig.) . . . . .	70	Sykes, E. R., 'A Pteropod alias' — 'On the Mollusca procured during the "Porcupine" Ex- peditions, 1869-1870. Supple- mental Notes, Part III' . . . . .	5 173
<i>Segmentina Kennerdi</i> , n.sp. (fig.) . . .	130	— 'On the Dates of Publica- tion of Sowerby's "Mineral Conchology" and "Genera of Recent and Fossil Shells"' . . . .	191
<i>Siphonaria cyancomaculata</i> , n.sp. (fig.) . . . . .	37	— 'The name <i>Bourcieria</i> ' . . . . .	312
Smith, E. A., 'Note on <i>Neptunca</i> <i>antiqua</i> ' . . . . .	68	† <i>Syncyclonema Sowerbyi</i> (McCoy) (fig.) . . . . .	288
— 'Note on the subgenus <i>Mallurium</i> , Melvill' . . . . .	122	<i>Syrnola aperanta</i> , n.sp. (fig.) . . . . .	73
— 'Notes on some species of Mitridae, with the description of <i>M. Brettinghami</i> , n.sp.' . . . . .	124	— <i>clavellosa</i> , n.sp. (fig.) . . . . .	73
— 'Note on <i>Fistulana</i> <i>numia</i> perforating a valve of a <i>Dosinia</i> ' . . . . .	203	T.	
— 'Note on <i>Paludestrina</i> <i>Jenkinsi</i> ' . . . . .	203	<i>Tagelus divisus</i> , anatomy (fig.) . . . . .	221, 260
— 'Description of a new species of <i>Calliostoma</i> from South Formosa' . . . . .	205	— <i>gibbus</i> , anatomy (fig.) . . . . .	218, 260
— 'Note on an "Octopus" with branching arms' . . . . .	310	<i>Tellina (Angulus) Spenceri</i> , n.sp. (fig.) . . . . .	212
— 'Note on the occurrence of Pearls in <i>Haliotis gigantea</i> and <i>Pecten</i> sp.' . . . . .	311	<i>Terebra Filmeræ</i> , n.sp. (fig.) . . . . .	37
— 'Notes on <i>Achatina</i> <i>Dennisoni</i> , Reeve, and <i>A.</i> <i>magnifica</i> , Pfeiffer' . . . . .	313	<i>Tethys Burnupi</i> , n.sp. (fig.) . . . . .	52
<i>Solen Fonesii</i> , anatomy . . . . .	18	— <i>operta</i> , n.sp. (fig.) . . . . .	51
— <i>viridis</i> , anatomy . . . . .	19	<i>Triphora eupunctata</i> , n.sp. (fig.) . .	301
<i>Soletellina Hedleyi</i> , n.sp. (fig.) . . . . .	302	— <i>fuscoapicata</i> , n.sp. (fig.) . . . . .	301
Sowerby, G. B., 'On new species of <i>Siphonaria</i> , <i>Terebra</i> , and <i>Mangilia</i> , and a remarkable form of <i>Cypræa eruenta</i> , from S. Africa' . . . . .	37	— <i>fuscozonata</i> , n.sp. (fig.) . . . . .	301
— 'Descriptions of new marine Mollusca from New Caledonia, etc.' . . . . .	299	<i>Tritonia Challengeriana</i> , Bergh . .	354
<i>Spirotropis clytotropis</i> , n.sp. (fig.) . . .	183	— <i>mæsta</i> , Bergh, var. <i>pal-</i> <i>lescens</i> , n.var. (fig.) . . . . .	133
— (?) <i>megalacme</i> , n.sp. (fig.) . . . . .	183	<i>Trochomorpha crustulum</i> , Cox (fig.) .	235
— <i>Melvilli</i> , n.sp. (fig.) . . . . .	183	<i>Turbonilla Hermia</i> , n.sp. (fig.) . . .	74
		— ( <i>Pyrgostylis</i> ) <i>Delia</i> , n.sp. (fig.) . . . . .	73
		U.	
		<i>Unio Pajakomboensis</i> , n.sp. (fig.) . .	15

V.

	PAGE
<i>Fallonia miserrima</i> , n.sp. (fig.) . . .	307
<i>Venericardia (Pleuromeris) Bol-</i> <i>lonsi</i> , n.sp. (fig.) . . .	211
† <i>Vertigo parcedentata</i> , Al. Braun	119
† <i>Volutilithes muricina</i> (Lam.) (fig.)	100
† ——— <i>pertusa</i> , Swains. (fig.)	101
† <i>Volutospina</i> , n.n. . . .	103
<i>Volvula compacta</i> , n.sp. (fig.) . . .	79

W.

Woodward, B. B., 'On the Dates of Publication of C. L. F. von Sandberger's "Die Land- und Süsswasser - Conchylien der Vorwelt."' . . . . .	3
--	---

	PAGE
Woodward, B. B., 'On the Dates of Publication of J. D. Wilhelm Hartmann's "Erd- und Süs- wasser-Gasteropoden"' . . . . .	3
——— 'Cement as a Slug- killer' . . . . .	4
——— 'On some "Feeding- tracks" of Gastropods' . . . . .	31
——— 'What evolutionary processes do the Mollusca show?' (Inaugural Address) . . . . .	246
——— see Kennard, A. S., and Woodward, B. B. . . . .	119, 261, 264

X.

<i>Xesta cornicen</i> , n.sp. (fig.) . . . . .	13
——— <i>Wanganensis</i> , Cox (fig.) . . . . .	235





# PROCEEDINGS

OF THE

# MALACOLOGICAL SOCIETY

## OF LONDON.

EDITED BY

E. A. SMITH, I.S.O., F.Z.S.

*Under the direction of the Publication Committee.*

AUTHORS ALONE ARE RESPONSIBLE FOR THE STATEMENTS IN THEIR RESPECTIVE PAPERS.

## CONTENTS.

PROCEEDINGS:—	PAGE	PAPERS continued:—	PAGE
Ordinary Meetings:		Description of a new species of	
November 10th, 1905 .....	1	<i>Oliva</i> . By F. BRIDGMAN. (Fig.)	17
December 8th .....	1	On the Anatomy of <i>Ensis macha</i> ,	
January 12th, 1906 .....	2	<i>Solen Fonesii</i> , and <i>S. viridis</i> .	
NOTES:—		By H. H. BLOOMER .....	18
On the Dates of Publication of		A Revision of the Species of Cyclo-	
J. D. Wilhelm Hartmann's		strematidæ and Liotiidæ occurring	
"Erde- und Süßwasser-Gastero-		in the Persian Gulf and North	
poden." By B. B. WOODWARD,		Arabian Sea. By J. C. MEL-	
F.L.S. ....	3	VILL, M.A., F.L.S. (Plate III.)	20
On the Dates of Publication of		Description of <i>Cyclostrema Prestoni</i>	
C. L. F. von Sandberger's		and <i>Nassa Tindalli</i> , n.spp.,	
"Die Land- und Süßwasser-		from Ceylon. By J. C. MEL-	
Conchylien der Vorwelt." By		VILL, M.A., F.L.S. (Plate	
B. B. WOODWARD, F.L.S. ....	3	III and Fig.) .....	29
Cement as a Slug-killer! By		On some 'Feeding-tracks' of	
B. B. WOODWARD, F.L.S. (Fig.)	4	Gastropods. By B. B. WOOD-	
A Pteropod Alias. By C. HEDLEY,		WARD, F.L.S. (Figs.) .....	31
F.L.S., and E. R. SYKES, B.A.	5	Descriptions of four new species	
On the Locality of Melanotic		of Marine Shells, probably from	
<i>Helicigona arbustorum</i> . By		Ceylon. By H. B. PRESTON,	
G. W. SWANTON .....	5	F.Z.S. (Figs.) .....	34
On <i>Conus Waterhouseæ</i> , Brazier,		Description of a new species of	
var. By A. F. KENYON .....	5	<i>Limnæa</i> from N.W. Australia.	
On <i>Voluta papillosa</i> , Swainson,		By H. B. PRESTON, F.Z.S.	
var. By A. F. KENYON .....	6	(Fig.) .....	36
PAPERS:—		On new species of <i>Siphonaria</i> ,	
Descriptions of new species of		<i>Terebra</i> , and <i>Mangilia</i> , and a	
<i>Drymaeus</i> , <i>Amphicyclotus</i> , and		remarkable form of <i>Cypræa</i>	
<i>Neocyclotus</i> , from South and		<i>eruenta</i> , from South Africa. By	
Central America. By S. I.		G. B. SOWERBY, F.L.S. (Figs.)	37
DA COSTA. (Plate I.) .....	7	Critical remarks on certain forms	
Description of a new species of		of <i>Chloritis</i> , with descriptions	
<i>Achatina</i> from Mashonaland.		of twelve new species. By G. K.	
By S. I. DA COSTA. (Fig.) .....	11	GUDE, F.Z.S. (Plates IV, V.)	40
On some Land and Fresh-water		Notes on the Anatomy of South	
Mollusca from Sumatra. Part I.		African Aplysiidæ, with des-	
By Rev. R. A. BULLEN, B.A.,		criptions of two new species.	
F.L.S. (Plate II.) .....	12	By R. H. BURNE, B.A. (Figs.)	51

LONDON:

DULAU & CO.,  
37, SOHO SQUARE, W.

BERLIN:

R. FRIEDLÄNDER & SOHN,  
11, KARLSTRASSE, N.W.

For information concerning the  
**MALACOLOGICAL SOCIETY OF LONDON**

See page iii of this wrapper.

---

*CHARGES FOR ADVERTISEMENTS.*

**OUTSIDE COVER. Each insertion—**

Whole page . . .	30s.
Half page . . .	15s.
Quarter page . . .	7s. 6d.

**INSIDE COVER. Each insertion—**

Whole page . . .	20s.
Half page . . .	10s.
Quarter page . . .	5s.

# Malacological Society of London.

(Founded 27th February, 1893.)

---

Officers and Council—elected February, 1906.

**President** :—E. R. SYKES, B.A., F.L.S.

**Vice-Presidents** :—Sir C. N. E. ELIOT, K.C.M.G.; Professor W. A. HERDMAN, F.R.S.; W. G. RIDWOOD, D.Sc., F.L.S.; B. B. WOODWARD, F.L.S.

**Treasurer** :—J. H. PONSONBY, F.Z.S., 15, Chesham Place, London, S.W.

**Secretary** :—R. H. BURNE, B.A., F.Z.S., 21, Stanley Crescent, Notting Hill, London, W.

**Editor** :—E. A. SMITH, I.S.O., Natural History Museum, Cromwell Road, London, S.W.

**Other Members of Council** :—Rev. R. ASHINGTON BULLEN, F.L.S.; S. I. DA COSTA; J. COSMO MELVILL, M.A., F.L.S.; R. BULLEN NEWTON, F.G.S.; ALEXANDER REYNELL; HENRY WOODWARD, LL.D., F.R.S.

---

By kind permission of the Council of the LINNEAN SOCIETY, the **MEETINGS** are held in their apartments at BURLINGTON HOUSE, PICCADILLY, W., on the **SECOND FRIDAY** in each month from **NOVEMBER** to **JUNE**.

The **OBJECT** of the Society is to promote the study of the Mollusca, both recent and fossil.

**MEMBERS**, both Ordinary and Corresponding (the latter resident without the British Islands), are elected by ballot on a certificate of recommendation signed by two or more Members.

**LADIES** are eligible for election.

The **SUBSCRIPTION** is, for Ordinary Members 10s. 6d. per annum or £7 7s. for Life, for Corresponding Members 7s. 6d. per annum or £5 5s. for Life. All Members on election pay an **Entrance Fee** of 10s. 6d.

The **PROCEEDINGS** are issued three times a year, and each Member is entitled to receive a copy of those numbers issued during his membership.

[Vols. I–VI, consisting of 37 Parts, have now appeared. Price 5s. per Part. To Members, for personal use only, 3s. per Part, or 15s. per vol.]

Further information, with forms of proposal for Membership, may be obtained from the Secretary, to whom all communications should be sent at his private address, as given above.

# JAPANESE SHELLS,

*Land, Fresh-water, and Marine.*

---

Catalogue sent on Application.  
Names and exact Localities correctly given.

---

## SPECIAL OFFER :

Land Shells,	50 species	(150 specimens)	.	.	.	Five dollars.
"	"	100 "	(300	"	)	Twelve "
Marine	"	50 "	(150	"	)	Five "
"	"	100 "	(300	"	)	Twelve "

**Y. HIRASE, KYOTO, JAPAN.**

# PROCEEDINGS

OF THE

# MALACOLOGICAL SOCIETY

## OF LONDON.

EDITED BY

E. A. SMITH, I.S.O., F.Z.S.

*Under the direction of the Publication Committee.*

AUTHORS ALONE ARE RESPONSIBLE FOR THE STATEMENTS IN THEIR RESPECTIVE PAPERS.

### CONTENTS.

PROCEEDINGS:—	PAGE	PAPERS continued:—	PAGE
Annual Meeting: Feb. 9th, 1906	60	On a small collection of Land and Fresh-water Shells from Uganda, with descriptions of new species of <i>Martensia</i> and <i>Limicolaria</i> . By H. B. PRESTON, F.Z.S. (Figs.)	88
Ordinary Meetings:		On new species of <i>Polyplacophora</i> from South Australia. By W. T. BEDNALL and E. H. V. MATTHEWS. (Plate IX.)	91
February 9th, 1906	61	On a species of the Land Molluscan genus <i>Dyakia</i> from Siam. By Lieut.-Colonel H. H. GODWIN-AUSTEN, F.R.S. (Plate X.)	93
March 9th	62	Descriptions of new species of Land Shells from Peru and Colombia and two new species of <i>Curvella</i> from the Philippine Islands. By S. I. DA COSTA. (Plate XI.)	97
April 6th	63	Note on Swainson's genus <i>Voluti-lithes</i> . By R. B. NEWTON, F.G.S. (Plate XII.)	100
Obituary Notices. (Plate VI.)	64	Further remarks on the genus <i>Chloritis</i> , with descriptions of eleven new species. By G. K. GUDE, F.Z.S. (Plate XIII.)	105
NOTES:—		On the occurrence of <i>Vertigo parcedentata</i> , Al. Braun, in Holocene deposits in Great Britain. By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S.	119
<i>Cassidaria rugosa</i> . By A. REYNELL	67		
On <i>Neptunea antiqua</i> . By E. A. SMITH, I.S.O.	68		
On the name <i>Pilsbryella</i> . By H. VON IHERING	68		
PAPERS:—			
Descriptions of thirty-one Gastropoda and one Scaphopod from the Persian Gulf and Gulf of Oman. By J. C. MELVILL, M.A., F.L.S. (Plates VII and VIII.)	69		
<i>Capulus lissus</i> , Smith, as type of a proposed new subgenus ( <i>Malluvium</i> ) of <i>Amathea</i> , Schumacher. By J. C. MELVILL, M.A., F.L.S. (Figs.)	81		
Notes on a Holocene deposit at Harlton, Cambs. By Rev. R. A. BULLEN, B.A., F.L.S. (Figs.)	85		

LONDON:  
DULAU & CO.,  
37, SOHO SQUARE, W.

BERLIN:  
R. FRIEDLÄNDER & SOHN,  
11, KARLSTRASSE, N.W.

For information concerning the  
**MALACOLOGICAL SOCIETY OF LONDON**

See page iii of this wrapper.

---

*CHARGES FOR ADVERTISEMENTS.*

**OUTSIDE COVER. Each insertion—**

Whole page . . .	30s.
Half page . . .	15s.
Quarter page . . .	7s. 6d.

**INSIDE COVER. Each insertion—**

Whole page . . .	20s.
Half page . . .	10s.
Quarter page . . .	5s.

# Malacological Society of London.

(Founded 27th February, 1893.)

---

Officers and Council—elected February, 1906.

**President** :—E. R. SYKES, B.A., F.L.S.

**Vice-Presidents** :—Sir C. N. E. ELIOT, K.C.M.G.; Professor W. A. HERDMAN, F.R.S.; W. G. RIDEWOOD, D.Sc., F.L.S.; B. B. WOODWARD, F.L.S.

**Treasurer** :—J. H. PONSONBY, F.Z.S., 15, Chesham Place, London, S.W.

**Secretary** :—R. H. BURNE, B.A., F.Z.S., 21, Stanley Crescent, Notting Hill, London, W.

**Editor** :—E. A. SMITH, I.S.O., Natural History Museum, Cromwell Road, London, S.W.

**Other Members of Council** :—Rev. R. ASHINGTON BULLEN, F.L.S.; S. I. DA COSTA; J. COSMO MELVILL, M.A., F.L.S.; R. BULLEN NEWTON, F.G.S.; ALEXANDER REYNELL; HENRY WOODWARD, LL.D., F.R.S.

---

By kind permission of the Council of the LINNEAN SOCIETY, the **MEETINGS** are held in their apartments at BURLINGTON HOUSE, PICCADILLY, W., on the **SECOND FRIDAY** in each month from **NOVEMBER** to **JUNE**.

The **OBJECT** of the Society is to promote the study of the Mollusca, both recent and fossil.

**MEMBERS**, both Ordinary and Corresponding (the latter resident without the British Islands), are elected by ballot on a certificate of recommendation signed by two or more Members.

**LADIES** are eligible for election.

The **SUBSCRIPTION** is, for Ordinary Members 10s. 6d. per annum or £7 7s. for Life, for Corresponding Members 7s. 6d. per annum or £5 5s. for Life. All Members on election pay an **Entrance Fee** of 10s. 6d.

The **PROCEEDINGS** are issued three times a year, and each Member is entitled to receive a copy of those numbers issued during his membership.

[Vols. I–VI, consisting of 37 Parts, and Vol. VII, Pt. 1, have now appeared. Price 5s. per Part. To Members, for personal use only, 3s. per Part, or 15s. per vol.]

Further information, with forms of proposal for Membership, may be obtained from the Secretary, to whom all communications should be sent at his private address, as given above.

# JAPANESE SHELLS,

*Land, Fresh-water, and Marine.*

---

Catalogue sent on Application.

Names and exact Localities correctly given.

---

## SPECIAL OFFER :

Land Shells,	50 species	(150 specimens)	.	.	.	Five dollars.
"	"	100 "	(300	"	)	Twelve "
Marine "	"	50 "	(150	"	)	Five "
"	"	100 "	(300	"	)	Twelve "

**Y. HIRASE, KYOTO, JAPAN.**



## PROCEEDINGS

OF THE

MALACOLOGICAL SOCIETY  
OF LONDON.

EDITED BY

E. A. SMITH, I.S.O., F.Z.S.

*Under the direction of the Publication Committee.*

AUTHORS ALONE ARE RESPONSIBLE FOR THE STATEMENTS IN THEIR RESPECTIVE PAPERS.

## CONTENTS.

PROCEEDINGS:—	PAGE	PAPERS continued:—	PAGE
Ordinary Meetings:		Notes on Indian and Ceylonese species of <i>Glossula</i> . By Col. R. H. BEDDOMB, F.L.S. (Plate XV.)	160
May 11th, 1906 .....	121	Mollusca of the "Porcupine" Expeditions, 1869-1870. Supplemental Notes, Part III. By E. R. SYKES, B.A. (Pl. XVI.)	173
June 8th .....	121	On the Dates of Publication of Sowerby's "Mineral Conchology" and "Genera of Recent and Fossil Shells." By E. R. SYKES, B.A.	191
PAPERS:—		Note on a new variety (var. <i>longispira</i> ) of <i>Oliva ispidula</i> . By F. G. BRIDGMAN. (Fig.)	195
Note on the subgenus <i>Malluvium</i> , Melvill. By EDGAR A. SMITH, I.S.O. ....	122	On <i>Chloritis heteromphalus</i> , Pilsbry. By Prof. H. A. PILSBRY. (Figs.)	196
Notes on some species of Mitridæ, with the description of <i>M. Brettinghami</i> , n.sp. By EDGAR A. SMITH, I.S.O. ....	124	On <i>Burtoa Nilotica</i> and its relationship to <i>Achatina</i> , etc. By A. REYNELL. (Plate XVII.)	197
On some land and fresh-water Mollusca from Sumatra. Part II. By the Rev. R. A. BULLEN, B.A., F.L.S. (Figs.)	126		
Report upon a collection of Nudi-branchiata from the Cape Verd Islands, with notes by C. CROSSLAND. By Sir CHARLES ELIOT, K.C.M.G. (Pl. XIV.)	131		

LONDON:

DULAU & CO.,  
37, SOHO SQUARE, W.

BERLIN:

R. FRIEDLÄNDER & SOHN,  
11, KARLSTRASSE, N.W.

For information concerning the  
**MALACOLOGICAL SOCIETY OF LONDON**

See page iv of this wrapper.

---

*CHARGES FOR ADVERTISEMENTS.*

**OUTSIDE COVER.** Each insertion—

Whole page . . . .	30s.
Half page . . . .	15s.
Quarter page . . . .	7s. 6d.

**INSIDE COVER.** Each insertion—

Whole page . . . .	20s.
Half page . . . .	10s.
Quarter page . . . .	5s.

M. ANDRÉ BONNET

186, BOULEVARD PEREIRE, PARIS,

Désire entrer en relation avec ses collègues pour échanges de coquilles récentes françaises et exotiques, et coquilles fossiles éocènes et miocènes de France pour coquilles récentes de tous pays, et fossiles tertiaires.

*Envoyer oblata.*

# Malacological Society of London.

(Founded 27th February, 1893.)

---

Officers and Council—elected 9th February, 1906.

President :—E. R. SYKES, B.A., F.L.S.

Vice-Presidents :—Sir C. N. E. ELIOT, K.C.M.G.; Professor W. A. HERDMAN, F.R.S.; W. G. RIDWOOD, D.Sc., F.L.S.; B. B. WOODWARD, F.L.S.

Treasurer :—J. H. PONSONBY, F.Z.S., 15, Chesham Place, London, S.W.

Secretary :—R. H. BURNE, B.A., F.Z.S., 21, Stanley Crescent, Notting Hill, London, W.

Editor :—E. A. SMITH, I.S.O., Natural History Museum, Cromwell Road, London, S.W.

Other Members of Council :—Rev. R. ASHINGTON BULLEN, B.A., F.L.S.; S. I. DA COSTA; J. COSMO MELVILL, M.A., F.L.S.; R. BULLEN NEWTON, F.G.S.; ALEXANDER REYNELL; HENRY WOODWARD, LL.D., F.R.S.

---

By kind permission of the Council of the LINNEAN SOCIETY, the **MEETINGS** are held in their apartments at BURLINGTON HOUSE, PICCADILLY, W., on the **SECOND FRIDAY** in each month from **NOVEMBER** to **JUNE**.

The **OBJECT** of the Society is to promote the study of the Mollusca, both recent and fossil.

**MEMBERS**, both Ordinary and Corresponding (the latter resident without the British Islands), are elected by ballot on a certificate of recommendation signed by two or more Members.

**LADIES** are eligible for election.

The **SUBSCRIPTION** is, for Ordinary Members 10s. 6d. per annum or £7 7s. for Life, for Corresponding Members 7s. 6d. per annum or £5 5s. for Life. All Members on election pay an **Entrance Fee** of 10s. 6d.

The **PROCEEDINGS** are issued three times a year, and each Member is entitled to receive a copy of those numbers issued during his membership.

[Vols. I–VI, consisting of 37 Parts, and Vol. VII, Pt. 1–3, have now appeared. Price 5s. per Part. To Members, for personal use only, 3s. per Part, or 15s. per vol.]

Further information, with forms of proposal for Membership, may be obtained from the Secretary, to whom all communications should be sent at his private address, as given above.

## PROCEEDINGS

OF THE

MALACOLOGICAL SOCIETY  
OF LONDON.

EDITED BY

E. A. SMITH, I.S.O., F.Z.S.

*Under the direction of the Publication Committee.*

AUTHORS ALONE ARE RESPONSIBLE FOR THE STATEMENTS IN THEIR RESPECTIVE PAPERS.

## CONTENTS.

PROCEEDINGS:—	PAGE	PAPERS continued:—	PAGE
Ordinary Meetings:		Description of a new species of	
November 9th, 1906 .....	201	<i>Latirus</i> . By J. C. MELVILL,	
December 14th .....	201	M.A., F.L.S. (Fig.) .....	217
January 11th, 1907 .....	202	On the Anatomy of <i>Tagelus gibbus</i>	
NOTES:—		and <i>T. divisus</i> . By H. H.	
On <i>Fistulana mumia</i> perforating		BLOOMER. (Plate XIX.) .....	218
a valve of a <i>Dosinia</i> . By E. A.		Description of two new species	
SMITH, I.S.O. (Figs.) .....	203	of Helicoid Land-Shells from	
On <i>Paludestrina Jenkinsi</i> . By		German New Guinea. By J. H.	
E. A. SMITH, I.S.O. ....	203	PONSONBY, F.Z.S. (Figs.) ....	224
On <i>Glessula parabilis</i> . By Colonel		Descriptions of seven new species	
R. H. BEDDOME .....	204	of <i>Achatina</i> from the Congo	
PAPERS:—		Free State. By S. I. DA COSTA.	
Description of a new species of		(Plate XX.) .....	226
<i>Calliostoma</i> from South For-		A further contribution to our	
mosa. By E. A. SMITH, I.S.O.		knowledge of the genus	
(Fig.) .....	205	<i>Chloritis</i> , with descriptions of	
Description of a new subgenus		eleven new species. By G. K.	
and species of <i>Alycaeus</i> from		GUDE, F.Z.S. (Plate XXI.) 228	
Ke-lan-tan. By H. B. PRESTON,		Description of a new species of	
F.Z.S. (Fig.) .....	206	<i>Papuina</i> , and illustrations of	
Descriptions of some Tertiary		some hitherto unfigured shells.	
shells from New Zealand. By		By G. K. GUDE, F.Z.S.	
H. SUTER. (Plate XVIII.) .....	207	(Plate XXI.) .....	234
Descriptions of six new species of		Descriptions of new non-marine	
shells and of <i>Leptomya lineata</i> ,		shells from New Zealand. By	
Hutton, from New Zealand.		H. SUTER. (Plate XXII.) ....	236
By H. SUTER. (Plate XVIII.) 211			

LONDON:

DULAU & CO.,  
37, SOHO SQUARE, W.

BERLIN:

R. FRIEDLÄNDER & SOHN,  
11, KARLSTRASSE, N.W.

For information concerning the  
**MALACOLOGICAL SOCIETY OF LONDON**

See page iv of this wrapper.

---

*CHARGES FOR ADVERTISEMENTS.*

**OUTSIDE COVER.** Each insertion—

Whole page . . .	30s.
Half page . . .	15s.
Quarter page . . .	7s. 6d.

**INSIDE COVER.** Each insertion—

Whole page . . .	20s.
Half page . . .	10s.
Quarter page . . .	5s.

**GREAT REDUCTION IN PRICES**  
OF  
**GLASS-CAPPED BOXES, CARDBOARD TRAYS,  
WOOD TABLETS, AND GLASS TUBES.**

**Round Glass-Capped Boxes**—No. 1, 9d. doz.; No. 2, 10d.; No. 3, 1/-; No. 4, 1/4; No. 5, 1/6; No. 6, 2/-; No. 7, 2/9; No. 8, 4/-. Various depths.

**Rectangular Glass-Capped Boxes**—From 1/9 dozen.

**Cardboard Trays**—From 3/- gross.

**NEW PRICE LIST of one hundred sizes and depths post free.**

*All kinds of Cabinets, Glass-Capped Boxes, Cardboard Trays, Wood Tablets, and Glass Specimen Tubes made to order.*

 **ESTIMATES FREE.**

**W. J. SHAW,**  
**11, JOHN STREET, BEDFORD ROW,**  
**London, W.C.**

# Malacological Society of London.

(Founded 27th February, 1893.)

---

Officers and Council—elected 8th February, 1907.

**President** :—B. B. WOODWARD, F.L.S.

**Vice-Presidents** :—R. H. BURNE, B.A. ; Sir C. N. E. ELIOT, K.C.M.G. ;  
W. G. RIDWOOD, D.Sc., F.L.S. ; E. R. SYKES, B.A., F.L.S.

**Treasurer** :—J. H. PONSONBY, F.Z.S., 15, Chesham Place, London, S.W.

**Secretary** :—ALEXANDER REYNELL, 152, Selhurst Road, South Norwood,  
London, S.E.

**Editor** :—E. A. SMITH, I.S.O., Natural History Museum, Cromwell  
Road, London, S.W.

**Other Members of Council** :—H. H. BLOOMER ; Rev. R. ASHINGTON  
BULLEN, B.A., F.L.S. ; G. C. CRICK, F.G.S. ; S. I. DA COSTA ;  
R. BULLEN NEWTON, F.G.S. ; HENRY WOODWARD, LL.D., F.R.S.

---

By kind permission of the Council of the LINNEAN SOCIETY, the  
**MEETINGS** are held in their apartments at BURLINGTON HOUSE,  
PICCADILLY, W., on the SECOND FRIDAY in each month from NOVEMBER  
to JUNE.

The **OBJECT** of the Society is to promote the study of the Mollusca,  
both recent and fossil.

**MEMBERS**, both Ordinary and Corresponding (the latter resident  
without the British Islands), are elected by ballot on a certificate of  
recommendation signed by two or more Members.

**LADIES** are eligible for election.

The **SUBSCRIPTION** is, for Ordinary Members 10s. 6d. per annum  
or £7 7s. for Life, for Corresponding Members 7s. 6d. per annum or  
£5 5s. for Life. All Members on election pay an **Entrance Fee** of 10s. 6d.

The **PROCEEDINGS** are issued three times a year, and each  
Member is entitled to receive a copy of those numbers issued during  
his membership.

[Vols. I–VI, consisting of 37 Parts, and Vol. VII, Pt. 1–4, have  
now appeared. Price 5s. per Part. To Members, for personal  
use only, 3s. per Part, or 15s. per vol.]

Further information, with forms of proposal for Membership, may be  
obtained from the Secretary, to whom all communications should be sent  
*at his private address*, as given above.



## PROCEEDINGS

OF THE

## MALACOLOGICAL SOCIETY

## OF LONDON.

EDITED BY

E. A. SMITH, I.S.O., F.Z.S.

*Under the direction of the Publication Committee.*

AUTHORS ALONE ARE RESPONSIBLE FOR THE STATEMENTS IN THEIR RESPECTIVE PAPERS.

## CONTENTS.

PROCEEDINGS:—	PAGE	PAPERS continued:—	PAGE
Annual Meeting, Feb. 8th, 1907	242	Descriptions of four new species of <i>Melania</i> from New Ireland and Kelantan. By H. B. PRESTON, F.Z.S. (Figs.)	266
Ordinary Meetings:		On the Arms of the Belemnite. By G. C. CRICK, F.G.S. (Plate XXIII.)	269
February 8th, 1907	243	Relics of Coloration in Fossil Shells. By R. BULLEN-NEWTON, F.G.S. (Plate XXIV.)	280
March 8th	243	Notes on New Zealand Polyplacophora, with descriptions of five new species. By H. SUTER. (Figs.)	293
April 12th	244	Descriptions of new Marine Mollusca from New Caledonia, etc. By G. B. SOWERBY, F.L.S. (Plate XXV.)	299
Obituary Notice	245	Descriptions of new species of <i>Drymaeus</i> from Peru, Mexico, etc. By S. I. DA COSTA. (Plate XXVI.)	304
Presidential Address	246	Description of a new species of <i>Vallonia</i> from South India. By G. K. GUDE, F.Z.S. (Figs.)	306
NOTES:—			
On the name <i>Jousseaumia</i> . By G. C. BOURNE	260		
A Correction. By H. H. BLOOMER	260		
PAPERS:—			
Notes on the Post-Pliocene Mollusca of the Mylne Collection. By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S.	261		
Notes on some Holocene Shells from Ightham. By A. S. KENNARD, F.G.S., and B. B. WOODWARD, F.L.S.	264		

LONDON:

DULAU & CO.,  
37, SOHO SQUARE, W.

BERLIN:

R. FRIEDLÄNDER & SOHN,  
11, KARLSTRASSE, N.W.

For information concerning the  
**MALACOLOGICAL SOCIETY OF LONDON**

See page iv of this wrapper.

---

*CHARGES FOR ADVERTISEMENTS.*

**OUTSIDE COVER. Each insertion—**

Whole page . . .	30s.
Half page . . .	15s.
Quarter page . . .	7s. 6d.

**INSIDE COVER. Each insertion—**

Whole page . . .	20s.
Half page . . .	10s.
Quarter page . . .	5s.

**GREAT REDUCTION IN PRICES**  
OF  
**GLASS-CAPPED BOXES, CARDBOARD TRAYS,  
WOOD TABLETS, AND GLASS TUBES.**

**Round Glass-Capped Boxes**—No. 1, 9d. doz.; No. 2, 10d.; No. 3, 1/- ;  
No. 4, 1/4; No. 5, 1/6; No. 6, 2/-; No. 7, 2/9; No. 8, 4/-. Various depths.

**Rectangular Glass-Capped Boxes**—From 1/9 dozen.

**Cardboard Trays**—From 3/- gross.

**NEW PRICE LIST of one hundred sizes and depths post free.**

*All kinds of Cabinets, Glass-Capped Boxes, Cardboard Trays, Wood Tablets, and  
Glass Specimen Tubes made to order.*

 **ESTIMATES FREE.**

**W. J. SHAW,**  
**11, JOHN STREET, BEDFORD ROW,**  
**London, W.C.**

# Malacological Society of London.

(Founded 27th February, 1893.)

---

Officers and Council—elected 8th February, 1907.

**President** :—B. B. WOODWARD, F.L.S.

**Vice-Presidents** :—R. H. BURNE, B.A. ; Sir C. N. E. ELIOT, K.C.M.G. ;  
W. G. RIDWOOD, D.Sc., F.L.S. ; E. R. SYKES, B.A., F.L.S.

**Treasurer** :—J. H. PONSONBY, F.Z.S., 15, Chesham Place, London, S.W.

**Secretary** :—ALEXANDER REYNELL, Carleon, Whyteleafe Road, Upper  
Caterham, Surrey.

**Editor** :—E. A. SMITH, I.S.O., Natural History Museum, Cromwell  
Road, London, S.W.

**Other Members of Council** :—H. H. BLOOMER ; Rev. R. ASHINGTON  
BULLEN, B.A., F.L.S. ; G. C. CRICK, F.G.S. ; S. I. DA COSTA ;  
R. BULLEN NEWTON, F.G.S. ; HENRY WOODWARD, LL.D., F.R.S.

---

By kind permission of the Council of the LINNEAN SOCIETY, the **MEETINGS** are held in their apartments at BURLINGTON HOUSE, PICCADILLY, W., on the **SECOND FRIDAY** in each month from **NOVEMBER** to **JUNE**.

The **OBJECT** of the Society is to promote the study of the Mollusca, both recent and fossil.

**MEMBERS**, both Ordinary and Corresponding (the latter resident without the British Islands), are elected by ballot on a certificate of recommendation signed by two or more Members.

**LADIES** are eligible for election.

The **SUBSCRIPTION** is, for Ordinary Members 10s. 6d. per annum or £7 7s. for Life, for Corresponding Members 7s. 6d. per annum or £5 5s. for Life. All Members on election pay an **Entrance Fee** of 10s. 6d.

The **PROCEEDINGS** are issued three times a year, and each Member is entitled to receive a copy of those numbers issued during his membership.

[Vols. I–VI, consisting of 37 Parts, and Vol. VII, Pt. 1–5, have now appeared. Price 5s. per Part. To Members, for personal use only, 3s. per Part, or 15s. per vol.]

Further information, with forms of proposal for Membership, may be obtained from the Secretary, to whom all communications should be sent at his private address, as given above.

## PROCEEDINGS

OF THE

MALACOLOGICAL SOCIETY  
OF LONDON.

EDITED BY

E. A. SMITH, I.S.O., F.Z.S.

*Under the direction of the Publication Committee.*

AUTHORS ALONE ARE RESPONSIBLE FOR THE STATEMENTS IN THEIR RESPECTIVE PAPERS.

## CONTENTS.

FRONTISPIECE to Vol. VII:	PAGE	PAPERS:—	PAGE
Portrait of the late Professor G. B. Howes.		Notes on <i>Achatina Dennisoni</i> , Reeve, and <i>A. magnifica</i> , Pfeiffer. By E. A. SMITH, I.S.O. (Fig.) .....	313
PROCEEDINGS:—		Review of the New Zealand Acmaeidae, with descriptions of new species and subspecies. By H. SUTER. (Plate XXVII.)	315
Ordinary Meetings:		Nudibranchs from New Zealand and the Falkland Islands. By Sir C. N. E. ELIOT, K.C.M.G. (Plate XXVIII.) .....	327
May 10th, 1907 .....	309	Descriptions of new species of Australian <i>Planispira</i> and <i>Chloritis</i> . By H. C. FULTON. (Figs.) .....	362
June 14th .....	309	The presence of a double wall in some species of the <i>Diaphora</i> group of <i>Ennea</i> . By H. C. FULTON. (Fig.) .....	364
NOTES:—		TITLE-PAGE, Contents, and Index to Vol. VII.	
On the Pairing of <i>Limnæa pereger</i> with <i>Planorbis corneus</i> . By W. D. LANG, F.G.S. ....	310		
Note on an 'Octopus' with branching arms. By E. A. SMITH, I.S.O. ....	310		
Holocene Mollusca from Staines. By J. E. COOPER .....	310		
Note on the occurrence of Pearls in <i>Haliotis gigantea</i> and <i>Pecten</i> sp. By E. A. SMITH, I.S.O.	311		
The name <i>Bourciera</i> . By E. R. SYKES, B.A. ....	312		

LONDON:

DULAU & CO.,  
37, SOHO SQUARE, W.

BERLIN:

R. FRIEDLÄNDER & SOHN,  
11, KARLSTRASSE, N.W.

For information concerning the  
**MALACOLOGICAL SOCIETY OF LONDON**

See page iv of this wrapper.

\*

---

*CHARGES FOR ADVERTISEMENTS.*

**OUTSIDE COVER.** Each insertion—

Whole page . . . 30s.

Half page . . . 15s.

Quarter page . . . 7s. 6d.

**INSIDE COVER.** Each insertion—

Whole page . . . 20s.

Half page . . . 10s.

Quarter page . . . 5s.

**GREAT REDUCTION IN PRICES**  
OF  
**GLASS-CAPPED BOXES, CARDBOARD TRAYS,  
WOOD TABLETS, AND GLASS TUBES.**

---

**Round Glass-Capped Boxes**—No. 1, 9d. doz.; No. 2, 10d.; No. 3, 1/-; No. 4, 1/4; No. 5, 1/6; No. 6, 2/-; No. 7, 2/9; No. 8, 4/-. Various depths.

**Rectangular Glass-Capped Boxes**—From 1/9 dozen.

**Cardboard Trays**—From 3/- gross.

**NEW PRICE LIST of one hundred sizes and depths post free.**

*All kinds of Cabinets, Glass-Capped Boxes, Cardboard Trays, Wood Tablets, and Glass Specimen Tubes made to order.*

 **ESTIMATES FREE.**

---

**W. J. SHAW,**  
**11, JOHN STREET, BEDFORD ROW,**  
**London, W.C.**

# Malacological Society of London.

(Founded 27th February, 1893.)

---

Officers and Council—elected 8th February, 1907.

**President** :—B. B. WOODWARD, F.L.S.

**Vice-Presidents** :—R. H. BURNE, B.A. ; Sir C. N. E. ELIOT, K.C.M.G. ;  
W. G. RIDWOOD, D.Sc., F.L.S. ; E. R. SYKES, B.A., F.L.S.

**Treasurer** :—J. H. PONSONBY, F.Z.S., 15, Chesham Place, London, S.W.

**Secretary** :—ALEXANDER REYNELL, Carleon, Whyteleafe Road, Caterham-on-the-Hill, Surrey.

**Editor** :—E. A. SMITH, I.S.O., Natural History Museum, Cromwell Road, London, S.W.

**Other Members of Council** :—H. H. BLOOMER ; Rev. R. ASHINGTON BULLEN, B.A., F.L.S. ; G. C. CRICK, F.G.S. ; S. I. DA COSTA ; R. BULLEN NEWTON, F.G.S. ; HENRY WOODWARD, LL.D., F.R.S.

---

By kind permission of the Council of the LINNEAN SOCIETY, the **MEETINGS** are held in their apartments at BURLINGTON HOUSE, PICCADILLY, W., on the **SECOND FRIDAY** in each month from **NOVEMBER** to **JUNE**.

The **OBJECT** of the Society is to promote the study of the Mollusca, both recent and fossil.

**MEMBERS**, both Ordinary and Corresponding (the latter resident without the British Islands), are elected by ballot on a certificate of recommendation signed by two or more Members.

**LADIES** are eligible for election.

The **SUBSCRIPTION** is, for Ordinary Members 10s. 6d. per annum or £7 7s. for Life, for Corresponding Members 7s. 6d. per annum or £5 5s. for Life. All Members on election pay an **Entrance Fee** of 10s. 6d.

The **PROCEEDINGS** are issued three times a year, and each Member is entitled to receive a copy of those numbers issued during his membership.

[Vols. I–VII, consisting of 43 Parts, have now appeared.

Price 5s. per Part. To Members, for personal use only, 3s. per Part, or 15s. per vol.]

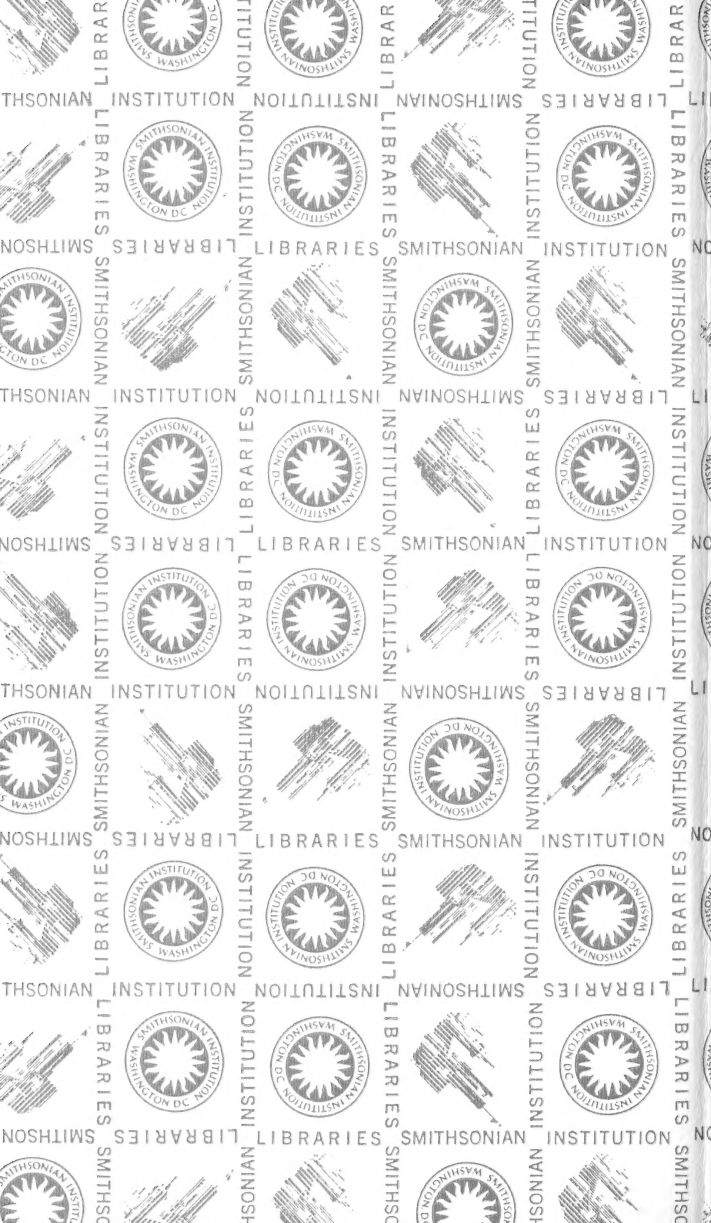
Further information, with forms of proposal for Membership, may be obtained from the Secretary, to whom all communications should be sent at his private address, as given above.

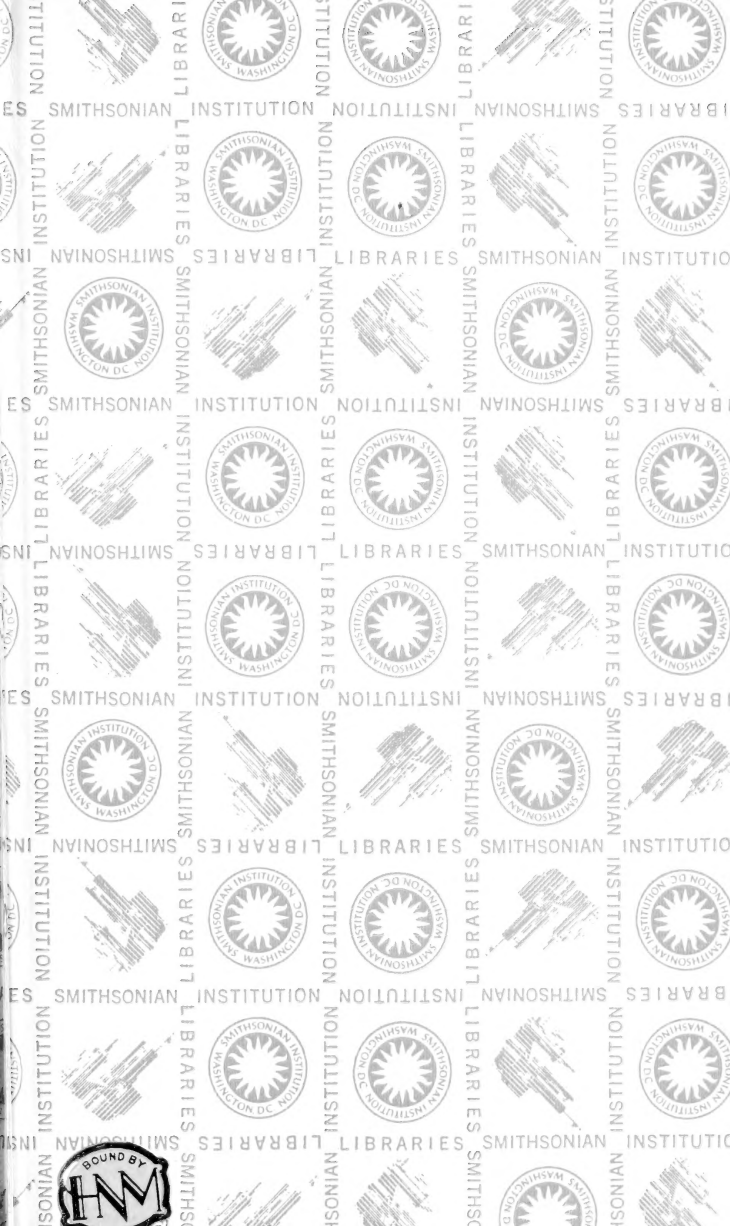












SMITHSONIAN INSTITUTION LIBRARIES



3 9088 00843 7667