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ERRATA.

Page 36, line 14 from bottom, for *Neptis Hira,* Kiel, read *Neptis ilira,* Kheil.
57, first line, *for* ENNOMIIDÆ *read* ENNOMIDÆ.
57, line 2 from bottom, for *Briada reliquenda* read *Briarda reliquenda.*
59, line 4 from bottom, for *Botys rutilatis* read *Botys rutilalis.*
140, line 11 from bottom, for *Hypothornis azurea* read *Hypothymis azurea.*

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THE LINNEAN SOCIETY.

On the Madreporaria of the Mergui Archipelago collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By Prof. P. Martin Duncan, M.B. (Lond.), F.R.S., F.L.S.

[Read 18th March, 1886.]

(Plate I.)

Introduction.

The Madreporaria which are classified and in part described in this communication were personally collected by Dr. Anderson in the Mergui Archipelago off the coast of Tenasserim. The collection is very interesting on account of the numerous species which it contains and of their alliances with the forms of the Coral-faunas of the Red Sea, of Ceylon, of the Eastern Archipelago, and of the Central-American coast. The facies of the large collection of 84 determinable species is stamped and characterized by the presence of numerous encrusting species, and by the evidence that even some of the species of the reef-building genus *Madrepora* appear to have grown under unfavourable conditions. Encrusting species of genera, hitherto known as freely growing, occur, and many species which are recognized without difficulty in more

vigorously growing faunas, are represented at Mergui by varieties which have given me much trouble in their classification. This difficulty was intensified on account of the predominance in the fauna of such large and therefore very variable genera as *Mussa*, *Mæandrina* (*Cœloria*), *Symphyllia*, *Favia*, and *Goniastræa*.

Several species which were described by MM. Milne-Edwards and Jules Haime, the habitats of which were not known to them, are recognized at Mergui.

The following is the list of genera and species constituting the fauna.

List of Genera and Species.

MADREPORARIA APOROSA.

Family Turbinolidæ.

1. Paracyathus Andersoni, sp. nov.
2. —— profundus, sp. nov.
3. —— indicus, sp. nov.
4. —— cæruleus, sp. nov.
5. —— merguiensis, sp. nov.
6. Polycyathus Verrilli, sp. nov.
7. —— difficilis, sp. nov.

Family Pocilloporidæ, *Dunc.*

8. Pocillopora cæspitosa, *Dana.*
9. —— favosa, *Ehr.*

Family Astræidæ.

10. Mussa cristata, *Esper*, sp.
11. —— flexuosa, *Ed. & H.*
12. —— corymbosa, *Forskål*, sp.
13. Euphyllia striata, *Ed. & H.*, sp.
14. —— rugosa, *Dana.*
15. —— plicata, *Ed. & H.*
16. Mæandrina (Cœloria) dædalea, *Solander*, sp.
17. —— (C.) Esperi, *Ed. & H.*, sp.
18. —— (C.) astræiformis, *Ed. & H.*, sp.
19. —— (C.) labyrinthiformis, *Linn.*, sp.
20. Brachymæandrina pachychila, *Ehr.*, sp.
21. Symphyllia grandis, *Ed. & H.*
22. —— recta, *Dana*, sp.
23. —— (Isophyllia) erythræa, *Klunz.*, sp.
24. Hydnophora microcona, *Lmk.*, sp.
25. Tridacophyllia lactuca, *Pallas*, sp.
26. Favia Ehrenbergi, *Klunz.*, var. laticollis, *Klunz.*
27. —— Okeni, *Ed. & H.*
28. —— Rousseaui, *Ed. & H.*, sp,
29. Favia tubulifera, *Klunz.*
30. —— cavernosa, *Forskål*, sp.
31. —— Geoffroyi (*Val.*), *Ed. & H.*
32. Goniastræa favus, *Forsk.*, sp., and variety.
33. —— retiformis, *Lmk.*, sp.
34. —— Bournoni, *Ed. & H.*
35. —— halicora, *Hemp. & Ehr.*, sp., and variety.
36. —— incrustans, sp. nov.
37. Heliastræa (Ulastræa) crispata, *Lmk.*, sp.
38. Phymastræa irregularis, *Dunc.*
39. —— aspera, *Quelch.*
40. Solenastræa (Quelchia) spongiformis, sp. nov.
41. Plesiastræa indurata, *Verrill*, variety.
42. Echinopora aspera, *Solander*, sp.
43. Leptastræa humilis, sp. nov.
44. Galaxea irregularis, *Ed. & H.*, sp.
45. Prionastræa abdita, *Solander*, sp.
46. —— vasta, *Klunz.*
47. —— robusta, *Dana*, sp.
48. Merulina ampliata, *Solander*, sp.
49. —— ramosa, *Ehr.*

MADREPORARIA FUNGIDA.

Family Plesiofungidæ, *Dunc.*

50. Siderastræa radians, *Pallas*, sp., variety pulchella=S. pulchella, *Ed. & H.*

Family Fungidæ.

51. Fungia crassa, *Dana.*
52. —— dentata, *Dana.*
53. —— patella, *Solander*, sp.
54. —— glans, *Dana?*
55. —— (Haliglossa) echinata, *Pallas*, sp.

56. Halomitra (Podabacia) crustacea, *Ed. & H.*
57. Cryptabacia talpina, *Lmk.*, sp.
58. Herpolitha limax, *Esper*, sp.

Family Lophoseridæ.

59. Lophoseris cristata, *Solander*, sp.
60. —— cactus, *Hemp. & Ehr.*, sp.
61. Pachyseris speciosa, *Dana*, sp.
62. Coscinaræa mæandrina, *Ehr.*, sp.
63. —— monile, *Forskål*, sp.

Family Plesioporitidæ, *Dunc.*

64. Mæandroseris Bottæ, *Rouss.*

MADREPORARIA PERFORATA.

Family Eupsammidæ.

65. Balanophyllia merguiensis, sp. nov.
66. Dendrophyllia coarctata, sp. nov.
67. —— (Cœnopsammia) affinis, sp. nov.
68. Astropsammia Pedersoni, *Verrill.*

Family Madreporidæ.

69. Madrepora gracilis, *Ed. & H.*
70. —— valida, *Dana.*
71. —— surculosa, *Dana.*
72. —— hebes, *Dana.*
73. —— pyramidalis, *Klunz.*
74. —— paxilligera, *Dana.*
75. —— cribripora, *Dana.*
76. —— spicifera, *Dana.*
77. Turbinaria cinerascens, *Solander*, sp.
78. —— crater, *Pallas*, sp.

Family Poritidæ.

79. Porites conglomerata, *Quoy & Gaim.*, variety.
80. —— nodifera, *Klunz.*
81. —— excavata, *Verrill.*
82. Synaræa lutea, *Verrill.*
83. Goniopora columna, *Dana.*
84. —— lobata, *Ed. & H.*

Indeterminable Species of the Genera:—

Heliastræa.
Aphrastræa.
Astræopora.
Fungia.

New Species:—

Paracyathus Andersoni. (Plate I. figs. 1–3.)
—— profundus. (Plate I. figs. 4–6.)
—— indicus. (Plate I. figs. 7–9.)
—— cæruleus. (Plate I. figs. 10, 11.)
—— merguiensis. (Plate I. figs. 12–14.)
Polycyathus Verrilli. (Plate I. figs. 15, 16.)
—— difficilis. (Plate I. figs. 17, 18.)
Goniastræa incrustans. (Plate I. figs. 19, 20.)
Solenastræa (Quelchia) spongiformis. (Plate I. figs. 21, 22.)
Leptastræa humilis. (Plate I. figs. 23, 24.)
Balanophyllia merguiensis. (Plate I. figs. 25, 26.)
Dendrophyllia coarctata. (Plate I. figs. 27, 28.)
—— (Cœnopsammia) affinis. (Plate I. figs. 29, 30.)

Description of the new Species.

Section MADREPORARIA APOROSA, *Ed. & H.*

Family Turbinolidæ, *Ed. & H.*

Genus Paracyathus, *Ed. & H.*

Paracyathus Andersoni, sp. nov. (Plate I. figs. 1–3.)

The corallum is short, has a slightly compressed, broad base,

above which there is some constriction, and a compressed elliptical calice. The calice is deep, broad at the margin, where the longer axis is on a slightly lower plane than the shorter. The septa are in nearly complete five cycles, slightly and unequally exsert, unequal in breadth, close, projecting outwards slightly at the margin, and only the primaries and secondaries projecting much into the calice. First three cycles nearly equal in size; the septa of the fourth cycle of a half-system unite with the tertiary, and the highest orders may unite with the fourth and fifth higher up in the calice. All are sharply spinulose at the sides, and the larger septa have plain and lobed margins, the others being crenulated. The pali of the primaries and secondaries are bilobed, rounded, and the upper lobe is large; those of the tertiaries and combined orders are smaller, much subdivided, and stout. The columella is small, deeply seated, concave, papillose, and the outer processes resemble the small pali. Costæ subequal, broad, low, large in relation to the smaller septa, and minutely granulated; some project near the calice.

Height 12·5 millim.; breadth of calice 10 millim., length 14 millim. The septa are coloured brown. Locality, Mergui Archipelago.

Paracyathus profundus, sp. nov. (Plate I. figs. 4–6.)

The corallum is short with a broad adherent base, above which there is a slight constriction, very slightly compressed at the sides, and the calice equal to the base in diameter. Calice elliptical, deep and open; marginal planes on the same level. Septa unequal, very crowded, in incomplete five cycles, very slightly exsert and not projecting much into the calice. The fourth and fifth orders unite with the tertiaries near the columella, and all are spinulose at the sides, and the larger are lobed. Pali of the larger septa trilobed and large, and those of the tertiaries are stout, numerous, and crenulated. Columella deep, concave; papillæ numerous and ragged and united at their bases. Costæ subequal, large, broad, granular, and with marked grooves between them near the calice and less so lower down.

Height 7 millim.; length of calice 11 millim., breadth of calice 10 millim. The dry corallum has the septa, pali, and columella of a brown colour, the rest being white. Locality, Mergui Archipelago.

Paracyathus indicus, sp. nov. (Plate I. figs. 7–9.)

The corallum is short, has a very expanded base with a considerable constriction above it: an elliptical calice, the long diameter of which is on a lower plane than the shorter and as long as the base is broad. Calice elliptical, deep, margin curved upwards at the sides, and a slight downward curve at the extremities. Septa numerous, unequal, in five cycles, all exsert at the margin, and most of them overhanging slightly. The fourth and fifth orders unite with the tertiaries not far from the columella, and the highest orders unite with the fourth and fifth not far from the margin. The edges of the primaries and secondaries are thin and boldly curved convexity towards the fossa, the tertiaries are less bowed, and the other orders have straighter or slightly wavy edges; but all are boldly crenulated with paliform edges. The sides of the septa are spinulose. Pali small and in one lobe before the primaries and secondaries, and resembling an outer papilla of the columella before the tertiaries. The columella is deep, elongate, concave, and consists of many processes united and resembling the smaller pali. The costæ are small, nearly equal, rounded, barely projecting, and sparsely and minutely granular.

Length of calice 14 millim., breadth 10 millim., height 12 millim. The primaries and secondaries are exsert to the height of 2 millim. Locality, Mergui Archipelago.

Paracyathus cæruleus, sp. nov. (Plate I. figs. 10–11.)

The corallum is low with a broad base, a much constricted stem, and a large shallow elliptical calice with a slightly everted margin, and with marginal axes nearly in the same plane. Septa in incomplete five cycles, very unequal, the primaries, secondaries, and tertiaries being exsert; none project much into the widely open calice. The sides of the septa are roughly and largely papillose. The pali are variable in number, those before the first orders are double, one high and narrow and rounded, the other small or absent. The pali before the combined higher orders are usually in multiple series. Columella very large, concave, processes numerous and united, the outer not to be distinguished from pali. Costæ low, subequal, narrow, and distinctly granular.

Height of corallum 8 millim.; length of calice 12 millim., breadth 9 millim. The colour of the septa, columella, and pali is blue; the costæ usually dull white, some are brown. Locality, Mergui Archipelago.

Paracyathus merguiensis, sp. nov. (Plate I. figs. 12–14.)

The corallum has a broad expanded base and a narrower calice, the stem constricted, otherwise cylindrical, and taller than broad. The calice is elliptical, very deep, and the columella is small, concave, with small and crowded processes. The septa are in five incomplete cycles, slightly exsert, unequal, crowded, and projecting into the calice; spinulose at the sides. The pali are single, and often tall, before the secondaries and primaries, and are small and nodular; those before the tertiaries are numerous and tall, and some are like twisted open lamellæ. The costæ are large, subequal, broad, and marked with granules.

Height of corallum 8·5 millim., breadth of calice 6·5 millim., length of calice 8 millim. The septa, pali, and columella are of an intense Prussian-blue colour. Locality, Mergui Archipelago.

Subfamily Turbinolidæ reptantes, *Dunc.* (*Revision of Genera &c., Journ. Linn. Soc., Zool.* vol. xviii. p. 34).

Genus Polycyathus, *Dunc. op. cit.* p. 34.

Polycyathus Verrilli, sp. nov. (Plate I. figs. 15, 16.)

The colony covers about 10 square inches, the corallites are variously spaced, rarely very close, small, cylindrical, short, and their costæ pass over the basal structure, which is minutely granular. The calices are widely open, circular, or slightly wavy in marginal outline. Septa slightly exsert, unequal, sharply granular at the sides, extending like a circular *zone* inwards, and surrounding the narrow, deep, circular fossa; rarely with four cycles, usually with three and a few of the fourth order, or only three cycles. Costæ faint on some corallites, well seen on others, much broader relatively than the septa, low, nearly equal, but those of the primaries and secondaries may project near to the margin; they traverse much or all the space between the corallites, or they may not pass far. Epitheca pellicular and granular. There are pali before all septa except those of the last cycle, or they may exist before all the septa in some calices with three cycles of septa; broadest before the secondaries. The pali reach well into the "*zone*" of septa. Columella small, deep, concave, papillose.

Height of ordinary corallites 2–2·5 to 3 millim., width of calice 2 to 2·5 millim.; distance between corallites 2 to 4 millim. Locality, Mergui Archipelago, encrusting.

Polycyathus difficilis, sp. nov. (Plate I. figs. 17, 18.)

The colony covers considerable space and encrusts; the corallites are short, cylindrical, crowded in places, distant in others, broadest at the calice. Calice circular in outline. Septa in three cycles, the tertiaries uniting with the secondaries; the primaries are the larger and are slightly exsert, and all are granular at the sides; they are unequal in size, and project into the calice, and have trifid spinules on the edges. Columella small, concave, and formed by little processes united at their bases. Pali small and short, often indistinct, small before the primaries and larger before the secondaries and nearer the calicular edge. The costæ are large, broad, subequal, and reach over the basal structure more or less, distinct, close, and sometimes curved or bent suddenly, much broader than the septa. A granular epitheca. Much of the basal structure is non-costulate, but is granular.

Height of corallites 2–3 millim., breadth of calices 2–3 millim. Locality, Mergui Archipelago.

Family Pocilloporidæ, *Dunc.* (*Rev.* p. 46).

Genus Pocillopora, *Lmk., pars.*

Pocillopora cæspitosa.

Pocillopora cæspitosa, *Dana, U. S. Expl. Exped., Zooph.* vol. vii. p. 525, pl. 49. figs. 5, 5 *a*, 1846.

Locality, King Island Bay.

Pocillopora favosa.

Pocillopora favosa, *Ehrenberg, Abhandl. d. Akad. Berl.* (1832) p. 351 1834.

Locality, Sullivan Island.

Family Astræidæ.

Genus Mussa, *Oken.*

Mussa cristata.

Madrepora cristata?, *Esper, Pflanz.* t. i. p. 150, *Madr.* p. 226, 1791.

Mussa cristata, *Ed. & H. Hist. Nat. des Corall.* t. ii. p. 335, 1857.

Locality, Elphinstone Island, below low-water mark.

Mussa flexuosa.

Mussa flexuosa, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xi. p. 252, 1849.

Locality, King Island Bay.

Mussa corymbosa.

Madrepora corymbosa, *Forskål, An. in terr. Orient.* p. 137, 1775.

Mussa corymbosa, *Dana, op. cit.* p. 177.

Locality, Elphinstone Island.

Genus Euphyllia, *Ed. & H.*

Euphyllia striata.

Leptosmilia striata, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. x. p. 269, 1849.

Euphyllia striata, *Ed. & H. Hist. Nat. des Corall.* t. ii. p. 194, pl. D 2. fig. 1, 1857.

Locality, King Island Bay.

Euphyllia rugosa.

Euphyllia rugosa, *Dana, op. cit.* p. 166.

Locality, King Island Bay.

Euphyllia plicata.

Euphyllia plicata, *Ed. & H. op. cit.* p. 195.

Locality, King Island Bay.

Genus Mæandrina, *Ed. & H.*

Subgenus Cœloria, (genus) *Ed. & H.*

Mæandrina (Cœloria) dædalea.

Madrepora dædalea, *Ellis & Solander, Hist. of Zooph.* p. 163, pl. 46. figs. 1 & 2, 1786.

Cœloria dædalea, *Ed. & H. Pol. foss. des terr. paléoz. etc.* p. 93, 1831.

Locality, Mergui Archipelago.

Mæandrina (Cœloria) Esperi.

Astoria Esperi, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xi. p. 298, 1849.

Cœloria Esperi, *Ed. & H. Hist. Nat. des Corall.* t. ii. p. 417.

Locality, Mergui Archipelago.

Mæandrina (Cœloria) astræiformis.

Astoria astræiformis, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xi. p. 299, 1849.

Cœloria astræiformis, *Ed. & H. Hist. Nat. des Corall.* t. ii. p. 417, 1857.

Locality, King Island Bay.

Mæandrina (Cœloria) labyrinthiformis.

Madrepora labyrinthiformis (pars), *Linn. Syst. Nat.* ed. x. p. 194, 1758.

Cœloria labyrinthiformis, *Ed. & H. op. cit.* t. ii. p. 412, 1857.

Locality, Sullivan Island.

Genus Brachymæandrina, *Dunc. op. cit.* p. 90.

Brachymæandrina pachychila.

Platygyra labyrinthica, var. pachychila, *Ehrenb. Abhand. Akad. zu Berlin*, 1832, p. 323, 1834.

Cœloria pachychila, *Klunz. Korallth. des Rothen Meeres*, Bd. iii. p. 15, Taf. i. fig. 6, 1879.

Locality, Mergui Archipelago.

Genus Symphyllia, *Ed. & H.*

Symphyllia grandis.

Symphyllia grandis, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xi. p. 255, 1849.

Locality, Mergui Archipelago.

Symphyllia recta.

Mussa recta, *Dana, Zooph.* p. 186, pl. 8. fig. 11, 1846.

Locality, Mergui Archipelago.

Symphyllia (Isophyllia) erythræa.

Isophyllia erythræa, *Klunz. op. cit.* p. 10, Taf. i. fig. 10, & Taf. ix. fig. 9.

Locality, Mergui Archipelago.

Genus Hydnophora, *Ed. & H.*

Hydnophora microcona.

Monticularia microconus, *Lamarck, Hist. Anim. s. Vert.* t. ii. p. 251, 1816; 2 édit. p. 293.

Hydnophora microconus, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xi. p. 302, 1849.

Locality, Sullivan Island.

Genus Tridacophyllia, *Blainv.*

Tridacophyllia lactuca.

Madrepora lactuca, *Pallas, Elench. Zooph.* p. 281, 1766.

Tridacophyllia lactuca, *Dana, op. cit.* p. 195.

Locality, King Island Bay.

Genus Favia, *Oken.*

Favia Ehrenbergi, var. laticollis.

Favia Ehrenbergi, var. laticollis, *Klunz. op. cit.* p. 29, Taf. iii. fig. 7.

Locality, Sullivan Island.

Favia Okeni.

Favia Okeni, *Ed. & H. Hist. Nat. des Corall.* t. ii. p. 430, 1857.

Locality, King Island Bay.

Favia Rousseaui.

Parastræa Rousseaui, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xii. p. 168, 1850.

Favia Rousseaui, *Ed. & H. Hist. Nat. des Corall.* t. ii. p. 429, 1857.

Locality, Mergui Archipelago.

Favia tubulifera.

Favia tubulifera, *Klunz. op. cit.* p. 28, Taf. iii. fig. 6, & Taf. x. fig. 2.

Locality, King Island Bay.

Favia cavernosa.

Madrepora cavernosa, *Forskål, Desc. Anim. &c. quæ in terr. orient. observ.* p. 132, 1775.

Locality, King Island Bay.

Favia Geoffroyi.

Favia Geoffroyi, *Val. MS., in Ed. & H. op. cit.* t. ii. p. 433, 1857.

Locality, King Island Bay.

Genus Goniastræa, *Ed. & H.*

Goniastræa favus.

Madrepora favus, *Forskål, op. cit.* p. 132, 1775.

Goniastræa favus, *Klunz. op. cit.* pt. iii. p. 35, Taf. iv. fig. 4, & Taf. x. fig. 7.

Locality, Mergui Archipelago.

A variety.

Locality, Mergui Archipelago.

Goniastræa retiformis.

Astræa retiformis, *Lamk. Hist. Anim. s. Vert.* t. ii. p. 265, 1816; 2 édit. p. 415.

Goniastræa retiformis, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xii. p. 161, 1850; *Klunz. op. cit.* pt. iii. p. 36, Taf. iv. fig. 5.

Locality, Mergui Archipelago.

Goniastræa Bournoni.

Goniastræa Bournoni *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xii. p. 162, 1850.

Locality, Mergui Archipelago.

Goniastræa halicora.

Astræa halicora, *Hemp. & Ehr. Abhandl. Akad. Berl.* 1832, p. 321.

Prionastræa halicora, *Ed. & H. Hist. Nat. des Corall.* t. ii. p. 517.

Goniastræa halicora, *Klunz. op. cit.* pt. iii. p. 33, Taf. iv. fig. 1, & Taf. x. fig. 3 *a* & *b*.

Locality, King Island Bay.

A variety.

Locality, King Island Bay.

Goniastræa incrustans, sp. nov. (Plate I. figs. 19, 20.)

The colony is large, swollen and gibbous above, and has a thin edge, where an epitheca of a basal nature is seen. Encrusting old corals and parts of dead individuals of the same species. Calices very variable in shape and size, generally irregularly hexagonal, often elongate, and some are more simple than hexagonal, with a large crown of pali. Shallow as a rule, but many are deep; united to the neighbouring corallites by sharp ridges at the surface or by decidedly broad ones; in some parts there is a delicate line or furrow on the broad ridge over which the septa do not pass. Septa extremely variable in number, but the complete fifth cycle is not present. The distinction between the cycles is not possible, and the long and larger are separated by smaller and shorter septa; hence the arrangement is alternate, and this is found in small calices as well as in large. The septa are rather crowded, alternately large and small, and project but slightly from the wall, are straight, and sharply and minutely granular at the free edge. The pali form a very large crown, and encircle a deep and small columellary space; they are before nearly all the longer septa, and are often broader and higher than the septal ends, and are boldly arched and minutely granular. As the septal number of neighbouring calices is never the same, so the size of the crown of pali varies greatly. In some large calices where there are forty-eight septa the pali are before the large twenty-four septa, and then it may occur that those opposite the tertiaries are smaller than the others and bend towards them. But this arrangement does not always occur. Size of the calices has not everything to do with the dimensions of the crown of pali, for neighbouring calices exist of the same size, and in one there are not so many septa as the size would appear to warrant and the pali are diminished in number. In some recently formed corallites the septa are slender and there are no pali; these occur near the margin of the

colony. Fissiparous division occurs, and it is evident that it is the usual method of increase, but gemmation from the basal epitheca seems to happen. Columella deeply seated and very small.

Length of the colony 24 centim., breadth 14; height of the encrusting mass less than 10 millim. Diameter of calices from 3 millim. with forty septa, 5 millim. of the same septal number, 8 millim. with fifty-six septa. Locality, Mergui Archipelago.

Genus Heliastræa, *Ed. & H.*

Subgenus Ulastræa, *Ed. & H.*

Heliastræa (Ulastræa) crispata.

Astræa crispata, *Lamk. Hist. Anim. s. Vert.* t. ii. p. 265, 1816; 2 édit. p. 416.

Ulastræa crispata, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. x. pl. 9. fig. 4, et t. xii. p. 116, 1850.

Locality, Mergui Archipelago.

Genus Phymastræa, *Ed. & H.*

Phymastræa irregularis.

Phymastræa irregularis, *Dunc. Proc. Zool. Soc.* 1883, p. 406.

Locality, King Island Bay.

Phymastræa aspera.

Phymastræa aspera, *Quelch, Report on 'Challenger' Reef-building Corals*, p. 105.

Locality, King Island Bay.

Genus Solenastræa, *Ed. & H.*,
Amended, Dunc. Rev. Fam. & Gen. p. 107.

Subgenus Quelchia. Solenastræans sometimes increasing by fissiparity.

Solenastræa (Quelchia) spongiformis, sp. nov. (Plate I. figs. 21, 22.)

The colony is tuberose, taller than broad, more or less subcylindrical, rounded above and narrower at the attached base. Calices numerous, circular, and slightly raised at the margin, separated by varying amounts of cellular cœnenchyma, which is minutely and sharply spinulose, the spinules being short, slender, jagged, and with from one to four thorny endings. Calicular fossa deep and narrow. The septa are twenty in number, ten

large and ten very small, broadest at the margin and slender within, the larger exsert and the smaller very incised at the free inner edge, all granular at the sides. Costæ larger than the septa, and rarely extending far from the calicular margin. Columella small and deeply seated, composed of a few trabeculæ. Endotheca scanty. Gemmation frequent, and from the cœnenchyma, one part of a bud being close to a calice. Fissiparous calices occasional, large.

Height of colony 45 millim., breadth 30 millim.; breadth of calices 1·5 to 2 millim. Locality, Mergui Archipelago.

Genus Plesiastræa, *Ed. & H.*

Plesiastræa indurata.

Plesiastræa indurata, *Verrill, Proc. Essex Inst.* ser. 2, v. p. 36, 1867.

A variety.

Locality, King Island Bay.

Genus Echinopora, *pars, Dana.*

Echinopora aspera.

Madrepora aspera, *Ellis & Solander, Hist. of Zooph.* p. 156, pl. 39, 1786.

Echinopora aspera, *Dana, U.S. Expl. Exped., Zooph.*, vol. vii. p. 281, 1846.

Locality, King Island Bay.

Genus Leptastræa, *Ed. & H.*

Leptastræa humilis, sp. nov. (Plate I. figs. 23, 24.)

The colony is low, gibbous and encrusting, covering a considerable surface. The corallites are small and short, close, closely united near the base by the fused walls, but separate slightly above, so that the margins of the calices are close but not joined, there not being any costæ in the interval. Calices variable in size and shape, rarely circular, widely open, and having a narrow and deep fossa. Septa in three cycles, with orders of the fourth; primaries the largest, entire above and dentated within; secondaries decidedly less exsert than the primaries; the septa of the fourth and fifth orders small. Columella deeply seated, very small. Endotheca well developed. Increase by gemmation from the marginal calices of the colony.

Height of corallites 9–10 millim., breadth of calices 2–4 millim. Locality, Mergui Archipelago.

Genus Galaxea, *Oken*.

Galaxea irregularis.

Sarcinula irregularis, *Ed. & H. Ann. des Sci. Nat.* 3 sér. t. x. p. 316, 1848.

Galaxea irregularis, *Ed. & H. Pal. foss. des terr. paléoz. &c.* p. 71, 1851.

Locality, Mergui Archipelago.

Genus Prionastræa, *Ed. & H.*

Prionastræa abdita.

Madrepora abdita, *Ellis & Solander, op. cit.* p. 319.

Prionastræa abdita, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xii. p. 128, 1850.

Localities, King Island Bay and Sullivan Island.

Prionastræa vasta.

Prionastræa vasta, *Klunz. Korallth. des Rothen Meeres*, pt. iii. p. 38, Taf. iv. figs. 12 & 8 (var. *superficialis*), Taf. x. fig. 4 *a* & *b* (*Durchschnitte*).

Locality, King Island Bay.

Prionastræa robusta.

Astræa robusta, *Dana, op. cit.* p. 248, pl. 13, fig. 10.

Prionastræa robusta, *Ed. & H. Hist. Nat. des Corall.* t. ii. p. 525.

Locality, Mergui Archipelago.

Genus Merulina, *Ehr.*

Merulina ampliata.

Madrepora ampliata, *Ellis & Solander, op. cit.* p. 157, pl. 41. figs. 1 & 2.

Merulina ampliata, *Ehr. Corall. des Roth. Meer.* p. 104, 1834.

Locality, Elphinstone Island.

Merulina ramosa.

Merulina ramosa, *Ehr. in Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xv. p. 144, 1851.

Locality, Elphinstone Island.

Section MADREPORARIA FUNGIDA.

Family Plesiofungidæ, *Dunc. Revision*, p. 133.

Genus Siderastræa, *Blainv.*

Siderastræa radians.

Madrepora radians, *Pallas, Elench. Zooph.* p. 322, 1766.

Siderastræa galaxea, *Ed. & H. Ann. des Sc. Nat.* xii. p. 139, 1850.

Var. PULCHELLA.
Astræa pulchella, *Ed. & H. Hist. Nat. des Corall.* ii. p. 507.
Locality, Mergui Archipelago.

Family FUNGIDÆ.

Genus FUNGIA, *Dana*,
Amended, Dunc. Revis. p. 141.

FUNGIA CRASSA.
Fungia crassa, *Dana, op. cit.* p. 304, pl. 19. fig. 13.
Locality, Elphinstone Island.

FUNGIA DENTATA.
Fungia dentata, *Dana, op. cit.* p. 293, pl. 18. fig. 7.
Locality, Elphinstone Island.

FUNGIA PATELLA.
Madrepora patella, *Ellis & Solander, op. cit.* p. 148, tab. 28. figs. 1-4, 1786.
Fungia patella, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xv. p. 77, 1851.
Locality, Elphinstone Island.

FUNGIA GLANS.
Fungia glans, *Dana*?
Locality, Elphinstone Island.

Subgenus HALIGLOSSA, (gen.) *Ehr.*, *Dunc. Revis.* p. 142.

FUNGIA (HALIGLOSSA) ECHINATA.
Madrepora echinata, *Pallas, Elench. Zooph.* p. 284, 1766.
Haliglossa echinata, *Klunz. op. cit.* pt. iii. p. 67.
Locality, Elphinstone Island.

Genus HALOMITRA, *Dana*,
Amended, Dunc. Journ. Linn. Soc., Zool. xiii. p. 155, 1883.

Subgenus PODABACIA.

HALOMITRA (PODABACIA) CRUSTACEA.
Podabacia crustacea, *Ed. & H. Hist. Nat. des Corall.* iii. p. 20, 1860.
Locality, Elphinstone Island.

Genus CRYPTABACIA, *Ed. & H.*

CRYPTABACIA TALPINA.
Fungia talpina, *Lamk. Hist. Anim. s. Vert.* p. 370.

Cryptabacia talpina, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xv. p. 95, 1851.

Locality, Elphinstone Island.

Genus Herpolitha, *Eschscholtz.*

Herpolitha limax.

Madrepora limax, *Esper, Pflanz.* t. i. *Forts.* 77, *Madr.* tab. lxiii., 1797.

Herpetolitha limax, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xv. p. 94, 1851.

Locality, Elphinstone Island.

Family Lophoseridæ, *Dunc. Revis.* p. 146.

Genus Lophoseris, *Ed. & H.*

Lophoseris cristata.

Madrepora cristata, *Ellis & Solander, op. cit.* p. 158, tab. xxxi. figs. 3-4, 1786.

Lophoseris cristata, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xv. p. 121, 1851.

Locality, Mergui Island.

Lophoseris cactus.

Pavonia cactus, *Hemp. & Ehr. Abhandl. d. Akad. Berl.* (1832), p. 329, 1834.

Lophoseris cactus, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xv. p. 123, 1851.

Locality, King Island Bay.

Genus Pachyseris, *Ed. & H.*,
Amended, Dunc. Revis. p. 162.

Pachyseris speciosa.

Agaricia speciosa, *Dana, U.S. Explor. Exped., Zooph.* p. 337, pl. 21. fig. 7, 1847.

Pachyseris speciosa, *Ed. & H. Ann. des Sc. Nat.* 3 sér. t. xv. p. 136, 1851.

Locality, Mergui Archipelago.

Genus Coscinaræa, *Ed. & H.*,
Amended, Dunc. Revis. p. 184.

Coscinaræa mæandrina.

Astræa mæandrina, *Ehr. Abhandl. d. Akad. Berl.* 1832, p. 1834.

Coscinaræa mæandrina, *Ed. & H. Pal. foss. des terr. paléoz. &c.* p. 144, 1851.

Locality, Mergui Archipelago.

COSCINARÆA MONILE.

Madrepora monile, *Forskâl, op. cit.* p. 133.

Coscinaræa monile, *Klunz. op. cit.* pt. iii. p. 79, Taf. ix. fig. 4, and Taf. x. fig. 17 *a* & *b* (*Durchschnitte*).

Locality, Mergui Archipelago.

Family PLESIOPORITIDÆ, *Dunc. Revis.* p. 165.

Genus MÆANDROSERIS (*pars*), *Rousseau.*

MÆANDROSERIS BOTTÆ.

Mæandroseris Bottæ, *Rousseau, Voy. au Pôle sud de Dumont d'Urville, Zool.* t. v. p. 121, *Zooph.* pl. 28. fig. 1 (1854).

Locality, Mergui Archipelago.

Section MADREPORARIA PERFORATA, *Ed. & H.*

Family EUPSAMMIDÆ, *Dunc. Revis.* p. 172.

Genus BALANOPHYLLIA, *S. Wood.*

BALANOPHYLLIA MERGUIENSIS, sp. nov. (Plate I. figs. 25, 26.)

The corallum is small, short, rather higher than broad, nearly cylindrical, being slightly compressed. Calice elliptical and larger than the base, and deep. Septa numerous and crowded, in incomplete five cycles. Primaries and secondaries equal, thin, plain at the margin of the calice and with ragged edges elsewhere and near the columella. The tertiaries have a tall, stout, serrated swelling near the columella, joined by the higher orders. These large projections form as it were a paliferous crown around the columella, and this is deeply seated, long and narrow, and trabeculate. Costæ nearly equal, with a single row of short rounded granulations, often wavy, narrow, bifurcating, and not much projecting. Intercostal spaces minutely and regularly perforated. Epitheca rudimentary.

Height of corallum 8–9 millim.; breadth of calice 5·5 millim., length 7 millim. Locality, Mergui Archipelago.

Genus DENDROPHYLLIA, *Ed. & H.*

DENDROPHYLLIA COARCTATA, sp. nov. (Plate I. figs. 27, 28.)

The colony is moderately tall, with a broad base, and consists of corallites of various sizes and of different ages; parent corallite not usually detected. Some buds arise close to the base

and others nearer the calicular margins of the corallites. Corallites turbinate, compressed. Calices elliptical, often much compressed, longer than broad, with a moderately stout margin. Septa slightly exsert and projecting but slightly from the wall towards the axis of the calice, thin, imperforate except close to the wall, and with plain edges; the smaller with ragged edges and often with projections on them near the columella. There are four complete cycles, and part of a fifth may exist. In the large calices the fifth is nearly complete and the primaries and secondaries are equal; the tertiaries are slender and do not project much from the wall, but they become large near the columella on account of the junction of the higher orders with them. The septa of the fourth and fifth orders reach halfway down the corallite and join the tertiaries, and the small cribriform septa of the fifth cycle join the fourth and fifth orders not far from the calice. Or this last junction may not take place. Columella deep, small, elongate, formed of lax trabeculæ, and these join the principal septa. Wall stout, cribriform, perforated very regularly. Costæ variable, usually subequal, minutely granular, projecting slightly. The long and short axes of the margin of the calices are on different planes.

Height 38 millim.; breadth of free surface 20–25 millim., length of the free surface 35–45 millim.; length of calices 8–15 millim., breadth 8–12 millim.; depth of large calices 8–15 millim. Locality, Mergui Archipelago.

Subgenus Cœnopsammia, (gen.) *Ed. & H.*, *Dunc. Revis.* p. 178.

Dendrophyllia (Cœnopsammia) affinis, sp. nov. (Plate I. figs. 29, 30.)

The colony is low, more or less hemispherical, and encrusts. Corallites project slightly above the lax, highly porous cœnenchyma. Calices circular in outline, as deep as they are broad. Septa with three cycles, often incomplete, and rarely an order of the fourth; primaries are a little exsert, imperforate except near the wall, slightly granular, and larger than the secondaries; both join the columella. The smaller tertiaries may bend towards and join the secondaries, but the opposite condition is quite as frequent, and the Eupsammine condition is often not seen. Columella deeply seated, small, and composed of two or three trabeculæ, or larger and of many trabeculæ. Costæ

granular, numerous, equal, distinct down to the cœnenchyma. Intercostal spaces large and highly perforate. Cœnenchyma finely spinulose and more or less perforated. There is an epitheca at the edge of the base of the coral, and it is dense.

Height of corallites above the cœnenchyma 2–4 millim.; breadth of the calices 5–7 millim. Gemmation occurs from the corallite-walls. Locality, Mergui Archipelago.

In some calices of *Cœnopsammia affinis* the third cycle is complete and its septa are long and reach the columella in most half-systems; but occasionally there is an attempt as it were to bend towards the secondary, and there may be the rudiments of a fourth cycle. In another calice as large as the last the primaries are the only well-developed septa; and in some systems the secondaries are small, bent, and cribriform, and unite with the columella low down, and then there are just vestiges of rudimentary tertiaries. The columella in this calice is not one quarter the size of that of the other.

Genus Astropsammia, *Verrill.*

Astropsammia Pedersoni.

Astropsammia Pedersonii, *Verrill, Proc. Boston Soc. of Nat. Hist.* vol. xii. p. 392, 1869.

Locality, Mergui Archipelago.

Family Madreporidæ (*pars*), *Ed. & H.*

Genus Madrepora, *Linn.*

Madrepora gracilis.

Madrepora gracilis, *Ed. & H. Hist. Nat. des Corall.* iii. p. 147, 1860.

Locality, Sullivan Island.

Madrepora valida.

Madrepora valida, *Dana, op. cit.* p. 461.

Locality, Elphinstone Island.

Madrepora surculosa.

Madrepora surculosa, *Dana, op. cit.* p. 445, pl. 32. fig. 4.

Locality, Owen Island.

Madrepora hebes.

Madrepora hebes, *Dana, op. cit.* p. 468, pl. 35. fig. 5.

Locality, Sullivan Island.

MADREPORA PYRAMIDALIS.

Madrepora pyramidalis, *Klunz. op. cit.* pt. ii. p. 12, Taf. i. fig. 2, Taf. iv. fig. 6, Taf. ix. fig. 7.

Locality, Sullivan Island.

MADREPORA PAXILLIGERA.

Madrepora paxilligera, *Dana, op. cit.* v. p. 452, pl. 34. fig. 1.

Locality, Owen Island and Sullivan Island.

MADREPORA CRIBRIPORA.

Madrepora cribripora, *Dana, op. cit.* p. 470, pl. 31. figs. 1, 1 *a*, 1 *b*.

Locality, Elphinstone Island.

MADREPORA SPICIFERA.

Madrepora spicifera, *Dana, op. cit.* p. 442, pl. 33. figs. 4, 4 *a*, 4 *b*, 5, et pl. 31. fig. 6, *a*, *b*, *c*.

Locality, Sullivan Island.

Genus TURBINARIA, *Oken*.

TURBINARIA CINERASCENS.

Madrepora cinerascens, *Ellis & Solander, op. cit.* p. 157, pl. 43.

Turbinaria cinerascens, *Oken, Lehrb. der Naturgesch. Zool.* t. i. p. 67.

Locality, King Island Bay.

TURBINARIA CRATER.

Madrepora crater, *Pallas, Elench. Zooph.* p. 332.

Turbinaria crater, *Oken, Lehrb. der Naturgesch. Zool.* t. i. p. 67.

Locality, King Island Bay.

Family PORITIDÆ, *Ed. & H.*

Genus PORITES, *Ed. & H.*

PORITES CONGLOMERATA.

Porites conglomerata, *Quoy & Gaim. Voy. de l'Astrol. Zooph.* p. 429, 1833. A variety.

Locality, Elphinstone Island.

PORITES NODIFERA.

Porites nodifera, *Klunz. op. cit.* pt. ii. p. 41, Taf. iv. fig. 13, Taf. v. fig. 17.

Locality, King Island Bay.

PORITES EXCAVATA.

Porites excavata, *Verrill, Trans. Connect. Acad.* vol. i. part 1, p. 504, 1866.

Locality, King Island Bay.

Genus Synaræa, *Verrill.*

Synaræa lutea.

Synaræa lutea, *Verrill, Bull. Mus. Comp. Zoöl. Harvard,* 1869; *Klunz. op. cit.* pt. ii. p. 49, Taf. v. fig. 29, Taf. vii. fig. 4.

Locality, Elphinstone Island.

Genus Goniopora.

Goniopora columna.

Goniopora columna, *Dana, op. cit.* p. 469, pl. 56. fig. 5, 1846.

Locality, King Island Bay.

Goniopora lobata.

Goniopora lobata, *Ed. & H. Monogr. des Poritides,* p. 40.

Locality, Mergui Archipelago.

The indeterminable species were either dead corals forming the bases of encrusting species, or fragments. A *Fungia* remains to be described.

Remarks on the Species.

The *Paracyathi* have all a high septal number and low, broad subequal granular costæ, and with one exception, *P. cæruleus*, they have deeply seated small columellæ. Most of them are large forms, and the specific characters are given by the septa and pali. Some small specimens which are on the blocks of stone with the types show that the septal number is attained very early.

The species are allied to the Chinese forms and to such species as *P. caltha*, Verrill, from the west coast of North America. They have but slight affinity with Mediterranean species.

It is interesting to find that in two of the species the septa, pali, and columella are of a blue colour, which has withstood the effects of alcohol, eau de Javelle, and chloride of lime. Other species are brown in part, whilst one beautiful form is of the usual brilliant white colour. All the *Paracyathi* are new to science.

I have already described a species of *Polycyathus* from the Persian Gulf (Proc. Zool. Soc. 1876, p. 433), and two have now come before me from Mergui. About one which is well characterized, *P. Verrilli*, there is no doubt, and the wandering of the

costæ over the common basal structure is very well shown and so are the pali. A single corallite has a great resemblance to *Astrangia palifera*, Verrill, from Ceylon, but the Mergui form is not an *Astrangia*. The smallness of the pali in *Polycyathus difficilis* and their resemblance to columellary papillæ may mislead, but in some of the corallites the existence of pali and the absence of endotheca are as apparent as is the presence of costæ reaching down to and upon the intermediate basal structure.

Pocillopora is represented by two species, one of which is also found in the Red Sea, whilst the other has a Sandwich-Island habitat.

Of the genus *Mussa* two of the species in the collection are Red-Sea forms, and the third, *M. flexuosa*, Ed. & H., obtains a known habitat for the first time. They are all fine forms.

Euphyllia striata and *E. plicata* now receive known habitats; and *E. rugosa* is also from Fiji.

The species of *Symphyllia* are common to the Red Sea and the islands of the Pacific; and the solitary species of *Hydnophora* is also found in the seas of the great islands to the east.

The four species of *Mæandrina*, subgenus *Cœloria*, show the intermediate character of the Mergui fauna, for some are known in the Red Sea and others are members of the Chinese and Pacific faunas.

The genus *Brachymæandrina* was founded to receive a form well known in the Red Sea, and there are specimens from Mergui.

The six species of *Favia* are known in the coral-faunas of the Red Sea and the Seychelles. *Goniastræa* is a genus which has also species in the Red Sea, Ceylon, Seychelles, and in the Pacific reefs. The Mergui forms are large as a rule. One, *G. Bournoni*, Ed. & H., has a habitat given to it for the first time. *Goniastræa incrustans* is a new species, and it shows how necessary it is to study the variations of every part of a colony in order to diagnose a species properly. It is evident, after an examination of the whole of the specimen which is the type, that were it broken up and fossilized two or three species and a new genus might be made out of it. The interesting point is the absence of the large crown of pali in some few corallites and the thickness of the fused wall of others, some resembling species of *Favia*.

Mr. Quelch, late of the British Museum, has given me his efficient help in comparing some of the *Phymastrææ* from Mergui

with the types in the British Museum, and there is no doubt that *Phymastræa irregularis*, Dunc., which I described in the Proc. Zool. Soc. 1883, p. 406, is a Mergui form. *P. aspera*, Quelch, which will shortly appear described in the ' Challenger ' Report on the Reef Corals (p. 105), is also a Mergui form. Its first discovery was at Banda.

The Solenastræan subgenus *Quelchia* has occasional fissiparous calices, and is a characteristic form from Mergui. *Plesiastræa indurata*, Verrill, was described by Verrill from the Loo Choo Islands (Proc. Essex Institute, ser. 2, vol. v. 1867, p. 35, pl. 2. fig. 7).

The *Balanophyllia* is a well-marked species, and the row or crown-like series of swollen tertiaries resembles one consisting of pali. The small and young forms show this peculiarity also, and their septal number is of course lower.

The *Dendrophyllia* is a common form at Mergui, and, as the specific name implies, the colony is stunted, and resembles a bunch of compressed buds without a definite stem. It is a very exceptional species of a very variably shaped group. The subgenus *Cœnopsammia* is represented by an interesting species, and it is not without its affinity with *C. coccinea*; but the small and variably shaped columella and the septal number constitute, besides the colour, specific distinctions. The variability of the corallites in the small colonies of this species is very suggestive.

Verrill's species *Astropsammia Pedersoni*, which was first found in the Panamian province of W. America, occurs at Mergui, and there is no doubt that the distant localities have their simple corals closely allied and some of the colonial also.

The collection of species of *Madrepora* is very considerable, and their variability, owing to the conditions under which the forms grew, has given much trouble in classification. The only form about which I have some doubt I have classified under *M. gracilis*, Ed. & H. The description given in Hist. Nat. des Corall. vol. iii. p. 147, is conveyed in two lines and with a reference to another species. The large tubulo-nariform calices are very characteristic of the Mergui form. A species, *M. cribripora*, also with nariform calices, is stunted, and shows some evidence of having had the same occasionally slightly saline water to live in as is the case where the type of Dana was obtained in Fiji. Some of the species found at Mergui have a Red-Sea habitat, and others belong to the Pacific fauna.

The genus *Porites* flourishes at Mergui, and there is a large

form with twenty-four septa which I believe is Verrill's *P. excavata* from the Pearl Islands, Panama Bay. The only distinction is that the type has deeper calices. *Synaræa* of Verrill is also represented.

Fifteen species of the section Madreporaria Fungida occur at Mergui, but there is nothing particular to be said about them; they are well-known forms which also live in the Red Sea, Indian Ocean, Chinese seas, and on the Pacific reefs.

As a coral-fauna that of Mergui has rather more than one sixth of the species characteristic, and they are humble and for the most part simple species (solitary). The remaining species are also found from the Mozambique coast to China, as well as in western Central American seas and in the reefs of the Pacific Islands. The Australian, Mediterranean, and Atlantic coral-faunas are not represented by species at Mergui.

It is very remarkable that the coral-fauna of Ceylon, so far as it is known from Mr. Stuart O. Ridley's researches (Ann. & Mag. Nat. Hist. ser. 5, vol. xi. 1883, p. 250), does not contain a single Mergui species. The number of genera common to the two areas is, however, great, and many species are very closely allied.

Some great groups of Madreporaria are absent at Mergui, such as the non-paliferous Turbinolidæ, and the whole of the Oculinidæ except *Pocillopora*.

On turning to the descriptions of the Tertiary Madreporaria of the Asiatic province, and especially to the collections which were so carefully collected by the Geological Survey of India from Sind, which belong to the remains of a flourishing coral sea of Miocene age, one cannot but be impressed with the total distinctness of the ancient and modern faunas. There are no species, and few genera, in common (Pal. Ind. ser. xiv.). Unfortunately Pliocene fossiliferous deposits are rare in that part of the world, but it is to be hoped that search will be made for those which may be coralliferous so as to enable palæontologists to give the succession of forms in India from the Jurassic to the present day.

DESCRIPTION OF PLATE I.

Figs. 1–3. *Paracyathus Andersoni.* 1, side view, nat. size; 2, a system of septa and pali, magnified; 3, costæ, magnified.

4–6. *P. profundus.* 4, side view, nat. size; 5, a half-system of septa and pali, magnified; 6, costæ, magnified.

7–9. *P. indicus.* 7, side view, nat. size; 8, a system of septa and pali, magnified; 9, costæ, magnified.

10, 11. *P. cæruleus.* 10, side view, nat. size; 11, a half-system of septa and pali, magnified.

12–14. *P. merguiensis.* 12, side view, nat. size; 13, a half-system of septa and pali, magnified; 14, costæ, magnified.

15, 16. *Polycyathus Verrilli.* 15, part of a colony, nat. size; 16, a corallite, magnified. The pali are the outer knobs of the axial space.

17, 18. *P. difficilis.* 17, part of a colony, nat. size; 18, a corallite, magnified.

19, 20. *Goniastræa incrustans.* 19, part of a colony, nat. size; 20, a calice, magnified.

21, 22. *Solenastræa* (*Quelchia*) *spongiformis.* 21, the colony, nat. size; 22, calices, magnified.

23, 24. *Leptastræa humilis.* 23, calices, nat. size; 24, a calice, magnified.

25, 26. *Balanophyllia merguiensis.* 25, coral, nat. size; 26, part of a calice, magnified.

27, 28. *Dendrophyllia coarctata.* 27, colony, nat. size; 28, part of a calice, magnified.

29, 30. *D.* (*Cœnopsammia*) *affinis.* 29, the colony, nat. size; 30, a calice, magnified.

On the Holothurians of the Mergui Archipelago collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, Superintendent of the Museum.

By Professor F. Jeffrey Bell, M.A., Sec. R.M.S. (Communicated by Dr. John Anderson, F.R.S., F.L.S.)

[Read 3rd June, 1886.]

(Plate II.)

The collection of Holothurians made by Dr. John Anderson, though small, offers some points of interest, for it contains an unexpectedly large number of undescribed species, of species known to me before from one locality only, or forms that have as yet been seen only by those who described them.

The recent publication of Dr. Kurt Lampert's comprehensive monograph on the Holothuroidea * renders it unnecessary for me

* Reisen &c. von Dr. C. Semper. II. iv. Die Seewalzen, von Dr. Kurt Lampert: Wiesbaden, 1885.

to enter here on any extensive bibliography; I propose, in most cases, to refer simply to that naturalist's work.

1. Synapta recta, *Semper*; *Lampert*, p. 220.—Owen Island.
This species has hitherto only been reported from Bohol.

2. Chirodota rufescens, *Brandt*; *Lampert*, p. 230.—Elphinstone Island.
This is a widely distributed species, extending to Japan.

3. Cucumaria Forbesi, n. sp. (Plate II. figs. 1–3.)
Among various Echinoderms sent at different times by Mr. James A. Murray, of the Kurrachee Museum, I have recognized a new species of *Cucumaria*, which was comparatively well represented. In an essay of mine on that genus, which has now been long in preparation, I find the MS. description of this species. As it is represented in Dr. Anderson's collection by a single specimen, I here transcribe and publish that description:—

Body elongated, almost quadrilateral; suckers numerous, confined to the ambulacral areæ; integument thick, white, dense, richly supplied with spicules. Calcareous ring simple; retractors rather long, broadest in their middle.

The spaces separating the trivial row of suckers are narrow, and, as they lie nearly in the same plane, the general form of the body is as nearly quadrangular as pentagonal; in these rows the suckers are not confined to two regular series; in the bivial rows the suckers are more regularly arranged in paired sets.

The calcareous ring is simple and delicate, the retractors are inserted just behind the first anterior third of the body, and are swollen into a muscular belly about their middle. Polian vesicle large, elongated; genital tubes simple, attached far forwards.

The spicules are not unlike those of *C. Planci*, but not so stout; the rounded medusiform bodies have a few holes, and those large; the supporting spicules in the suckers are nearly straight, and have a few holes, which are largest and most numerous at either end.

Measurements:—

	millim.	millim.	millim.
Length	48	57·5	63·5
Breadth of narrower interambulacrum..	3·5	5	6
Breadth of wider do..	4	7	7

I associate with this species the name of my lamented friend W. A. Forbes, who was for several years the Prosector of the Zoological Society of London.

4. Cucumaria assimilis, n. sp. (Plate II. fig. 4.)

A true *Cucumaria* of small size, irregular cask-like shape, soft integument, suckers arranged in zigzag or in irregular rows.

Differs from *C. leonina* in being of a slate-colour, the suckers darker, in having the spicules without projecting processes and stouter (Pl. II. fig. 4), and in not, so far as one is able to judge from the single specimen dissected, having long genital tubes.

The species would appear to be most closely allied to *C. leonina*, the spiculation being most similar to that of *Semperia syracusana*.

Length 33 ; 25 millim. Greatest breadth 14·5 ; 7 millim.

Elphinstone Island.

5. Semperia, sp.

There are several specimens of a species of this genus, but the characters are, it seems to me, those of young and not of adult specimens, and it is therefore impossible to exactly assign the species to its proper place. It will, I think, be found to be a form that will exhibit interesting modifications during growth. The idea suggested itself to me, but did not commend itself, that the specimens in question are the young of *Cucumaria Forbesi*.

Elphinstone Island.

6. Ocnus javanicus, *Sluiter* ; *Lampert*, p. 129.—Palaw Bay.

This species, hitherto known only from Java, seems to be fairly abundant at Mergui ; I have little doubt that the single specimen of *Ocnus*, whose specific position I was unable to identify when writing the Report on the Echinoderms of the 'Alert' Collection (see Brit. Mus. Rep. 'Alert' Coll. 1884, p. 147), belongs to Sluiter's species ; in which case, as the 'Alert' found it at Port Darwin, it will be widely distributed.

7. Thyone sacellus, *Selenka* ; *Lampert*, p. 154.—Elphinstone Island.

8. Stichopus chloronotus, *Brandt*; *Lampert*, p. 107.—Elphinstone Island ; a single specimen in very bad condition.

9. Bohadschia argus, *Jaeger* ; *Lampert*, p. 87.—Elphinstone Island ; there was but one specimen of this common species.

10. Holothuria atra, *Jaeger*; *Lampert*, p. 85.—Elphinstone Island.

11. Holothuria impatiens, *Forskål*; *Lampert*, p. 65.—Elphinstone Island.

12. Holothuria insignis, *Ludwig*; *Lampert*, p. 61.—Palaw Bay. This specimen is not of so stout a habit as those described by Prof. Ludwig.

13. Holothuria vagabunda, *Selenka*; *Lampert*, p. 71.—Owen Island and Elphinstone Island.

14. Holothuria Andersoni, n. sp.

In the recently proposed arrangement of Dr. Lampert, this new species will stand nearest to *H. lubrica* of Selenka, for there are no turriform or C-shaped bodies, no anal teeth, and the Cuvierian tubes are small and inconspicuous.

Body elongated, cylindrical; skin smooth, soft, not very closely packed, papillæ on bivial and scattered suckers on trivial areas. Tentacles ?20. Pharyngeal annularia only, the radial much longer than the interradials. One Polian vesicle, 25 millim. long. Genital tubes few, short, not much branched; Cuvierian tubes few, short, pale. Spicules in the form of reticulated rods only, such as are commonly found in suckers. Colour black. Length 120 millim.; breadth 26 millim.

Mergui.

In addition to the specimen described above, there are two others which in essential characters belong to the same species; the body-wall, however, is thinner, the colour is lighter, and the bivial papillæ are less thickly massed and pronounced.

DESCRIPTION OF PLATE II.

Fig. 1. *Cucumaria Forbesi*; external view. $\times\frac{3}{2}$.

2. The same, dissected to show the form of the retractor muscles (*m*), the characters of the œsophageal ring (*v*), and the size of the Polian vesicle (*p*). $\times 2$.

3. The same: *a*, front, *b*, side view of calcareous plate from the integument; *c*, medusiform plate. $\times 450$.

4. Calcareous plate from integument of *C. assimilis*. $\times 225$.

List of the Lepidoptera of Mergui and its Archipelago collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By Frederic Moore, A.L.S., F.Z.S.

[Read 3rd June, 1886.]

(Plates III. & IV.)

The Lepidoptera comprised in this collection consist of 208 species of Butterflies and 64 species of Moths. Of the Butterflies, *one third* of the number are species that are common to both the Continent of India and the Malay Peninsula. About *one fourth* are confined to Burmah and the Malay Peninsula, and about *one eighth* extend northward to the Khasia Hills; the remaining *one fourth*, so far as is yet known, being Burmese—some few of these latter species also extending, on the one hand, to Siam, and two or three, on the other hand, to the Andamans and Ceylon. Of the 64 species of Moths, *one third* are also common to India and the Malay Peninsula, *one fourth* are Burmese and Malayan, and *one fourth* extend northward, *three* only being strictly Burmese.

RHOPALOCERA.

Family Nymphalidæ.

Subfamily Euplœinæ.

Hestia agamarschana, *Felder*, *Nov. Reise*, *Lep.* ii. p. 351, pl. 43. f. 7 (1867).

Minthantoung (Dec.).

Radena vulgaris.

Danais vulgaris, *Butler*, *Ent. M. Mag.* xi. p. 164 (1874).

Mergui (Dec.).

Tirumala Limniace.

Papilio Limniace, *Cramer*, *Pap. Exot.* i. pl. 59. f. D, E (1775).

Mergui (March); Tavoy (Dec.).

Tirumala septentrionis.

Danais septentrionis, *Butler*, *Ent. M. Mag.* xi. p. 163 (1874).

Mergui (Dec.); Thaing, King Island (Feb.).

Tirumala gautama.

Danais gautama, *Moore*, *Ann. & Mag. Nat. Hist.* 4th ser. xx. p. 43 (1877); *P. Z. S.* 1883, pl. 31. f. 3.

Mergui (Dec., March); Zediwon (Dec.).

Limnas Chrysippus.

Papilio Chrysippus, *Linn. S. N.* (1758) p. 471.

Mergui (Dec., March).

Salatura Genutia.

Papilio Genutia, *Cramer, Pap. Exot.* iii. pl. 206. f. C, D (1779).

Mergui (Dec., Jan.); Pataw Island (Dec.); Thaing, King Island (Feb.). Very common.

Salatura Hegesippus.

Papilio Hegesippus, *Cramer, Pap. Exot.* ii. pl. 180. f. A (1777).

Mergui (Dec.); Zediwon (Dec.); Minthantoung (Dec.); Pataw (Dec.).

Bahora crocea.

Danais crocea, *Butler, Proc. Zool. Soc.* 1866, p. 57, pl. 4. f. 5.

Mergui (Dec.); Elphinstone Island (March).

Parantica melanoides.

Parantica melanoides, *Moore, Proc. Zool. Soc.* 1883, p. 247.

Mergui (Dec.); Pataw Island (Dec.).

Parantica agleoides.

Danais Agleoides, *Felder, Wien. ent. Monats.* iv. p. 398 (1860).

Mergui (Dec., Jan., March); Zediwon (Dec.); Pataw Island (Dec.); Minthantoung (Dec.). Very common.

Caduga melaneus.

Papilio melaneus, *Cramer, Pap. Exot.* i. pl. 40. f. D (1775).

Mergui (Dec.).

Menama cupreipennis.

Crastia cupreipennis, *Moore, Proc. Zool. Soc.* 1871, p. 823.

Mergui (Dec., March); Pataw Island (Dec.); Sullivan Island (Jan.); Thapo, King Island (Jan.); Elphinstone Island (March).

Menama tavoyana.

Menama tavoyana, *Moore, P. Z. S.* 1883, p. 265, pl. 30. f. 6, ♂.

Mergui (Nov., Dec.); Sullivan Island (Jan.).

Tronga Bremeri.

Euplœa Bremeri, *Felder, Wien. ent. Monats.* iv. p. 398 (1860).

Mergui (Dec., March); Minthantoung (Dec.); Pataw Island (Dec.); Yimiki, King Island (Feb.); Zediwon (Dec.); Pataw Island (Dec.); Sullivan Island (Jan.); Elphinstone Island (March). Very common.

Penoa Limborgii.

Euplœa limborgii, *Moore, P. Z. S.* 1878, p. 823, pl. 41. f. 2.

Mergui (Dec.); Pataw Island (Dec.); Thapo, King Island (Jan.).

Penoa Alcathoë.

Danais Alcathoë, *Godart, Enc. Méth.* ix. p. 178 (1819).

Pataw Island (Dec.); Minthantoung (Dec.); Sullivan Island (Jan.); Elphinstone Island (March).

Penoa Menetriesii.

Euplœa Menetriesii, *Felder, Wien. ent. Monats.* iv. p. 398 (1860).

Mergui (Dec.).

Crastia Godartii.

Euplœa Godartii, *Lucas, Rev. Zool.* 1853, p. 319.

Mergui (Nov., Dec., March); Pataw Island (Dec.); Zediwon (Dec.); Elphinstone Island (March). Very common.

Trepsichrois Linnæi.

Trepsichrois Linnæi, *Moore, P. Z. S.* 1883, p. 286, pl. 29. f. 4, pl. 30. f. 1.

Mergui (Nov., Dec.); Pataw Island (Dec.); Sullivan Island (Jan.); Zediwon (Jan.); Minthantoung (Dec.); Thaing, King Island (Feb.); Owen Island (Feb.); Elphinstone Island (March). Very common.

Euplœa Phœbus.

Euplœa Phœbus, *Butler, P. Z. S.* 1866, p. 270.

Sullivan Island (Jan.); Elphinstone Island (March).

Danisepa Diocletianus.

Papilio Diocletianus, *Fabr. Ent. Syst.* iii. p. 40.

Mergui (March); Elphinstone Island (March).

Pademma Erichsonii.

Euplœa Erichsonii, *Felder, Nov. Reise, Lep.* ii. p. 324 (1867).

Mergui (Dec.); Elphinstone Island (Dec.); Thaing, King Island (Feb.).

Isamia margarita.

Euplœa margarita, *Butler, P. Z. S.* 1866, p. 279.

Mergui (Nov., Dec., March); Thapo, King Island (Jan.); Sullivan Island (Jan.); Minthantoung (Dec.).

Stictoplœa Harrisii.

Euplœa Harrisii, *Felder, Nov. Reise, Lep.* ii. p. 238, ♂ (1867).

Mergui (Dec.); Elphinstone Island (Dec.); Sullivan Island (Jan.).

Males and a single female were collected by Dr. Anderson. The female of this species is erroneously figured by Felder in the Novara Reise, pl. 41. f. 7, as the female of *Euplœa Grotei*.

Subfamily Satyrinæ.

Lethe Europa.

Papilio Europa, *Fabr. Syst. Ent.* p. 500 (1775).

Mergui (March).

Melanitis Ismene.

Papilio Ismene, *Cramer, Pap. Exot.* i. pl. 26. f. A, B.

Mergui (March 21st, April 24th); Owen Island (Jan.); Thaing, King Island (Jan.); Elphinstone Island (March).

Melanitis determinata, *Butler, Trans. Ent. Soc.* 1885, p. vi.

Melanitis Leda (of modern authors).

Mergui (December 8th, April 23rd).

From the fact that the two above-mentioned species of *Melanitis* are both found flying at the same time of year, they cannot possibly be "seasonal forms" of one another, as has been recently stated (Proc. Ent. Soc. London, 1885, p. ii) by Mr. L. de Nicéville.

Calysisme Perseus.

Papilio Perseus, *Fabr. Syst. Ent.* p. 488 (1775).

Mergui (Dec.).

Calysisme indistans, *Moore, Trans. Ent. Soc.* 1880, p. 164.

Mergui (Dec., March); Pataw Island (Dec.); Thaing, King Island (Jan., Feb.); Elphinstone Island (March).

Calysisme mamerta (var.).

Papilio mamerta, *Cram. Pap. Exot.* iv. pl. 326. f. D.

Elphinstone Island (March). A single specimen.

Orsotriæna Medus.

Papilio Medus, *Fabr. Syst. Ent.* p. 488 (1775).

Mergui (Dec., March); Elphinstone Island (March).

Ypthima Hubneri, *Kirby, Catal. D. Lep.* p. 95.

Ypthima Philomela, *Hübner, Zutr. exot. Sch.* f. 83, 84.

Mergui (Dec., March); Minthantoung (Dec.). Very common.

Ypthima Baldus.

Papilio Baldus, *Fabr. Mant. Ins.* ii. p. 34 (1787).

Mergui (Dec., March); Pataw Island (Dec.); Zediwon (Dec.); Thaing, King Island (Feb.). Very common.

Ypthima Marshallii, *Butler, Ann. & Mag. Nat. Hist.* 5th ser. x. p. 373, 1882.

Mergui (Dec.); Thaing, King Island (Jan. and Feb.); Thapo, King Island (Jan.) Numerous.

Elymnias tinctoria.

Elymnias tinctoria, *Moore, P. Z. S.* 1878, p. 826, ♂.

Mergui (Dec.); Thaing, King Island (Jan.).

The female of this species has the basal median area of the fore wing tawny, and a curved submarginal purpurescent-white macular band; the hind wing has the basal median area whitish, mottled with ferruginous brown, and a submarginal row of four white spots.

Elymnias obnubila. (Plate III. fig. 2.)

Elymnias obnubila, *Marshall, Butt. of India*, i. p. 272.

Thaing, King Island (Jan.). A single specimen.

Dyctis Andersonii. (Plate III. fig. 5.)

Male. Upperside violet-brown; fore wing with a marginal curved series of grey spots, the three upper of which are of a lengthened oval form, and the three lower pyriform, with the point acute; hind wing with a broad marginal scalloped-bordered lilacine-grey band. Underside of a pale vinous brown, the apical area of fore wing and the exterior marginal area of hind wing whitish; crossed by numerous darker brown, more or less confluent strigæ, which are broadest from the disk to the base.

Expanse $2\frac{1}{8}$ inches.

Hab. Minthantoung (Dec.).

Nearest to *D. Esaca*, from Borneo. Differs from the same sex of that species in its smaller size. On the fore wing above the lower marginal grey spots have a decidedly acute inner point. On the hind wing the marginal grey spots are of three times the width, and form a broad marginal band. Underside differs in being of a uniformly paler colour, especially at the apex of fore wing and along the exterior border of hind wing; the brown strigæ also showing up more prominently.

Subfamily Morphinæ.

Amathusia Phidippus.

Papilio Phidippus, *Linn. Syst. Nat.* i. 2, p. 725 (1767).

Thaing, King Island (Jan.). A single specimen of the female.

Discophora Celinde.

Papilio Celinde, *Stoll, Cram. Pap. Exot.* v. pl. 37. f. 1, 1 *a* (1790).

Elphinstone Island (Feb.). A single male specimen.

Subfamily Nymphalinæ.

Cethosia Biblis.

Papilio Biblis, *Drury, Ill. Exot. Ent.* iii. pl. 4. f. 2 (1773).

Mergui (Dec.). A single specimen.

Cirrochroa rotundata, *Butler, Trans. Linn. Soc.*, 2nd ser. *Zool.* i. p. 543 (1879).

Minthantoung (Dec.); Sullivan Island (Jan.); Thaing, King Island (Feb.); Elphinstone Island (March).

Cirrochroa surya, *Moore, P. Z. S.* 1878, p. 827.

Kisseraing Island (Dec.); Yimiki, King Island (Feb.).

Paduca, gen. nov.

Wings narrower than in *Cirrochroa*.

Male. Fore wing more triangular in form; fourth subcostal branch emitted at a further distance from the third; discocellular descending obliquely inward; the two upper medians at a short distance beyond end of the cell; venation of hind wing similar, the lower submedian straighter. Antennæ with a much stouter and shorter terminal club; palpi narrower.

Type *P. fasciata*.

Paduca fasciata.

Atella fasciata, *Felder, Wien. ent. Monats.* iv. p. 236; *Nov. Reise, Lep.* iii. pl. 49. f. 9, 10 (1867).

Sullivan Island (Jan.); Elphinstone Island (March).

Messaras Erymanthis.

Papilio Erymanthis, *Drury, Ill. Exot. Ent.* i. pl. 15. f. 3, 4 (1773).

Pataw Island (Dec.); Thapo, King Island (Jan.); Thaing, King Island (Feb.); Yimiki, King Island (Feb.); Mergui (March). Common.

Atella Alcippe.

Papilio Alcippe, *Cram. Pap. Exot.* iv. pl. 382. f. G, H (1782).

Thaing, King Island (Feb.).

Atella Sinha.

Terinos Sinha, *Kollar, Hügel's Kaschm.* iv. 2, p. 438 (1844).

Mergui (Dec.). A single specimen.

Junonia Asterie.

Papilio Asterie, *Linn. S. N.* i. 2, p. 769 (1767).

Minthantoung (Dec. 20); Mergui (Dec.).

Junonia Almana.

Papilio Almana, *Linn. S. N.* i. 2, p. 769 (1767).

Minthantoung (Dec. 20).

These two species (*J. Asterie* and *J. Almana*) being found flying at the same time must disprove Mr. de Nicéville's supposition that they are seasonal forms of one another.

Junonia Laomedia.

Papilio Laomedia, *Linn. S. N.* i. 2, p. 772 (1767).

Mergui (Nov., Dec., March); Zediwon (Dec.); Minthantoung (Dec.); Thaing, King Island (Jan. and Feb.); Yimiki, King Island (Feb.). Very common.

Junonia Lemonias.

Papilio Lemonias, *Linn. S. N.* i. 2, p. 770 (1767).

Mergui (Dec., Jan., March); Taing (Jan.); Taingthoung (Jan.); Thapo, King Island (Jan.); Elphinstone Island (March). Very common.

Junonia Œnone.

Papilio Œnone, *Linn. S. N.* i. 2, p. 770.

Mergui (Dec.); Thaing, King Island (Jan. and Feb.); Yimiki, King Island (Feb.). Very common.

Precis Iphita.

Papilio Iphita, *Cram. Pap. Exot.* iii. pl. 209. f. C, D (1792).

Mergui (Nov., Dec., March); Thaing and Thapo, King Island (Jan.). Very common.

Rhinopalpa Polynice.

Papilio Polynice, *Cram. Pap. Exot.* iii. pl. 195. f. D, E.

Mergui (Dec.); Minthantoung (Dec.).

Ergolis Ariadne.

Papilio Ariadne, *Linn. S. N.* i. 2, p. 778 (1767).

Thapo, King Island (Jan.).

Ergolis Merione.

Papilio Merione, *Cram. Pap. Exot.* ii. pl. 144. f. G, H (1779).

Elphinstone Island (March).

Cyrestis Themire, *Honrath, Berlin. ent. Zeits.* 1884, p. 398, pl. 10. f. 5.

Yimiki, King Island (Feb.); Elphinstone Island (March).

Apatura Bolina.

Papilio Bolina, *Linn. S. N.* i. 2, p. 781 (1767).

Mergui (Dec.).

Parthenos apicalis, *Moore, P. Z. S.* 1878, p. 829.

Minthantoung (Dec.); Sullivan Island (Jan.).

Lebadea attenuata, *Moore, P. Z. S.* 1878, p. 829.

Mergui (Dec., March); Zediwon (Dec.); Pataw Island (Dec., Jan.); Thaing, King Island (Feb.). Common.

Moduza Procris.

Papilio Procris, *Cram. Pap. Exot.* ii. pl. 106. f. E, F (1779).

Minthantoung (Dec.).

Neptis jumbah, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 167, pl. 4*a*. f. 5 (1857).

Minthantoung (Dec.); Elphinstone Island (March).

Neptis nata, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 168, pl. 4*a*. f. 6 (1857).

Mergui (Dec.); Minthantoung (Dec.).

Neptis adara, *Moore, P. Z. S.* 1878, p. 830.

Mergui (Dec.); Thaing, King Island (Feb.).

Neptis leuconata, *Butler, Trans. Linn. Soc.*, 2nd ser. *Zool.* i. p. 541, pl. 69. f. 3 (1879).

Elphinstone Island (March).

Neptis thamala. (Plate III. fig. 1, ♀.)

Upperside fuliginous black; fore wing with a pale dusky ferruginous entire discoidal streak, two transverse discal curved interrupted macular bands, a submarginal narrower band, followed by a slender marginal line; the submarginal band with a large conical spot protruded between the radial and upper median; two small incurved spots also above end of the cell: hind wing with a subbasal and discal slightly recurved dusky ferruginous band, between which is a slender paler band, and beyond is a similar submarginal band and a marginal line.

Expanse, ♂ $1\frac{7}{10}$, ♀ $2\frac{1}{10}$ inches.

Hab. Mergui (Feb.); Elphinstone Island (March).

Nearest to *N. Hira*, Kiel, from the island of Nias. A specimen of this species from Borneo is also in the Hewitson collection.

Neptis gononata, *Butler, Tr. Linn. Soc.*, 2nd ser. *Zool.* i. p. 541, pl. 69. f. 2.

Thaing, King Island (Jan.).

Neptis Vikasi, *Horsf. Catal. Lep. Mus. E.I. C.* pl. 5. f. 2 (1829).

Sullivan Island (Jan.).

Neptis paraka, *Butler, Trans. Linn. Soc.*, 2nd ser. *Zool.* i. p. 542, pl. 68. f. 2 (1879).

Mergui (Dec., March).

Neptis dorelia, *Butler, Trans. Linn. Soc.*, 2nd ser. *Zool.* i. p. 542, pl. 68. f. 3 (1879).

Mergui (Nov., Dec.); Sullivan Island (Jan.); Elphinstone Island (Feb.).

Rahinda plagiosa.

Neptis plagiosa, *Moore, P. Z. S.* 1878, p. 830.

Minthantoung (Dec.).

Athyma Idita, *Moore, P. Z. S.* 1858, p. 16, pl. 51. f. 3.

Minthantoung (Dec.).

Athyma Perius, *Aurivillius*, *Kong. V. Ak. Handl.* (1882), p. 68.

Papilio Perius, *Linn. S. N.* ed. x. p. 471 (1758); *Mus. Ulr.* p. 261 (1764); *S. N.* i. 2, p. 766 (1767).

Papilio Leucothoë, *Linn. S. N.* ed. x. p. 478 (1758).

Athyma Leucothoë (*auctorum*).

Mergui (Dec., Jan., March); Minthantoung (Dec.); Thaing (Jan.); Thapo, King Island (Jan.). Common.

Athyma nivifera, *Butler*, *Trans. Linn. Soc.*, 2nd ser. *Zool.* i. p. 540, pl. 69. f. 4 (1879).

Mergui (Dec.); Kisseraing Island (Dec.). Two males only.

Athyma Kresna, *Moore*, *P. Z. S.* 1858, p. 12, pl. 50. f. 4, ♂.

Minthantoung (Dec.). Two males only.

Athyma subrata, *Moore*, *P. Z. S.* 1858, p. 13, pl. 51. f. 1, ♀.

Mergui (Dec., March). Female only.

This may probably be a dimorphic form of female of *A. Kresna*, the ordinary female of which has reddish markings.

Athyma clerica, *Butler*, *Trans. Linn. Soc.*, 2nd ser. *Zool.* i. p. 540, pl. 69. f. 5 (1879).

One specimen of male, without locality.

Euthalia Dunya.

Adolias Dunya, *Doubleday & Hewits. D. Lep.* pl. 44. f. 3 (1850).

Kisseraing Island (Dec.); Elphinstone Island (March).

Euthalia Garuda.

Adolias Garuda, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 186 (1857); *Tr. Ent. Soc.* 1859, p. 64, pl. 3. f. 2.

Mergui (Dec.).

Euthalia Anosia.

Adolias Anosia, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 187 (1857); *Tr. Ent. Soc.* 1859, p. 65, pl. 5. f. 1.

Mergui (Dec., March).

Euthalia Jahnu.

Adolias Jahnu, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 192 (1857); *Tr. Ent. Soc.* 1859, p. 74, pl. 7. f. 1, ♀.

Adolias Sananda, *Moore, Tr. Ent. Soc.* 1859, p. 76, pl. 7. f. 3, ♂.

Kisseraing Island (Jan.). A single specimen of the female only.

Euthalia discispilota.

Adolias discispilota, *Moore, P. Z. S.* 1878, p. 831, ♀.

Mergui (Dec.). One female only.

Euthalia Satropaces.

Adolias Satropaces, *Hewitson, Ent. M. Mag.* 1876, p. 150; *Desc. Lep. Rhop. Coll. Atkinson, As. Soc. Beng.* p. 1, pl. 1. f. 6, 7, 8 (1879).

Mergui (Dec., March); Minthantoung (Dec.). One female only of this very rare species.

Euthalia Andersonii. (Plate III. figs. 3 & 4, ♂ ♀.)

Euthalia Andersonii, *Moore, Journ. Asiat. Soc. Beng.* 1884, p. 18.

Mergui (Dec., Jan., March); Zediwon (Dec.); Minthantoung (Dec.); Pataw Island (Dec.).

Euthalia Xiphiones.

Adolias Xiphiones, *Butler, P. Z. S.* 1868, p. 609, pl. 45. f. 6, ♂.

Mergui (March); Sullivan Island (Jan.). Two specimens of the male of this rare species.

Symphædra pardalis, *Moore, P. Z. S.* 1878, p. 698.

Mergui (Dec., March).

Haridra borneensis.

Charaxes Borneensis, *Butler, Lep. Exot.* i. p. 16, pl. 6. f. 2 (1869).

Elphinstone Island (March). A single female specimen only collected.

Family Lemoniidæ.

Subfamily Nemeobiinæ.

Zemeros Flegyas.

Papilio Flegyas, *Cram. Pap. Exot.* iii. pl. 280. f. E, F.

Mergui (Nov., Dec., March); Pataw Island (Jan.); Minthantoung (Jan.); Thaing, King Island (Jan. and Feb.); Elphinstone Island (March).

Abisara kausambi, *Felder, Wien. ent. Monats.* iv. p. 397 (1860).

Pataw Island (Dec.); Sullivan Island (Jan.); Yimiki, King Island (Feb.); Thapo, King Island (Jan.); Elphinstone Island (March).

Taxila Thuisto, *Hewitson, Exot. Butt.* ii. Tax. pl. 1. f. 5, ♀.

Mergui (March); Kisseraing Island (Jan.).

Family Lycænidæ.

Poritia Phraatica.

Poritia Phraatica, *Hewitson, Illust. D. Lep.* p. 214, pl. 88. f. 2, ♀.

Three males and one female collected by Dr. Anderson. The

female is identical with Mr. Hewitson's type, figured as above. One of the males has a broad lower basal cobalt-blue patch with an outer lobe protruding towards the posterior angle, and a partly confluent curved series of subapical spots; and the lower half of the hind wing has a similar coloured patch with a marginal row of blackish oval spots. In the other male the blue is of a decidedly ultramarine tint, and the patch on the fore wing has a central black streak. The markings on the underside of the males are exactly like those on the female.

Expanse, ♂ $1\frac{1}{8}$, ♀ $1\frac{2}{8}$ inch.

Hab. Mergui (Dec.); Minthantoung (Dec.); Thaing, King Island (Feb.).

Curetis malayica.

Anops malayica, *Felder, Nov. Reise, Lep.* ii. p. 221, pl. 28. f. 18 (1867).

Yimiki, King Island (Feb.). One male.

Curetis Felderi, *Distant, Rhop. Malayana*, p. 203 (1884).

Mergui (March). One male.

Curetis stigmata, *Moore, P. Z. S.* 1879, p. 138.

Yimiki, King Island (Feb.). One male.

Logania substrigosa. (Plate III. fig. 8.)

Logania substrigosa, *Moore, Journ. Asiat. Soc. Bengal,* 1884, p. 22.

Kisseraing Island (Jan.).

Logania marmorata. (Plate III. fig. 7.)

Logania marmorata, *Moore, Journ. Asiat. Soc. Bengal,* 1884, p. 22.

Elphinstone Island (March).

Logania Andersonii. (Plate III. fig. 6, ♀.)

Logania Andersonii, *Moore, Journ. Asiat. Soc. Bengal,* 1884, p. 22.

Kisseraing Island (Jan.).

Spalgis Epius.

Lucia Epius, *Westwood, Gen. D. Lep.* i. p. 502, pl. 76. f. 5 (1852).

Pataw Island (Dec.).

Neopithecops Zalmora?

Sullivan Island (Jan.). A single specimen, too much rubbed for determination.

Zizera Sangra.

Polyommatus Sangra, *Moore, P. Z. S.* 1865, p. 772, pl. 41. f. 8.

Mergui (Dec.); Zediwon (Dec.).

Zizera pygmæa.

Lycæna pygmæa, *Snellen, Tijd. voor Ent.* 1876, p. 163, pl. 7. f. 3.

Thapo, King Island (Jan.); Mergui (March); Elphinstone Island (March).

Castalius Rosimon.

Papilio Rosimon, *Fabr. Syst. Ent.* p. 523 (1775).

Thapo, Thaing, and Yimiki, King Island (Jan. and Feb.); Mergui (March, Dec.); Elphinstone Island (March); Zediwon (Dec.).

Castalius Ethion.

Lycæna Ethion, *Doubleday & Hewitson, D. Lep.* p. 490, pl. 76. f. 3 (1852).

Mergui (March); Elphinstone Island (March).

Nacaduba macrophthalma.

Lycæna macrophthalma, *Felder, Verh. zool.-bot. Ges. Wien*, 1862, p. 483; *Nov. Reise, Lep.* ii. p. 275, pl. 34. f. 35.

Sullivan Island (Jan.); Thaing and Yimiki, King Island (Feb.); Pataw Island (Jan.); Mergui (March); Elphinstone Island (March).

Nacaduba plumbeomicans.

Lampides plumbeomicans, *Wood-Mason, Journ. Asiat. Soc. Beng.* 1880, p. 231.

Owen Island (Dec.); Kisseraing Island (Jan.); Mergui (March); Elphinstone Island (March).

Nacaduba viola.

Lampides viola, *Moore, Ann. & Mag. Nat. Hist.* 1877, xx. p. 340.

Lycænesthes merguiana, *Moore, J. A. S. Beng.* 1884, p. 23.

Mergui (March); Elphinstone Island (March).

Nacaduba Ardates.

Lycæna Ardates, *Moore, P. Z. S.* 1874, p. 574, pl. 67. f. 1.

Taingthoung (Jan.); Thaing and Yimiki, King Island (Feb.); Mergui (March); Elphinstone Island (March).

Jamides Bochus.

Papilio Bochus, *Cramer, Pap. Exot.* iv. pl. 391. f. C, D (1782).

Elphinstone Island (March).

Catochrysops Strabo.

Hesperia Strabo, *Fabr. Ent. Syst.* iii. p. 287 (1793).

Mergui (Dec.); Zediwon (Dec.); Yimiki, King Island (Feb.); Elphinstone Island (March).

Catochrysops Cnejus.

Hesperia Cnejus, *Fabr. Ent. Syst. Suppl.* p. 430 (1798).

Mergui (Jan.).

Catochrysops Pandava.

Lycæna Pandava, *Horsfield, Catal. Lep. Mus. E.I. C.* p. 84 (1829).

Sullivan Island (Jan.).

Lampides Ælianus.

Hesperia Ælianus, *Fabr. Ent. Syst.* iii. 1, p. 280 (1793).

Mergui (Dec.); Minthantoung (Dec.).

Lampides pura, n. sp.

Allied to *L. Ælianus*, *celerio*, and *agnata*.

Male. Upperside of the same pale-bluish tint as in the above-named species. Fore wing entirely without any trace of a black border to the exterior margin, whereas in each of the above species there is a decided black marginal band decreasing in width from the apex. Underside of a similar colour as in above species, but of a darker tint than in *L. Ælianus*; markings also similar, but more strongly defined; the subanal spot with a much broader red inner border. Several specimens, all without marginal border to the fore wing. *Female*. Upperside with the marginal black band on fore wing narrower than in *L. Ælianus*, the inner edge of the band curved like that in *L. Alexis*; hind wing with a narrower series of marginal lunular spots.

Expanse $1\frac{1}{8}$ to $1\frac{3}{8}$ inch.

Hab. Zediwon (Dec.); Pataw Island (Dec.); Sullivan Island (Jan.); Thapo and Yimiki, King Island (Jan. and Feb.); Kisseraing Island (Jan.); Elphinstone Island (March).

Lampides subdita, n. sp.

Male. Upperside entirely pale glossy purpurescent lavender-blue as in *L. pseudelpis*, and without any marginal border. Underside darker brown, the white lines all conspicuously narrower. The discal lines on the fore wing almost straight, continuous, the middle line entire from end to end, whereas in *L. pseudelpis* they are disposed irregularly, and the upper portions are in a curved series; the area between the two marginal lunular lines is also blacker: hind wing with the basal and discal lines also more linearly disposed, beyond which are five very prominent black dentate submarginal spots bordered by the white lunules; the marginal spots also are black; the subanal black spot is only half the size, and its red bordering area much larger and of an oval shape. *Female*. Upperside paler greyish blue; fore wing with a broad brown exterior band: hind wing with brown anterior border, and a prominent row of black-centred white spots bordered with brown. Underside as in male.

Expanse, ♂ ♀ 1 to $1\frac{3}{16}$ inch.

Hab. Mergui (Dec., March). Numerous specimens, all alike both on the upper and underside.

Lycænesthes bengalensis, *Moore*, *P. Z. S.* 1865, p. 773.
Mergui (Dec.); Thapo and Yimiki, King Island (Jan. and Feb.).

Biduanda Lapithis.
Myrina Lapithis, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 43 (1857); *Hewitson, Ill. D. Lep.* p. 36, pl. 15. f. 35–38.
Yimiki, King Island (Feb.). The female only of this rare species was taken by Dr. Anderson.

Biduanda Boisduvalii.
Drupadia Boisduvalii, *Moore, Journ. As. Soc. Beng.* 1884, p. 31.
Myrina Lisias, *Boisd. Spec. Gén. Lép., Pap.* pl. 22. f. 2 ♂ (*nec* Fabricius*).
Mergui (Nov.); Sullivan Island (Jan.); Thaing, King Island (Feb.).

Biduanda Fabricii. (Plate IV. figs. 2 & 3, ♂ ♀.)
Drupadia Fabricii, *Moore, P. Z. S.* 1884, p. 17, ♀.
Male. Upperside similar to the same sex of *B. Thesmia*, except that on the fore wing there is a less amount of cuprescent red in the disk. Underside: fore wing paler, the markings within the cell, the discal and marginal bands uniformly paler: hind wing with the basal and discal spots brown, and much less defined; the discal zigzag lines also brown and less defined. *Female.* Fore wing with a broad, irregular-shaped, oblique median red band, whereas in *B. Thesmia* the band is nearly obsolete.
Expanse $1\frac{2}{8}$ to $1\frac{3}{8}$ inch.
Hab. Mergui (Dec.); Kisseraing Island (Jan.); Sullivan Island (Jan.); Pataw Island (Jan.); Elphinstone Island (March).

Thamala miniata. (Plate IV. fig. 1, ♀.)
T. miniata, *Moore, P. Z. S.* 1878, p. 834, pl. 52. fig. 6, ♂.
Female. Upperside: fore wing dark rufescent-brown, with a large broad bright red central patch, which nearly encompasses the black spot at the base of the median branches: hind wing with the anterior half brown, the costal border being edged with red; lower half, including its bordering cilia and the tails, grey.
Expanse $1\frac{3}{8}$ inch.
Hab. Mergui (Dec.); Minthantoung (Dec.). Very rare.

Spindasis Lohita.
Amblypodia Lohita, *Horsfield, Catal. Lep. Mus. E.I. C.* p. 107 (1829).
Pataw Island (Dec.); Thaing, King Island (Feb.).

* *Biduanda Lisias*, Fabricius, is an allied species, described in the Mant. Ins. as coming from "Puli Condor" (*i. e.* Pulo Kondol, one of the Nicobar Islands).

Spindasis Zoilus.
Aphnæus Zoilus, *Moore, P. Z. S.* 1877, p. 589.
Sullivan Island (Jan.).

Nadisepa Xenophon.
Hesperia Xenophon, *Fabr. Ent. Syst.* iii. 1, p. 272 (1793).
Mergui (Dec.); Elphinstone Island (March).

Nadisepa Jarbas.
Papilio Jarbas, *Fabr. Mant. Ins.* ii. p. 68 (1787).
Mergui (Dec.).

Vadebra Pheretima.
Deudorix Pheretima, *Hewitson, Ill. D. Lep.* p. 21, pl. 9. f. 27 (1863).
Mergui (March); Pataw Island (Jan.). A single female only collected.

Rapala Orseis.
Deudorix Orseis, *Hewitson, Ill. D. Lep.* p. 23 (1863).
Minthantoung (Dec.).

Iraota Rochana.
Amblypodia Rochana, *Horsfield, Catal. Lep. Mus. E.I. C.* p. 108 (1829).
Elphinstone Island (March). A single female only collected.

Hypolycæna Erylus.
Polyommatus Erylus, *Godt. Enc. Méth.* ix. p. 633 (1823).
Mergui (Dec.). One female only collected.

Chliaria Lisides.
Myrina Lisides, *Hewitson, Ill. D. Lep.* p. 33, pl. 14. f. 28, 29, ♂.
Female. Upperside: fore wing with a similar but broader reddish patch on the fore wing, the patch being confined more to the middle; hind wing brown, anal area broadly white-speckled, and with three prominent black anal marginal spots. Underside similarly marked to the upperside, excepting that there is no subbasal black spot.
Expanse, ♂ 1, ♀ 1 to 1⅛ inch.
Mergui (Dec. and March); Sullivan Island (Jan.).

Cheritra Etolus.
Papilio Etolus, *Fabr. Mant. Ins.* ii. p. 66 (1787).
Elphinstone Island (March).

Cheritra Freja.
Hesperia Freja, *Fabr. Ent. Syst.* iii. 1, p. 263 (1793).
Kisseraing Island (Jan.); Thaing and Yimiki, King Island (Feb. and March); Elphinstone Island (March).

Neomyrina hiemalis.

Myrina hiemalis, *Godman & Salvin, P. Z. S.* 1878, p. 640, pl. 40. f. 5, 6

Sullivan Island (Jan.); Mergui (March).

Tajuria Mantra.

Pseudolycæna Mantra, *Felder, Wien. ent. Monats.* iv. p. 396 (1860).

Owen Island (Jan.); Mergui (March).

Myrina Atymnus.

Papilio Atymnus, *Cram. Pap. Exot.* iv. pl. 331. f. D, E (1782).

Pataw Island (Dec.); Zediwon (Dec.).

Amblypodia Andersonii. (Plate IV. fig. 4, ♂.)

Amblypodia Andersonii, *Moore, Journ. Asiat. Soc. Beng., Zool.* 1884, p. 43, ♂.

Sullivan Island (Jan.).

Darasana perimuta.

Amblypodia Perimuta, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 42 (1857).

Sullivan Island (Jan.); Thaing, King Island (Feb.).

Narathura metamuta.

Amblypodia Metamuta, *Hewitson, Ill. D. Lep.* p. 13, pl. 2. f. 14, 15 (1863).

Kisseraing Island (Dec.).

Narathura Agelastus.

Amblypodia Agelastus, *Hewitson, Catal. Lyc. B. M.* p. 12, pl. 6. f. 61, 62 (1862).

Yimiki, King Island (Feb.).

Narathura albopunctata.

Amblypodia albopunctata, *Hewitson, Ill. D. Lep.* p. 14, pl. 3 *b*. f. 43, 44 (1869).

Mergui (Nov. and Dec.); Pataw Island (Jan.); Sullivan Island (Jan.).

Satadra Abseus.

Amblypodia Abseus, *Hewitson, Catal. Lyc. B. M.* p. 9, pl. 5. f. 51, 52 (1862).

Yimiki, King Island (Feb.).

Satadra Agaba.

Amblypodia Agaba, *Hewitson, Catal. Lyc. B. M.* p. 8, pl. 4. f. 39, 40 (1862).

Yimiki, King Island (Feb.); Mergui (March).

Nilasera centaurus.

Papilio centaurus, *Fabr. Syst. Ent.* p. 520 (1775).

Mergui (Nov. and Dec.); Thaing, King Island (Feb.); Pataw Island (Jan.).

Family Papilionidæ.

Subfamily Pierinæ.

Nychitona Xiphia.

Papilio Xiphia, *Fabr. Spec. Ins.* ii. p. 43 (1781).

Mergui (Nov.); Elphinstone Island (March).

Terias rubella, *Wallace, Tr. Ent. Soc.* 1867, p. 323.

Zediwon (Dec.); Mergui (March).

Terias Rama, *Moore, P. Z. S.* 1872, p. 566.

Mergui (Dec. and March); Pataw Island (Dec.).

Terias formosa.

Eurema formosa, *Hübner, Zutr. exot. Schmett.* f. 979–980 (1837).

Sullivan Island (Jan.); Thapo, King Island (Jan.); Kisseraing Island (Jan.); Yimiki, King Island (Feb.).

Terias sodalis, n. sp.

From typical Javan and Sumatran *T. Sari* this differs in its much smaller size. *Male*: fore wing with similar shaped but comparatively narrower marginal band; hind wing also with the marginal band narrower. *Female*: both wings with the marginal band also narrower, that on the fore wing having the lower end of the sinus convex, not sharply angular as in *T. Sari*. Underside: fore wing of both sexes with a large quadrate reddish-brown apical patch, which is dentate on its lower side; a small dusky patch at posterior angle; both wings also with the usual brown speckled lunular marks.

Expanse, ♂ ♀ $1\frac{4}{10}$ to $1\frac{5}{10}$ inch.

Hab. Thaing, King Island (Feb.); Pataw Island (Dec.).

Terias silhetana.

Terias silhetana, *Wallace, Trans. Ent. Soc.* 1867, p. 324.

Hab. Mergui (Dec.); Sullivan Island (Jan.); Thaing, Island (Jan.); Elphinstone Island (March).

Terias hecabeoides.

Terias Hecabeoides, *Ménét. Catal. Mus. Petr. Lép.* i. p. 85, t. 2. f. 2 (1855), ♂.

Hab. Mergui (Dec. and March); Pataw Island (Dec.); Zediwon (Dec.); Elphinstone Island (March).

Distinguished by its bright gamboge-yellow colour; the band on fore wing broad, its sinus dentate; the band on hind wing also broad. Underside with all the markings delicately defined, the discocellular marks narrow; and both sexes without any trace of the subapical patch on fore wing.

Terias contubernalis, n. sp.

Male. Upperside of the same tint of colour as in *T. hecabeoides*; band of fore wing of same shape, and with the same outwardly-oblique inner edge of the lower portion; band on hind wing somewhat narrower. Underside with all the markings more prominently defined than in *T. hecabeoides*, especially the disco-cellular mark on both wings, which is broader and triangularly-dentate in shape; the fore wing also has a well-formed brown subapical patch (which is not present in either sex of *T. hecabeoides*), and the three subbasal ring-spots on the hind wing are larger. *Female.* Very similar above to *T. hecabeoides*. Underside with the markings and subapical patch on fore wing as in male.

Expanse, ♂ ♀ $1\frac{6}{10}$ to $1\frac{7}{10}$ inch.

Hab. Mergui (Dec.); Zediwon (Dec.); Elphinstone Island Dec.); Pataw Island (Dec.); Minthantoung (Dec.).

This may possibly be only a variety of *T. hecabeoides*. Both sexes differ as above described from the many specimens of that species collected by Dr. Anderson. No specimens, however, such as here described as *T. contubernalis*, have come under my observation from any other locality where *T. hecabeoides* occurs.

Terias patruelis, n. sp. (Plate IV. fig. 5, ♂.)

Male. Somewhat smaller and of a paler yellow tint than *T. contubernalis*; the band on fore wing of similar shape but about half its width throughout, and its inner angles less acute; hind wing with a decidedly narrower band. Underside with similar but less defined markings; the discocellular mark narrower. *Female.* Also of smaller size; fore wing with similar shaped band as in male, being about half the width of that in *T. contubernalis*; the band on hind wing also narrower. Underside as in male.

Expanse, ♂ ♀ $1\frac{4}{10}$ to $1\frac{6}{10}$ inch.

Hab. Mergui (Dec.); Elphinstone Island (March); Pataw Island (Jan.).

This is nearest to typical *T. nicobarica*, which, however, differs beneath in the male having the markings similar to those in *T. hecabeoides*, and without any trace of the subapical patch.

Terias fraterna, n. sp. (Plate IV. fig. 6, ♂.)

Intermediate between *T. patruelis* and *T. merguiana*. Wings in both sexes comparatively broader than in *T. merguiana*. *Male.* Differs from typical *T. merguiana* in the fore wing having the marginal band more sinuous and broader at its lower end, the

inner edge of this portion is also less outwardly oblique; the band on hind wing is of similar width. Underside with very prominent reddish markings, the discocellular marks broader and triangularly-dentate; the discal sinuations on the hind wing diffused, especially the upper portions; the fore wing also has a very prominent red, rather broad, subapical patch. *Female.* Differs also from this sex of *T. merguiana* in the shape of the lower portion of the band on the fore wing, the band on the hind wing being somewhat narrower and more definitely dentated. Underside with all the markings as in above-described male.

Expanse, ♂ ♀ $1\frac{7}{10}$ to $1\frac{8}{10}$ inch.

Hab. Mergui (Dec.); Yimiki and Thaing, King Island (Feb.); Elphinstone Island (March).

Terias merguiana, n. sp. (Plate IV. fig. 7, ♂.)

Male. Upperside bright yellow, of a slight sulphurescent tint; fore wing with the marginal band somewhat narrower than in *T. contubernalis*, the portion below the sinus being about half the width of the same part in that species, and its inner edge is inclined acutely outward; hind wing with a narrow marginal band. Underside with delicately defined markings, similar to those in *T. hecabeoides*. *Female.* Pale sulphur-yellow; band on fore wing broader than in male, the lower portion being also inclined acutely outward as in male; the band on hind wing paler and dentated. Underside with the discocellular marks somewhat broader than in male, and with a more or less defined subapical patch on the fore wing.

Expanse, ♂ ♀ $1\frac{5}{10}$ to $1\frac{8}{10}$ inch.

Hab. Mergui (Nov. and Dec.); Zediwon (Dec.); Kisseraing Island (Dec.); Elphinstone Island (Jan. and March); Sullivan Island (Jan.).

Terias Andersonii, n. sp. (Plate IV. fig. 8, ♂.)

Male. Upperside bright deep sulphur-yellow; costal border from the edge to the costal vein entirely black; the marginal band broad, with the middle sinus inclined obliquely outward and upward, the upper edge of the band concave and angled at base of the third subcostal, the lower portion of band narrow, its upper angle very acute, its inner edge inclined obliquely outward; hind wing with a rather broad prominent black marginal band. Underside with the usual brown markings prominent, the discocellular marks cornucopoid in shape; the fore wing having a more or less defined subapical patch, and the speckled

sinuous mark within the cell situated somewhat nearer the base, the subbasal spot (present in other species) being absent; fringe brown. *Female.* Smaller; much paler sulphur-yellow; black costal band on fore wing narrower; marginal band as in the male; band on the hind wing broader. Underside as in male.

Expanse, ♂ $1\frac{5}{10}$, ♀ $1\frac{2}{10}$ to $1\frac{4}{10}$ inch.

Hab. Sullivan Island (Jan.); Elphinstone Island (March).

Terias Kana, n. sp. (Plate IV. fig. 9, ♂.)

Male. Nearest to *T. Andersonii*. Upperside paler sulphur-yellow; the marginal band with the base of the sinus inclined obliquely inward and upward, and dentate at the middle; the upper edge of the band concave but not dentate, the lower portion broader and its inner edge inclined inward; hind wing with a decidedly broader marginal band. Underside with ferruginous-brown marks; the discocellular mark on both wings very broad and triangularly-dentate; the subapical patch on fore wing broader; the sinuous mark and subbasal spot within the cell both present; fringe yellow. *Female.* Upperside of the same tint as the male; the band on fore wing the same shape; band on hind wing with dentated inner edge. Underside as in male.

Expanse, ♂ ♀ $1\frac{4}{10}$ to $1\frac{6}{10}$ inch.

Hab. Mergui (Jan.); Thapo and Yimiki, King Island (Jan. and Feb.); Elphinstone Island (March).

This comes nearest to the Ceylonese *T. simulata*.

Remarks on the above-named Terias.—*T. Andersonii*, *Kana*, *contubernalis*, *patruelis*, *fraterna*, and *merguiana*, so far as I yet know, are quite localized in their habitat. No specimens of these forms are either in the British Museum collection or in my own, nor does Mr. Distant refer to either of them in his 'Rhopalocera Malayana.' The four last-named may possibly be ultimately proved to be varietal forms of *T. hecabeoides*; but as no such marked specimens as here described, so far as my examinations have extended, occur in any of the other districts where *T. hecabeoides* is found, and until they are so proved, by *breeding*, to be varietal only, I prefer treating them as distinct forms. *T. sodalis* is found also in the Malay peninsula; *T. silhetana* extends northward to Assam; and *T. hecabeoides* has a wide range northward, and southward to the Malay Peninsula.

Ixias citrina, *Moore*, *P. Z. S.* 1878, p. 837, ♂.

Thaing, King Island (Feb.).

Ixias verna, *Druce*, *P. Z. S.* 1874, p. 108, pl. 16. f. 5, 6.
Mergui (Nov., Dec.); Elphinstone Island (March); Thaing, King Island (Jan., Feb.). Tolerably common.

Hebomoia Glaucippe.
Papilio Glaucippe, *Linn. S. N.* i. 2, p. 762 (1767).
Elphinstone Island (March).

Catopsilia Catilla.
Papilio Catilla, *Cram. Pap. Exot.* iii. pl. 229. f. D, E (1782).
Mergui (Dec.); Thaing, King Island (Jan.); Elphinstone Island (March).

Catopsilia Crocale.
Papilio Crocale, *Cram. Pap. Exot.* i. pl. 52. f. C, D (1779).
Thaing, King Island (Jan.).

Catopsilia Chryseis.
Papilio Chryseis, *Drury, Ill. Exot. Ent.* i. pl. 12. f. 3, 4 (1773).
Mergui (Dec., March).

Catopsilia Gnoma.
Papilio Gnoma, *Fabr. Syst. Ent.* App. p. 808 (1775).
Thaing, King Island (Feb.).

Huphina Lea.
Pieris Lea, *Doubleday, Ann. Nat. Hist.* 1st ser. vol. xvii. p. 23 (1846).
Sullivan Island (Jan.); Elphinstone Island (March).

Appias Zelmira.
Papilio Zelmira, *Cram. Pap. Exot.* iv. pl. 320. f. C, D (1782).
Elphinstone Island (March).

Appias hippoides, *Moore, Trans. Ent. Soc.* 1881, p. 312.
Mergui (Dec.).

Appias vacans, *Butler, Tr. Ent. Soc.* 1870, p. 490; *Lep. Exot.* p. 90, pl. 34. f. 5, 6, ♀.
Mergui (Dec.); Thaing, King Island (Feb.).

Hiposcritia Shiva, *Swinhoe, Proc. Zool. Soc.* 1885, p. 138, pl. 9. figs. 1, 2.
Owen Island (Jan.).
A single specimen of the female of this species, which had hitherto been known only from Bombay.

Delias metarete, *Butler, Tr. Linn. Soc.*, 2nd ser. *Zool.* i. p. 550 (1879).
Mergui (Jan., Dec.); Elphinstone Island (March); Thapo, King Island (Jan.).

Delias Deione.

Papilio Deione, *Drury, Ill. Exot. Ent.* ii. pl. 8. f. 3, 4, ♂.

Mergui (Dec., Jan., March); Thapo (Jan.); Thaing, King Island (Jan. and Feb.); Pataw Island (Jan.); Elphinstone Island (March).

Prioneris Clemanthe.

Pieris Clemanthe, *Doubleday, Ann. & Mag. Nat. Hist.* 1st ser. xvii. p. 23 (1846).

Mergui (March); Elphinstone Island (March).

Subfamily Papilioninæ.

Pathysa Antiphates.

Papilio Antiphates, *Cram. Pap. Exot.* i. pl. 72. f. A, B (1779).

Mergui (Dec., March).

Dalchina Sarpedon.

Papilio Sarpedon, *Linn. S. N.* i. 2, p. 747 (1767).

Yimiki, King Island (March).

Zetides Agamemnon.

Papilio Agamemnon, *Linn. S. N.* i. 2, p. 748 (1767).

Mergui (Dec.); Zediwon (Dec.); Sullivan Island (Jan.); Elphinstone Island (March).

Araminta, n. g.

Papilio (Demolion group), *Wallace, Tr. Linn. Soc.* xxv. p. 59 (1865).

Papilio (section 59, subsect. B), *Felder, Spec. Lep. Pap.* p. 30. 78 (1865).

Fore wing longer and more acutely triangular than in *Orpheides*; exterior margin very oblique, almost even; cell long, very broad: hind wing short, broad, triangular; cell more than half the length of the wing; furnished with a long spatular tail. Antennæ very long, with a lengthened slender club. Larva similar to that of *Orpheides* (*O. Erithoneus*), anterior segments scutellated; furnished with two short tentacular processes on the 2nd, 9th, and anal segments. Pupa with bifid head and lengthened acute thoracic process.

Araminta Demolion.

Papilio Demolion, *Cram. Pap. Exot.* i. pl. 89. f. A, B (1779).

Mergui (Dec.).

Orpheides malayanus.

Papilio malayanus, *Wallace, Trans. Linn. Soc.* xxv. p. 59 (1865).

Mergui (Dec.).

Iliades Achates.

Papilio Achates, *Cram. Pap. Exot.* ii. pl. 182. f. A, B (1779).

Mergui (Dec., March); Thaing, King Island (Feb.); Elphinstone Island (March).

Charus Iswara.

Papilio Iswara, *White, Entom.* i. p. 280 (1842).

Mergui (Dec.); Kisseraing Island (Jan.).

Charus Helenus.

Papilio Helenus, *Linn. S. N.* i. 2, p. 745 (1767).

Owen Island (Jan.).

Laertias Polytes.

Papilio Polytes, *Linn. S. N.* i. 2, p. 746, ♀ (1767).

Papilio Pammon, *Linn. S. N.* i. 2, p. 746, ♂.

Mergui (Dec., March); Elphinstone Island (March); Thapo and Thaing, King Island (Jan. and Feb.); Sullivan Island (Jan.).

Menelaides Diphilus.

Papilio Diphilus, *Esper, Aussl. Schmett.* t. 40 B. fig. 1.

Mergui (March).

Menelaides Doubledayi.

Papilio Doubledayi, *Wallace, Tr. Linn. Soc.* xxv. p. 42 (1865).

Mergui (Dec.); Sullivan Island (Jan.); Thaing, King Island (Jan. and Feb.); Elphinstone Island (March).

Pangerana, n. g.

Papilio (Nox group, part), *Wallace, Tr. Linn. Soc.* xxv. p. 23 (1865).

Papilio (sect. 66), *Felder, Spec. Lep. Pap.* p. 37. 84 (1865).

Male. Fore wing narrower than in *Byasa* (*B. Philoxenus*), triangular; the posterior margin shorter; cell comparatively longer; the fifth subcostal emitted somewhat further from beyond the cell: hind wing shorter, tailless; exterior margin undulated, but not scalloped; abdominal margin folded broadly over on to the upperside, and there forming a lengthened triangular lappet, which covers a plume of hairs extending along the lower submedian vein; cell longer, extending to about two thirds the length; antennal club shorter. *Female.* Wings broader than in male; hind wings slightly scalloped; tailless; abdominal margin normal.

Pangerana Varuna.

Papilio Varuna, *White, Entom.* i. p. 280 (1842).

Thaing, King Island (Jan. and Feb.). The female only captured.

Ornithoptera heliaconoides, *Moore, P. Z. S.* 1877, p. 592.

Yimiki, King Island (Feb.).

A single female only captured, agreeing with the type excepting that the pale rays on the fore wings are fuliginous-black instead of grey.

Leptocircus Meges.

Papilio Meges, *Zink. Som. Nova Acta Acad. N. C.* xv. p. 161, pl. 15. f. 8 (1831).

Sullivan Island (Jan.).

Family Hesperiidæ.

Badamia exclamationis.

Papilio exclamationis, *Fabr. Syst. Ent.* p. 530 (1775).

Sullivan Island (Jan.).

Astictopterus Diocles.

Nisoniades Diocles, *Moore, P. Z. S.* 1865, p. 787.

Mergui (Dec., March).

Astictopterus stellifer, *Butler, Tr. Linn. Soc.*, 2nd ser. *Zool.* i. p. 555 (1879).

Mergui (Dec., March); Pataw Island (Dec.); Elphinstone Island (March); Thapo and Thaing, King Island (Jan. and Feb.).

Astictopterus Butleri, *Wood-Mason, Journ. Asiat. Soc. Beng.* vol. lii. 1883, p. 98.

Thaing, King Island (Feb.).

Matapa Sasivarna.

Ismene Sasivarna, *Moore, P. Z. S.* 1865, p. 784.

Pataw Island (Dec.).

Erionota Irava.

Hesperia Irava, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 254 (1857).

Mergui (Nov., Dec.); Pataw Island (Dec.); Thapo, King Island (Jan.).

Baoris Kumara.

Hesperia Kumara, *Moore, Catal. Lep. Mus. E.I. C.* i. p. 255 (1857); *P. Z. S.* 1878, p. 687.

Mergui (Dec., March).

Parnara Toona.

Hesperia Toona, *Moore, P. Z. S.* 1878, p. 689.

Thaing, King Island (Feb.).

Parnara Bevani.

Hesperia Bevani, *Moore, P. Z. S.* 1878, p. 688.

Minthantoung (Dec.); Elphinstone Island (March).

Chapra Agna.

Hesperia Agna, *Moore, P. Z. S.* 1865, p. 791.

Pataw Island (Dec.); Zediwon (Dec.).

Plastingia Latoia.

Hesperia Latoia, *Hewitson, Desc. Hesp.* p. 34 (1868).

Sullivan Island (Jan.).

Telicota bambusæ.

Pamphila bambusæ, *Moore, P. Z. S.* 1878, p. 691, pl. 45. f. 11, 12.

Mergui (Jan., March).

Padraona Gola.

Pamphila Gola, *Moore, P. Z. S.* 1877, p. 594, pl. 58. f. 9, ♂.

Mergui (Dec.); Thaing, King Island (Feb.).

Padraona mæsoides.

Pamphila mæsoides, *Butler, Trans. Linn. Soc.*, 2nd ser. *Zool.* i. p. 554.

Thapo and Yimiki, King Island (Jan. and Feb.); Sullivan Island (Jan.); Mergui (March); Elphinstone Island (March).

Ampittia Maro.

Hesperia Maro, *Fabr. Ent. Syst. Suppl.* p. 432.

Cyclopides Camertes, *Hewits. Desc. Hesp.* p. 43 (1868).

Mergui (March).

Halpe ceylonica, *Moore, P. Z. S.* 1878, p. 690, pl. 45. f. 9.

Mergui (Jan., March).

Halpe Zema.

Hesperia Zema, *Hewitson, Ann. & Mag. Nat. Hist.* 1877, 4th ser. vol. xix. p. 77.

Mergui (Nov.).

Thanaos indistincta, *Moore, P. Z. S.* 1878, p. 694.

Mergui (Dec.).

Tagiades Ravi.

Pterygospidea Ravi, *Moore, P. Z. S.* 1865, p. 779.

Minthantoung (Dec.); Mergui (March and Dec.); Zediwon (Dec.); Pataw Island (Dec.); Sullivan Island (Jan.).

Hyarotis adrastus.

Hesperia adrastus, *Cram. Pap. Exot.* iv. pl. 319. f. F, G (1780).

Elphinstone Island (March).

Sarangesa Dasahara.

Nisoniades Dasahara, *Moore, P. Z. S.* 1865, p. 787.

Pataw Island (Dec. and Jan.); Thapo and Thaing, King Island (Jan. and Feb.); Mergui (March).

Antigonus Sura.

Achlyodes Sura, *Moore, P. Z. S.* 1865, p. 786.

Thaing, King Island (Feb.).

Coladenia Dan.

Papilio Dan, *Fabr. Mant. Ins.* ii. p. 88 (1787).

Mergui (March).

Plesioneura Alysos, *Moore*, *P. Z. S.* 1865, p. 789.
Thaing, King Island (Feb.).

HETEROCERA.

Family Zygænidæ.

Syntomis Atkinsoni, *Moore*, *P. Z. S.* 1871, p. 245, pl. 18. f. 2.
One specimen, King Island (Jan.).

Family Chalcosiidæ.

Nyctemera latistriga, *Walker*, *Catal. Lep. Het. B. M.* ii. p. 397.
One specimen, Mergui (Dec.).

Cyclosia papilionaris.
Phalæna-Noctua papilionaris, *Drury*, *Ill. Exot. Ent.* pl. 11. f. 4.
Three specimens, Mergui (Dec.); three specimens, Mergui (March); one specimen, Zediwon (Dec.); one specimen, King Island (Feb.).

Cyclosia Panthona.
Phalæna-Geom. Panthona, *Cram. Pap. Exot.* iv. pl. 322. f. C (1782).
Six specimens, Mergui (Dec.); one specimen, Mergui (March).

Milleria gemina.
Laurion gemina, *Walker*, *Catal. Lep. Het. B. M.* ii. p. 427.
Two specimens, Mergui (Dec.).

Scaptesyle tricolor, *Walker*, *Catal. Lep. Het. B. M.* ii. p. 378.
Two specimens, Minthantoung (Dec.).

Chalcosia distincta, *Guérin in Delessert's Voy. dans l'Inde*, pl. 24. f. 3.
One specimen, Sullivan Island (Jan.).

Pintia Drataraja, *Moore*, *Catal. Lep. Mus. E.I.C.* ii. p. 321, pl. 8*a*. f. 3 (1858).
One specimen, Mergui (Dec.).

Pintia cyanea, *Butler*, *Ann. & Mag. Nat. Hist.* 1883, 5th ser. xii. p. 160.
One specimen, Sullivan Island (Jan.).

Codane Zenotea.
Gynautocera Zenotea, *Doubleday*, *Ann. & Mag. Nat. Hist.* 1847, 1st ser. vol. xix. p. 77, pl. 7. f. 2, ♂.
One specimen, Mergui (Dec.).

Family Lithosiidæ.

Lithosia, sp. ?
One specimen (♀), Mergui (Dec.).

Lithosia, sp. ?

One specimen, Sullivan Island (Jan.).

Two specimens of a Lithosiid of doubtful determination.

Argina Astrea.

Phalæna-Noctua Astrea, *Drury, Exot. Ins.* pl. 6. f. 3.

One specimen, Mergui (Dec.).

Family Liparidæ.

Orgyia, sp. ?

One specimen, Mergui (March).

A specimen of doubtful determination.

Artaxa varia.

Euproctis varia, *Walker, Catal. Lep. Het. B. M.* iv. p. 840 (1855).

Three specimens, King Island (Jan. and Feb.) ; one specimen, Mergui (March).

Euproctis biguttata, *Walker, Catal. Lep. Het. B. M.* iv. p. 837 (1855).

One specimen (♀), Mergui (Dec.).

Euproctis atomaria, *Walker, Catal. Lep. Het. B. M.* iv. p. 837 (1855).

One specimen, Tavoy (Dec.).

Euproctis marginalis, *Walker, Catal. Lep. Het. B. M.* vii. p. 1731 (1856).

One specimen (♀), Minthantoung (Dec.); two specimens, Mergui (Dec.); one specimen, Elphinstone Island (March).

Procodeca angulifera, *Walker, Catal. Lep. Het. B. M.* iv. p. 919 (1855).

One specimen (♀), Mergui (Dec.).

Redoa, sp. ?

One specimen, King Island (Jan.). A specimen of doubtful determination.

Family Lasiocampidæ.

Trabala irrorata, *Moore, Tr. Ent. Soc.* 1884, p. 375 ; *Journ. Asiat. Soc. Bengal*, 1884, pt. ii. p. 205 (1885).

One specimen (♀), Tavoy (Dec.).

Female. Upperside dark olivaceous ochreous-yellow, sparsely speckled with dark purple-brown scales, which are most numerously disposed on the exterior border, and sinuously across the inner disk of both wings, and also subbasally across the fore wing, as well as on the posterior border of the fore wing. Both wings

with a discal transverse zigzag series of large lilacine-grey spots, which are also thickly speckled with dark-brown scales; fore wing also with the posterior border blotched with lilacine-grey, and with a promineut lilacine-grey spot, with dark brown-speckled border in the middle of the cell. Cilia entirely yellow. Underside slightly paler than the upperside; both wings with the discal zigzag spots as above, the exterior borders less sparsely speckled with brown scales; a slight brown-speckled sinuous discal band also on the hind wing; cell-spot indistinct. Body brighter yellow; anal tuft lilacine-white.

Expanse $3\frac{1}{4}$ inches.

Family Nyctalemonidæ.

Nyctalemon docile, *Butler*, *Trans. Linn. Soc.*, 2nd ser. *Zool.* vol. i. p. 562 (1879).

One male, Mergui (Dec.).

Family Euschemidæ.

Euschema Andersonii, sp. n.

Nearest to *E. Bellona*, Walker. Both wings with a similar-shaped broad blue-black marginal band, which is, however, without markings, except a faint short streak beyond end of the cell of the fore wing; the basal area is also bright yellow, the black basal broad streaks being replaced by a few similarly-disposed small spots, which in the female are somewhat confluent; and the cell-spot on the hind wing is either obsolescent, or present only as a narrow lunular mark (whereas in *E. Bellona* the cell-spot is very large, of an irregular rounded shape, and is accompanied by a geminate inner marginal spot).

Expanse $3\frac{1}{8}$ inches.

Mergui (March); Pataw Island (Dec.).

Euschema subrepleta, *Walker*, *Catal. Lep. Het. B. M.* ii. p. 406.

One specimen, King Island (Feb.).

Euschema aurilimbata, *Moore*, *P. Z. S.* 1878, p. 846.

One specimen, Minthantoung (Dec.).

Euschema Horsfieldii, *Moore*, *Catal. Lep. Mus. E.I. C.* ii. p. 334, pl. 8 *a*. f. 7.

One specimen, Minthantoung (Dec.).

Family Ennomiidæ.

Kalabana picaria.

Lagyra picaria, *Walker, Catal. Lep. Het. B. M.* xxvi. p. 1541 (1862).

One specimen (Dec.).

Family Boarmiidæ.

Boarmia trispinaria, *Walker, Catal. Lep. Het. B. M.* xxi. p. 378.

One specimen, Elphinstone Island (March).

Boarmia, sp. ?

One specimen, Sullivan Island (Jan.). An undeterminable species.

Family Palyadæ.

One specimen, King Island (Feb.).

A specimen, not in good condition, allied to the genus *Eumelea*.

Family Microniidæ.

Micronia caseata, *Guénée, Phal.* ii. p. 27.

One specimen, Tavoy (Dec.).

Micronia aculeata, *Guénée, Phal.* ii. p. 26, pl. 13. f. 8.

Two specimens, Sullivan Island (Jan.).

Micronia vagata, *Moore, P. Z. S.* 1867, p. 622, pl. 60. f. 18.

One specimen, Sullivan Island (Jan.).

Family Acidaliidæ.

Acidalia, sp. ?

Three specimens, Mergui (Dec. 1881), and one specimen (March); two specimens, King Island (Jan., Feb.); one specimen, Sullivan Island (Jan.). An undeterminable species.

Zanclopteryx saponaria, *Walker, Catal. Lep. Het. B. M.* xxiii. p. 810.

Family Zerenidæ.

Abraxas triseriaria, *Walker, Catal. Lep. Het. B. M.* xxiv. p. 1125.

Two specimens, Sullivan Island (Jan.).

Family Hypogrammidæ.

Oromena reliquenda.

Briada reliquenda, *Walker, Catal. Lep. Het. B. M.* xv. p. 1802.

One specimen, King Island (Jan.).

Family Ommatophoridæ.

Argiva hieroglyphica.
Phalæna-Noctua hieroglyphica, *Drury, Exot. Ins.* ii. pl. 2. f. 1.
One specimen, King Island (Feb.).

Nyctipao crepuscularis.
Phalæna-Attacus crepuscularis, *Linn.* (*Clerck, Icones*, pl. 53. f. 3, 4).
One specimen, King Island (Jan.).

Family Remigiidæ.

Remigia frugalis.
Noctua frugalis, *Fab. Ent. Syst.* iii. 2, p. 138.
One specimen, Mergui (Dec.).

Cauninda Archesia.
Phalæna-Noctua Archesia, *Cram. Pap. Exot.* iii. pl. 273. f. F, G.
One specimen, King Island (Feb.).

Family Thermesiidæ.

Thermesia signipalpis, *Walker, Catal. Lep. Het. B. M.* xv. p. 1572.
One specimen, Sullivan Island (Jan.).

Sonagara reticulata.
Thermesia reticulata, *Walker, Catal. Lep. Het. B. M., Suppl.* p. 1062.
One specimen, Mergui (March).

Capnodes, sp. ?
One specimen, Mergui (Dec.). An undeterminable species.

Apphadana evulsalis.
Apphadana evulsalis, *Walker, Catal. Lep. Het. B. M.* xxiv. p. 1213.
One specimen, Mergui (Dec.).

Family Hypenidæ.

Hypena Pactalis, *Walker, Catal. Lep. Het. B. M.* xvi. p. 64.
Two specimens, Mergui (Dec.).

Hypena, sp. ?
One specimen, Mergui (March). An undeterminable species.

Family Pyralidæ.

Vitessa Suradeva, *Moore, Catal. Lep. Mus. E.I. C.* ii. pl. 7 *a*. f. 7.
One specimen, Mergui (Dec.).

Rhodoneura puralis, *Walker, Catal. Lep. Het. B. M., Suppl.* p. 1238.
One specimen, Sullivan Island (Jan.).

Oligostigma, sp.?
One specimen, Minthantoung (Dec.). An undeterminable species.

Hymenia recurvalis, *Fabr.* (*Walker, Catal. Lep. Het. B. M.* xvii. p. 369).
Two specimens, Mergui (Dec.).

Lepyrodes geometralis, *Guénée, Delt. et Pyral.* p. 277.
One specimen, King Island (July).

Phalangiodes neptisalis, *Guénée, Delt. et Pyral.* p. 279.
Two specimens, Mergui (Dec.); one specimen, Mergui (March).

Glyphodes diurnalis, *Guénée, Delt. et Pyral.* p. 294, pl. 4. f. 5.
One specimen, Mergui (Dec.).

Ædiodes, sp.?
One specimen, Minthantoung (Dec.). An undeterminable species.

Zebronia plutusalis, *Walker, Catal. Lep. B. M.* xvii. p. 478.
No locality given.

Pyrausta, sp.?
One specimen, Sullivan Island (Jan.). An undeterminable species.

Coptobasis, sp.?
One specimen, Mergui (March). An undeterminable species.

Botys caldusalis, *Walker, Catal. Lep. Het. B. M.* xviii. p. 650.
One specimen, King Island (Dec.).

Botys multilinealis, *Walker, Catal. Lep. Het. B. M.* xviii. p. 661.
One specimen, Mergui (March).

Botys rutilatis, *Walker, Catal. Lep. Het. B. M.* xviii. p. 665.
One specimen, Mergui (Dec.).

Botys ruralis, *Walker, Catal. Lep. Het. B. M.* xviii. p. 666.
One specimen, Minthantoung (Dec.).

Family Crambidæ.

Chilo gratiosella, *Walker, Catal. Lep. Het. B. M.* xxx. p. 967.

Five specimens, Minthantoung (Dec.).

Apurima xanthogastrella, *Walker, Catal. Lep. Het. B. M.* xxvii. p. 194.

Two specimens (one a female), Minthantoung (Dec.).

DESCRIPTION OF THE PLATES.

Plate III.

Fig. 1. *Neptis Thamala*, ♀, p. 36.
2. *Elymnias obnubila*, p. 33.
3. *Euthalia Andersonii*, ♂, p. 38.
4. —— ——, ♀, p. 38.
5. *Dyctis Andersonii*, ♂, p. 33.
6. *Logania Andersonii*, ♀, p. 39.
7. *L. marmorata*, p. 39.
8. *L. substrigosa*, p. 39.

Plate IV.

Fig. 1. *Thamala miniata*, ♀, p. 42.
2. *Biduanda Fabricii*, ♂, p. 42.
3. —— ——, ♀, p. 42.
4. *Amblypodia Andersonii*, ♂, p. 44.
5. *Terias patruelis*, ♂, p. 46.
6. *T. fraterna*, ♂, p. 46.
7. *T. merguiana*, ♂, p. 47.
8. *T. Andersonii*, ♂, p. 47.
9. *T. Kana*, ♂, p. 48.

Report on the Marine Sponges, chiefly from King Island in the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum. By Henry J. Carter, F.R.S. (Communicated by Dr. John Anderson, F.R.S., F.L.S.)

[Read 3rd June, 1886.]

(Plates V.–VII.)

Before stating the result of my examination of these Sponges, I introduce this communication by a list of the species, arranged according to my classification *, and indicating the new species and the varieties yielded by the collection, also the number of specimens contained in it &c.

Order I. CARNOSA.

None.

Order II. CERATINA.

None.

Order III. PSAMMONEMATA.

Name.	Author.	New species.	New variety.	How many specimens.	Number on label.
Spongia officinalis.....	auct.	.....	.....	1	9.
Polytherses, *Duch. & Mich.* (Hircinia transformed), coarse structure.	Duch. & Mich.	.....	.....	3	61, 62, 64.
Ditto, fine structure	.....	.....	.....	1	2.
Ditto, incrusting bivalve	.....	.....	.....	1	76.
Cacospongia, sp.	Schmidt.	.....	.....	3	31, 39, 70.
Dysidea ramoglomerata	Carter.	n. sp.	.....	7	29, 26, 51, 34, 48, 56, & 65.
—— ——, var. ramotubulata.	Carter.	.....	n. v.	1	5.
—— ——, var. granulata ...	Carter.	.....	.....	1	49.

Order IV. RHAPHIDONEMATA.

Chalina oculata, var. fibrosa..	Carter.	.....	n. v.	1	53.
—— spinifera	Carter.	n. sp.?	.....	1	67.

* Ann. & Mag. Nat. Hist. 1875, vol. xvi. p. 126 &c.

Order V. ECHINONEMATA.

Name.	Author.	New species.	New variety.	How many specimens.	Number on label.
Dictyocylindrus hispidus.....	Bowerb.	.....	.....	1	75.
—— aceratus.....	Carter.	n. sp.	.....	1	6.
Microciona acerato-obtusa ...	Carter.	n. sp.	.....	11	17, 20.
Axinella virgultosa	Carter.	n. sp.	.....	1	7.
—— virgultosa, var. massa ...	Carter.	... ...	n. v.	3	4, 13, 33.

Order VI. HOLORHAPHIDOTA.

Halichondria panicea	Johnst.	.....	.....	4	16, 19, 21, 22, & on 62.
Phlœodictyon isodictyiforme	Carter.	.....	.....	1	11.
Isodictya simulans, var. cancellata (fusca).	Carter.	.....	n. v.	3	1, 43, 74, also two numbered 55.
—— ——, var. (albida)	Carter.	.....	n. v.	1	8.
—— densa.....	Bowerb.	.....	.....	1	71.
—— ——, var. incrustans ...	Carter.	.....	n. v.	2	55, and on 54, both labelled *I. simulans*.
—— ——, var. tubuloramosa	Carter.	.....	n. v.	2	59 (labelled *I. simulans*, var.), 15.
Thalysias tener	Carter.	.....	.....	3	14 (labelled *Reniera fibrosa*), 30, 25, 24.
Reniera crateriformis	Carter.	.....	.....	1	79.
Fibularia ramosa	Carter.	.....	.....	8	32, 38, 46, 50, 57, 58, 63, 74.
Halichondria birotulata	Higgin.	.....	.....	1	69.
Esperia plumosa	Carter.	.....	.....	6	37, 44, 45, 47, 52, 68.
—— indica	.....	n. sp.	.....	2	28, 54.
Suberites carnosa	Johnst.	.....	.....	2	3, 9.
—— coronarius	Carter.	.....	.....	1	73.
—— trincomaliensis.....	Carter.	n. sp.	.....	1	40.
Spirastrella cunctatrix.....	Schmidt.	.....	.....	1	72.
Cliona ensifera	Sollas.	.....	.....	.....	12 (altogether in the cancellated excavations of an old piece of coral).
Samus anonyma.....	Gray.	.....	.....	.....	
—— simplex	Carter.	.....	.....	.....	
Cliona stellifera?	Carter.	n. sp.	.....	.....	
—— sceptrellifera?	Carter.	n. sp.	.....	.....	
Reniera digitata.....	Schmidt.	.....	.....	.....	
Halichondria incrustans, var.	.....	.....	n. v.	.....	
Cliona bacillifera	Carter.	n. sp.	.....	1	78.
Amorphinopsis excavans	Carter.	n. g. et sp.	.....	1	74.
Donatia lyncurium	auct.	.....	.....	2	18, 18.
Stelletta bacillifera	Carter.	n. sp.	.....	3	18.
Tethya cranium, var. robusta.	Carter.	.....	n. v.	1	41, 42.
—— dactyloidea	Carter.	.....	.....	1	23.
Tethya merguiensis	Carter.	n. sp.	.....	2	27.

Order VII. HEXACTINELLIDA.

None.

Order VIII. CALCAREA.

None.

Order I. CARNOSA.

None.

Order II. CERATINA.

None.

Order III. PSAMMONEMATA.

Among the Psammonemata there is a small specimen of *Spongia officinalis*; three specimens of *Polytherses* with coarse, one with fine or compact structure, and one incrusting a mass of bivalves; three specimens of *Cacospongia*, and nine of *Dysidea*.

Spongia officinalis.

Of the single specimen of *Spongia officinalis* there is nothing to say beyond that it is genuine although small, not being more than an inch in its longest diameter.

Hircinia, sp.

The three large specimens of *Polytherses* with "coarse" structure are massive and sessile, with broad bases respectively, ending superficially in short pyramidal processes. The latter present the usual white lace-like reticulation over the polygonal interstices which is common (although not always produced) in these sponges, and arises from an accumulation of foreign bodies (fragments of the spicules of other sponges, sand-grains, and the hard parts of many other microscopic organisms) over the soft reticulated fibre which pervades the dermal sarcode and gives support to the pores or inhalant orifices which are situated in its interstices. This is the structure of a true *Hircinia* before it has been transformed by the invasion of the terminally swollen parasitic filament which I have described and illustrated under the name of *Spongiophaga communis* (Ann. & Mag. Nat. Hist. 1878, vol. ii. p. 168). It is to this transformation, which is so much more frequently seen in almost all the *Hircinicæ* than the original sponge itself, that has led many to consider it a distinct genus, and among them Duchassaing and Michelotti, who, in their account of the West-Indian Sponges ('Spongiaires de la Mer Caraïbe,' Haarlem, 1864), first called it "*Polytherses*." Many have endeavoured to unravel the nature of this filament, but it still remains as enigmatical as ever. Still there can be no doubt that specimens occasionally occur without the parasite. In any case the external form of the sponge is generally sufficient for

its specific identification. When, therefore, the name of "*Polytherses*" is used, it must be understood as applied to the combination of *Hircinia* and the parasite. In like manner a fourth specimen is equally transformed; but being delicate in structure, although otherwise identical with the rest, presents a much more compact appearance; it is lobate, about $2\frac{1}{2}$ inches in its longest diameter horizontally, and has grown over a crab's back of about half its size.

Cacospongia, sp.

The specimens of *Cacospongia*, on the other hand, which are of a light yellowish fawn-colour and loose straggling structure, are insignificant in size and devoid of satisfactorily distinctive specific characters to determine whether they belong to a distinct species or some aberrant growth of a *Hircinia* which has not attained its ultimate form. They occur growing over hard objects (*e. g.* the stems of *Gorgoniæ*, bivalve shells, &c.) in a parasitic incrusting manner without any distinguishing points, like this ill-defined genus generally.

Dysidea.

The specimens of *Dysidea*, in comparison with the preceding forms, are well marked, and the etymological meaning of the term, viz. "*ugliness*," was never more misapplied; for they form the most beautiful part of the collection. Of these there are nine specimens: seven constitute a new species, which I propose to designate *ramoglomerata*; whilst the other two are varieties, which I distinguish respectively as *ramotubulata* and *granulata*.

Dysidea ramoglomerata, n. sp.

Massive, sessile, convex; composed of erect columns in juxtaposition, more or less branched and terminating in obtuse ends which project unequally above the common level of the surface. Consistence fragile. Colour light or dark brown. Surface irregular. Pores and vents not seen in the dry state of the specimens, as the sarcode, always very delicate in this genus, has contracted considerably, so as to leave the skeleton almost bare. Structure exquisitely reticular; fibre of the reticulation filled throughout with foreign bodies of microscopic dimensions, as usual. Size of specimens variable; the largest, which is hemispherical (from having grown over a pebble or some globular body, probably), measures about 9 inches in diameter and 3 in thickness.

Hab. Growing over hard objects, *e. g.* the slender stems of *Gorgoniæ*, or convex bodies, or over the shell-detritus of the sea-bottom.

Loc. Muddy flats, King Island.

Obs. The fragility of this genus is due to the delicacy and scantiness of the sarcode, rendering it peculiarly brittle, and there is a want of toughness consequent on the preponderance of the "foreign objects" over the keratode throughout the fibre. At the same time, this fragility becomes considerably increased when the specimen has been torn from its place of growth by the waves, and finally thrown up "high and dry" upon the beach; under this condition it received the name "*Dysidea*" from Dr. Johnston, who, had he seen it growing in its natural habitat, would have proposed for it a very different appellation. While the British species is massive and lobate, this presents, as above stated, a columnar structure, in which the columns are more or less subdivided or branched, and the reticulate fibre of which they are composed terminated by short spines, which gives the whole mass an appearance like that of a prickly plant or shrub—e. g. *Ulex*. This species is also found at Mauritius.

Dysidea ramoglomerata, var. ramotubulata, nov.

The same as the foregoing, but with the branches tubular. Size of specimen about 3 inches in its longest diameter and 1 inch thick, mixed with shell-detritus at the base.

Dysidea ramoglomerata, var. granulata, *Carter*.

Massive, sessile, spreading, composed of erect columns in juxtaposition, branched and uniting with each other; intermingled with shell-detritus at the base. Consistence fragile. Colour dark brown. Surface of sponge as a whole even, horizontal, and uninterruptedly roughened, with the exception of certain round holes and of the depressions between the heads of the segments. Vents represented by the "round holes" just mentioned, which occur on the more prominent ends of the branches and in the midst of the roughnesses of the surface. Granulations consisting of little, subspherical masses of foreign bodies, which usually replace the spinous terminations (*conuli*) on the surface of these sponges. Size of specimen about 7 inches in its longest diameter and $1\frac{1}{2}$ inch thick.

Hab. Growing on shell-detritus, which becomes incorporated with the base of the sponge.

Loc. King Island.

Obs. The generally horizontal and granulated surface, together with the presence of the "round holes" or vents, distinguishes this variety from *D. ramoglomerata*. It occurs in England, as I learnt from a specimen in the Bowerbank Collection at the British Museum, obtained from the coast of Suffolk, and presented by Dr. W. B. Clarke to Dr. Bowerbank; for which I have already suggested the varietal term above mentioned (Ann. & Mag. Nat. Hist. 5th ser. vol. vii. p. 376, 1881).

Order IV. RHAPHIDONEMATA.

Chalina oculata, var. fibrosa, nov.

This consists of a large mass of branches uniting during their growth upwards, and becoming more or less expanded at the dichotomous extremities. The branches are solid and osculiferous on the surface; in short, the whole mass, with the exception of the fibrous structure terminating superficially in minute aculeations, which replaces the fine dermal reticulation in the typical form of *Chalina oculata*, is the same as in that species. Consistence firm. Colour brown. Size of specimen, which is rather compressed, about 1 foot long, 8 inches high, and 5 inches thick.

Loc. King Island.

Chalina spinifera, n. sp.? (Plate V. figs. 1 & 2.)

This is a small specimen, being not more than 2 inches high, indeed a mere fragment, but, from its solid branches, prickly aculeations, and the remains of the purple colour common to these Chalinæ, it evidently belongs to the *Spinifera*, the fourth group of my Rhaphidonemata, Ann. & Mag. Nat. Hist. 4th ser. vol. xvi. p. 194 (1875).

Order V. ECHINONEMATA.

Dictyocylindrus hispidus, *Bowerb.*

This is a well-preserved specimen, showing the dichotomous and setiferous branches rising from a single hard stem, together with the usual spicular and microscopic structure which charac-

terize the species. Size of specimen about 4 inches high and 5 inches broad.

Dictyocylindrus aceratus, n. sp. (Plate V. figs. 3–6.)

A small, ragged, branched specimen, of globular form and grey colour, about 2 inches high and $2\frac{1}{2}$ inches in horizontal diameter. In its rough aculeated appearance it strongly resembles *D. rugosus*, Bowerb., but is widely different in spiculation from it and the British species generally, inasmuch as the fibre is chiefly composed of *acerate* spicules, from which the acuates spring in long setaceous tufts on the surface, accompanied at the base by short, clavate, sharp-pointed, capitate, and spined echinating spicules. The acerate spicules are smooth, cylindrical in the middle, and pointed at each end, rather bent than arched in the centre, varying in size from less than 50-1800ths by 1-1800th inch downwards; while the acuates, as usual, consist of stout and comparatively short spicules, mixed with thin and long setaceous ones.

Loc. King Island.

Obs. The most characteristic point in this species is the presence of the acerate spicule; hence it has been designated "*aceratus*" after this peculiarity.

Microciona acerato-obtusa, n. sp. (Plate V. figs. 7–10.)

Adnate, spreading, almost immeasurably thin. Colour brown. Spicules consisting of long, setaceous, thin, mixed with shorter, stout acuates, for the most part obtusely pointed and microspined over the large end, but not inflated there; and of tricurvate flesh-spicules and minute, navicular equianchorates lying at the base of the acuates. Size variable.

Loc. King Island.

Obs. The obtuse ends of the acuates of this species led to the specific name; this point, together with the absence of a spinous echinating spicule, causes it to differ from the species hitherto described. In one specimen, viz. No. 20, the sponge presents itself under the form of short, obtuse, mammillary processes about $\frac{1}{4}$ inch long and $\frac{1}{12}$ inch in thickness; but as it here covers the tubes of *Serpulæ*, I am not certain that these prolongations are not the oral ends of the latter, over which the *Microciona* had grown, and which it had subsequently replaced by its own tissue, as I have never before seen prolongations from the surface of any species of *Microciona* that has come under my observation.

Axinella virgultosa, n. sp. (Plate V. fig. 11.)

This specimen, which is well represented by the figure of *Dictyocylindrus virgultosus*, Bowerb. (Mon. Brit. Spongiadæ, vol. iii. pl. 19. fig. 14), consists of a number of filaments or fringe-like shreds about $\frac{3}{4}$ inch long and $\frac{1}{12}$ inch in diameter at their base, where they rise from a continuous layer, about $2\frac{1}{2}$ inches square; they taper upwards and become bifurcated towards the extremities. Their spiculation consists only of smooth acuates bent towards the large end, many of which are subterminally inflated, and by their projection on the surface give the whole filament a hispid character. Superficial area of specimen coextensive with that of the basal layer above mentioned.

Hab. Growing on hard objects.

Loc. King Island.

Obs. The general character of this species has led to the above specific designation, and the absence of any echinating spicule to its being placed in the second family of my Echinonemata, viz. the "Axinellida" (*l. c.* p. 145). If one may be permitted to conjecture, it would appear that the filaments, which in the following species are united together into one mass, remain separate in this form.

Axinella virgultosa, var. massa, nov.. (Plate VII. figs. 6 & 7.)

Massive, lobate, rather compressed and crested, somewhat plumose in external appearance. Consistence firm. Colour grey or brown. Surface irregular, more or less hispid. Vents on the crests of the lobes. Internal structure fibro-plumose, traversed by the branches of the excretory canal-system. Spicules of one form only, viz. acuate, either stout or thin, frequently subterminally inflated, indeed precisely like those of the foregoing species, arranged in tufts which, projecting beyond the surface, here also produce the hispid character. Largest specimen about 6 inches long, $3\frac{1}{2}$ inches high, and 2 inches thick, thus being somewhat compressed.

Hab. Growing on hard objects.

Loc. King Island.

Obs. This appears to me, by the spiculation and structure, to be nothing more than a condensed and massive variety of *A. virgultosa*.

Order VI. HOLORHAPHIDOTA.

Halichondria panicea, *Johnston*.

Growing by itself and over other sponges. This world-wide species (Schmidt's "*Amorphina*"), by possessing one form of spicule only, viz. acerate, curved, fusiform, smooth, gradually attenuated to sharpness at both ends, and very variable in size, and by its white colour, is easily recognized as being present in several instances at King Island.

Phlœodictyon isodictyiforme, *Carter*, *Ann. & Mag. Nat. Hist.* 1882, vol. x. p. 122.

In this specimen the tubulate prolongations which grow from a common base, spreading over shell-detritus, are about $2\frac{1}{2}$ inches long and $\frac{1}{8}$ of an inch in transverse diameter. They are sometimes bifurcated or polychotomously divided, but they are unfortunately all frayed out and rendered thus imperfect at their free ends. The consistence is fragile and delicate. Colour white. Structure isodictyal externally, supported internally by reticulate fibre with meshes vertical to the surface, which seems to me to be the same structure as that described and illustrated by Johnston and Bowerbank in the species "*Halichondria albescens*" and "*Hymeniacidon albescens*" respectively.

Isodictya simulans, *Bowerb.* (Plate VI. figs. 1 & 2.)

There are eight specimens of *Isodictya*, all characterized by the symmetrical arrangement of their spicules, which are small acerates, and by the absence of skeletal fibre, as laid down by Dr. Bowerbank for the diagnosis of this genus. Moreover, although of different forms they all appear, like the British varieties of this sponge, as stated by Dr. Johnston, to belong to one species only, viz. his *Halichondria simulans* (Hist. Brit. Sponges, p. 109), = *Isodictya*, Bowerb. Four, which are small specimens that have grown on oyster-shells, are massive and cancellated; three of them are of a dark brown colour, and the other, viz. No. 8, much lighter. From its appearance this variety might be termed "*cancellata*," whence the subvarieties, after their colour, might be called "*fusca*" and "*albida*" respectively. No. 71 grows over a rock to the extent of several square inches, and, consisting of a thin stratum of a light brown colour with single, well-marked vents, some way

apart, but nearly equidistant from each other, resembles *Isodictya densa*, Bowerb. (Mon. Brit. Spong. vol. iii. pl. 50. fig. 5). No. 55 (Pl. VI. fig. 2) and that on the base of *Esperia indica* (No. 54) are much the same but without the vents on the surface, and this variety might be termed "*incrustans*." Lastly, Nos. 59 (Pl. VI. fig. 1) and 15 are branched fragments (some of which measure 3 inches in their longest diameter) of a large specimen which, from its fragility, has become broken into pieces. In its original state, the sponge consisted of a mass of short branches united with each other and tubulated, so that a large terminal vent is present in the free end of each branch. For this variety, which is the most characteristic of all, I would suggest the name of "*tubuloramosa*." It comes nearest in character to the British form of the species, and the specimen which represents it must when perfect have been of considerable size.

Thalysias tener, n. sp.

Densely ramose; sessile or stipitate; branches tubular, short, thick, crooked and anastomosing, ending on a horizontal surface. Consistence light, fragile. Colour light brown. Surface uniformly but irregularly pitted, covered with a delicately reticulate dermal structure. Vents large, numerous, and circular; placed on the sides or at the ends of the branches. Internal structure consisting of fibres intermixed with isodictyal tissue. Spicules of one form only, viz. acerate, smooth, fusiform, curved, sharp-pointed, about 40 by 2-6000ths inch in its greatest dimensions. Size of largest specimen, which is stipitate, about 4 inches in horizontal diameter and 3 inches high.

Loc. King Island.

Obs. The chief difference between this and the last species is caused by the *presence of fibres* among the isodictyal tissue, which show themselves in a beautiful manner through the delicate dermal network that veils the surface. It chiefly differs from the West-Indian species, viz. *T. subtriangularis*, Duch. & Mich., and its varieties in being less compact and much more tender in structure; otherwise it seems to be the representative of the latter in these parts. The adnate fragments, growing on rock, viz. Nos. 14 and 24, must be viewed as young individuals. It belongs to that division of the Renierid family in my classification which has been termed ("Thalysiosa") Thalyosa.

Reniera crateriformis, *Carter*, *Ann. & Mag. Nat. Hist.* 5th ser. vol. x. p. 115 (1882), where for "Carnosa" read "Crassa."

This species comes under the division "Crassa," chiefly so called from the greater size of the spicules, which in this instance are 85 by 6-6000ths inch in their greatest dimensions. Like all the other species, it is deeply excavated, and measures outside 14½ inches high by 10 and 7 horizontally, so that it is somewhat compressed, and is also bent upon itself in the direction of the longest diameter; while the excavation, the mouth of which is an elongated oval, measuring in its long and short diameters 9 and 2 inches respectively, is 9 inches deep. Like the large specimen in the British Museum, which exceeds the present in size, it is covered outside by a proliferous growth of ragged ridges and pyramidal processes, which are largest at the base and gradually diminish in size upwards until they approach the margin of the mouth, where they disappear altogether, leaving the latter with a plain, irregularly undulating, thin edge. In the large specimen in the British Museum most of these processes are themselves centrally excavated, forming "little craters." The specimen from Elphinstone Island, which was sessile, is very remarkable from its great size, good state of preservation, and great cleanness, which renders it as beautiful as it is valuable in an instructive point of view.

Fibularia ramosa, *Carter*, *Ann. & Mag. Nat. Hist.* 5th ser. vol. ix. p. 283 (1882). (Plate VII. figs. 1–3.)

If the abundance of this species in the Collection is any indication of its prevalence in the locality whence it came, it must be very plentiful. There are eight specimens of it, all of which are characterized by coarse, white, fibro-reticulate structure covered with an extremely delicate, gauze-like, reticulate dermal layer, and by the presence of the bihamate flesh-spicule which, in addition to the skeletal acerate, gives the diagnostic spiculation. One specimen, viz. No. 38, which appears to have grown upon a layer of barnacles, and is about 4 inches in horizontal diameter with a uniform height of 1½ inch, is composed of a reticulate mass of hollow branches whose cavities open by large round vents on the surface. These characters are better developed in Nos. 50 and 57, where the form is preserved by the intermixture of a tough, filiform, branched *Fucus* that pervades the whole structure and

projects from the surface here and there in pointed terminations like small spines. No. 57 (Pl. VII. figs. 1–3), which is the largest of these specimens, is about 9 by 5 inches in horizontal diameter and 3 inches high, composed of hollow branches subdividing and anastomosing so as to form a continuous structure, in which the free ends of the branches on the surface are inflated, and each presents a circular hole in the centre, which is the oscular termination of the tubular interior. The rest all grow over the surface of the stems of thread-like *Gorgoniæ*, with the exception of No. 74, which is a small specimen on a piece of rock.

Halichondria birotulata, *Higgin*, *Ann. & Mag. Nat. Hist.* 4th ser. vol. xix. p. 296 (1877).

This reddish-purple or claret-coloured sponge, originally described from a West-Indian specimen by Mr. Thos. H. Higgin, F.L.S., is represented by a small portion (No. 69) growing over a piece of old branched coral. It is also abundant on the S.W. coast of Australia, and probably occurs in other parts of the world.

Esperia plumosa, *Carter*, *Ann. & Mag. Nat. Hist.* 5th ser. vol. ix. pp. 298, 299 (1882).

Is plentifully represented, and appears to be identical with the form from Mauritius to which I have given the above name. Most of the specimens have grown over the stems of thread-like *Gorgoniæ*, where they present a spinous appearance as if they had grown over a layer of *Dysidea ramoglomerata*; while the anfractuous, irregular growth of the two separate ones, viz. Nos. 37 and 68, although more massive, present no specific character whatever in this respect. The fragility of the species has caused No. 37 during transit to become broken, so that, although apparently of great dimensions when entire, it now only presents fragments, of which the largest is only 3 inches in its longest diameter. In some parts of these specimens the tricurvate is replaced by the sheaf-shaped spicules ("trichites," Sollas), which, as I have before stated, appear to me to be only a straighter form of the tricurvate flesh-spicule; while the minute equianchorate of *E. plumosa* (*l. c.* pl. xi. fig. 19, *a*, *b*) is very abundant.

Esperia indica, n. sp. (Plate VI. figs. 3–6.)

Massive, sessile, lobate, taking the form of the bottom-detritus (shells and stones) over and among which it has grown, or rising

into short tubular processes. Consistence fragile. Colour yellowish white. Surface even, presenting the usual characteristic, viz. a beautiful, lace-like, stellar dermal reticulation covering an apparently confused broken-up fibrous interior. Vents scattered over the surface and at the ends of the tubular processes respectively. Internal structure fibrous, traversed by the branches of the excretory canal-system, which open at the vents mentioned. Spicules of four forms, viz.:—1, skeletal, acuate, smooth, slightly curved, sharp-pointed; head obtuse and smaller in diameter than the shaft and not inflated, 290 by 9-6000ths inch in its greatest dimensions, obtuse end 4-6000ths inch in diameter; 2, flesh-spicule, inequianchorate, shaft straight except towards the ends, where it is bent forwards to meet the arms, which at the large end are each prolonged into an angular sharp point towards the centre, where they are slightly everted; while at the small end, which is round, the lateral ones are short and the central one only pointed; shaft of the larger forms about 3-6000ths inch in transverse diameter, total length 31-6000ths, large head 14-6000ths and small one 7-6000ths inch in length; 3, flesh-spicule, simple, elongated C- and S-shaped (bihamates), more or less contort, about 22 by $1\frac{3}{4}$-6000th inch in its greatest dimensions; 4, flesh-spicule, minute acerates in sheaves (fig. 6), or isolated after disintegration of the sheaves, of various lengths, less than 35-6000ths inch. No tricurvates and no minute equianchorates seen. Size of largest specimen about 9 by 4 inches horizontally, and 3 inches high. No. 28, although not nearly so long, is somewhat higher, and is prolonged upwards into short tubular processes.

Hab. Incrusting and enveloping hard objects.

Loc. King Island.

Obs. The larger spicules of this species, together with the peculiar form of the arms of the inequianchorate and the absence of the tricurvate form and minute equianchorate, distinguish it from the last mentioned. I have designated it "*indica*" on account of the inequianchorate being almost identical in form with that represented by Schmidt from an Indian species (Spong. Adriat. Meeres, Supp. 1, tab. iii. fig. 11); but still more satisfactorily by Schmidt's slide of the actual specimen in the British Museum. The spicule is also like that of his *E. diaphana* from the coast of Florida.

SUBERITES CARNOSA, *Johnst.*

If a massive form, compact structure, whitish-grey colour, and pin-like spicule *only*, with terminal, globular, pointed head, and without the centrally inflated flesh-spicule of *Suberites domuncula*, Nardo, be allowed to characterize this species, then the two specimens in this collection, one of which, viz. the largest (No. 3), has grown over a crab's back, and is about $2\frac{3}{4}$ inches in horizontal and $1\frac{1}{2}$ inch in vertical diameter, represent this sponge.

SUBERITES CORONARIUS, *Carter, Ann. & Mag. Nat. Hist.* 5th ser. vol. ix. p. 352 (1882). (Plate VII. figs. 4 & 5.)

The soft consistence, verrucose surface, buff-yellow colour, and spiculation of this specimen, together with the peculiar form of its flesh-spicule (*l. c.* pl. xii. fig. 27*c*), correspond with the characters of the Honduras species to which this sponge is referred. Its growth is more remarkable than in that example, for it is laminar, and extends in a horizontal direction for several square inches; the superficial stratum, which is comparatively thin and buff-yellow in colour, changes to black or dark brown in the cancellated cavities to be presently mentioned for half an inch downwards, where it rests on granite. The explanation of this abrupt termination is that the lower portion is mingled with a layer of coral which has been cancellated by the excavating habit of these sponges, which exhibit an apparent fondness for calcareous material, whether in a mineral or organic form.

SUBERITES TRINCOMALIENSIS, n. sp. (Plate VI. figs. 7 & 8.)

"Suberites? sp. undescribed, Trincomalee," *Carter, Ann. & Mag. Nat. Hist.* 5th ser. vol. ix. p. 352 (1882).

Suberites vagabunda, *var.* trincomaliensis, *Ridley, Report Zool. Coll.* '*Alert*,' p. 468, note.

Massive, sessile, rising into short, mammillary processes which are more or less proliferous. Consistence soft. Colour brownish or yellowish white. Surface even, soft, villous. Vents on the side or about the base of the mammillary processes, which are otherwise *solid*, not tubular, and have not a terminal aperture. Internal structure compact, traversed by the branches of the excretory canal-system, which open at the vents. Spicules of two forms, viz.:—1, skeletal, pin-like, smooth, slightly curved, fusiform, slightly pointed at one end, slightly constricted at the other,

where the subglobular or slightly elliptical head is placed, about 153 by 5-6000ths inch in its greatest diameters; shaft a little thicker than the head; 2, flesh-spicule a spinispirula varying greatly in length and thickness, the largest about 6-6000ths inch long with 6 bends, the rest so short as to appear like the longer ones broken up. Both forms are equally abundant, the latter scattered among the former, but chiefly found congregated near the surface. Size of entire specimen $4\frac{1}{2}$ inches long, by $2\frac{1}{2}$ broad in its horizontal diameter, with a height of about $2\frac{1}{2}$ inches.

Hab. Growing upon shell-detritus which has become incorporated with its base.

Loc. King Island.

Obs. I first observed this sponge (to which I have already alluded, *l. c.*) in the Bowerbank Collection, where its label bore the words "Trincomalee, Johnston;" the Bowerbankian specimen only differs in the mammillary processes being larger and more agglomerated or proliferous. Having thus met with a second specimen, viz. on the coast of Burmah, I now for the first time name and describe it.

Spirastrella cunctatrix, *Schmidt*, *Spong. Küste Algier*, 1868, p. 17, Taf. 3. fig. 8.

This specimen grows over the surface of a piece of rock to the extent of several square inches in the form of a thin, incrusting layer about 1-48th inch thick with well-defined round margin. Consistence soft. Colour pinkish or lilac. Surface even. Structure throughout compact, but by no means corticate as Schmidt's specimen would appear to have been, although the flesh-spicules (spinispirulæ) are chiefly congregated on the surface, as in most sponges where they exist.

Eccœlonida, *Carter*, 1879.

"Excavating Sponges," *Journ. Roy. Microscopic. Society*, vol. xi. p. 496.

No. 12 specimen is a portion of old coral riddled throughout with cancellous excavations, inhabited as usual by several kinds of sponges, as testified by a fragment when boiled in nitric acid, whose residue when mounted presents the spiculations of:—*Cliona ensifera*, Sollas; *Samus anonyma*, Gray; *S. simplex*, Carter; *Cliona* sp. ?, pin-like spicules and little globular stellates; *Cliona*

sp. ?, spinous acerates and little sceptrellæ like those of *Alectona Wallichii* (olim *Gummina* mendose *Corticium*, Ann. & Mag. Nat. Hist. 1879, vol. iii. pp. 353–354, pl. xxix. figs. 5–9), but with both ends of the shaft shortened and inflated instead of extended and pointed, and all the inflations microspined; *Reniera digitata*; and a variety of *Halichondria incrustans*. All these species have become so mixed up together by the invasion of a small Annelid whose tubes, about $\frac{1}{24}$ inch thick, are chiefly composed of them, that it is impossible, where the species are not previously known, to distinguish their spiculations with certainty in this mounted "residue," where they are of course all mixed together; hence the notes of interrogation after *Cliona stellifera* and *C. sceptrellifera*, the characters of whose spiculations, although regarded as those of new species, are also conjectural.

Cliona bacillifera, n. sp.

This is another form, which has riddled an old oyster-shell that was incorporated with other shell-detritus at the base of *Esperia indica* (no. 54), making its appearance on the surface as usual in little circular heads (white when dry), in which are found three spicular forms, viz.:—1, skeletal, pin-like, with straight, smooth, conical shaft, pointed at one end and terminated at the other by a subglobular head, which is wider than the shaft, about 52 by $1\frac{1}{2}$-6000th inch in its greatest dimensions; 2, acerate, fusiform, sharp-pointed, bent or curved in the centre and finely microspined, about 23 by $1\frac{1}{2}$-6000th inch in its greatest diameters; 3, flesh-spicule, bacilliform, like a minute caraway seed in form, slightly curved, fusiform, and also finely microspined, about 2-6000ths inch long. No. 1, as usual, generally forms the external portion of the head with the points *outwards*, and nos. 2 and 3 are plentifully mixed together at the base.

Loc. King Island.

Obs. Of course the spiculation is the chief distinctive character in these excavating sponges, whose burrowing forms are so much alike in most instances that there is hardly any other difference between them. Where alone, as in this case, the species, although new, is easily recognized. *Cliona bacillifera* is closely allied to, if not the same as, *Cliona Carpenteri*, Hancock (Ann. & Mag. Nat. Hist. 1867, vol. xix. p. 241, pl. viii. fig. 4).

I would here observe that the number of "Eccœlonida" is

becoming so large and the species so different, that it will soon be questionable whether they should all be included in a separate family, or relegated respectively to the groups to which they may belong. *Suberites coronarius* as well as the following species, viz. *Amorphinopsis excavans*, are instances of the great differences between some species included in this group.

Amorphinopsis excavans, n. gen. et sp. (Plate V. figs. 12–15.)

Laminar, continuous, very thin, spreading horizontally over a piece of old coral, which it has excavated vertically. Consistence soft. Colour pinkish, almost white. Surface even, following that of the object on which it may be growing, presenting a beautiful arrangement of the spiculation on the surface, which gives it the appearance of a fabric formed of little stars. Pores and vents not seen. Spicules of two forms, viz. :—1, skeletal, acerate, fusiform, slightly curved, smooth, and very gradually sharp-pointed, varying much in size, 50 by $2\frac{1}{4}$-1800ths inch in its greatest dimensions ; 2, acuate, slightly curved, slightly fusiform, smooth and sharp-pointed, head obtuse, not inflated, less in diameter than the shaft, varying in size under 10 by $\frac{1}{2}$-1800th inch in its greatest dimensions. Horizontal diameter of specimen about 3 inches ; the portion which lies in the excavations about $\frac{1}{2}$ an inch in vertical diameter.

Hab. Growing over and incrusting and penetrating old coral.

Loc. King Island.

Obs. At first this sponge, from its structure and white colour, looks very much like *Halichondria panicea*, Johnst.,=*Amorphina*, Schmidt ; but it differs from it in its *horizontal laminar* growth and the presence of an *acuate* flesh-spicule in addition to the large *acerate*, together with the *excavating habit*, in which it approaches the Suberites ; so that having regard to these resemblances to such totally different sponges, I have considered it desirable to call it after neither, and so have given it the generic name *Amorphinopsis*. No laminar sponge with this spiculation and excavating habit has, I think, hitherto been described.

Donatia lyncurium, *auct.*

But for the colour being whitish, grey, or leaden white, instead of orange, this sponge, of which there are two specimens, would

be almost identical with the British species. Like that species of *Donatia* from Acapulco which I have designated "*multifida*," and its southern varieties especially (*e. g.* those from the Cape and Australia), a stellate spicule of intermediate size between the large globate and small one, with no body and with long, pointed and spined rays (Ann. & Mag. Nat. Hist. 1882, vol. ix. p. 361, pl. 12. figs. 22 *d* and 23), is also present, and seems to be chiefly confined to the *interior* structure of the sponge in all, where it is thus analogous to the larger stellate of the interior of *Geodia*.

Stelletta bacillifera, n. sp. (Plate VI. figs. 9–14.)

Compact, globular, sessile. Consistence hard, crisp. Colour light grey. Surface even, composed of the trifid heads of the "zone-spicule" in bundles supporting a crust of minute flesh-spicules, and forming a cribriform dermal structure between the "groups" into which the pores are arranged; vents not seen. Internal structure confused in the centre, radiating towards the circumference. Spiculation (as is usual in these sponges) consisting of six forms, viz.:—1, "body-spicule," large, acerate, fusiform, sharply curved and sharp-pointed; 2, "zone-spicule," also large, trifid, smooth, sharp-pointed, arms spread out laterally and slightly directed outwards; 3 and 4, the usual "anchors and forks" (anchoring-spicules), with much longer shafts, but much more delicate in every way; 5, minute flesh-spicule of the surface, bacilliform, more or less fusiform, microspined; 6, minute flesh-spicule of the interior, a delicate stellate, as usual. No. 1, in some numbers, forms the body or centre, becoming mixed with no. 2, the zone-spicule, towards the circumference, where the latter in bundles, arranged vertically to the surface, supports by its outstretched arms the crust, which is formed of no 5, while the delicate no. 6 is confined to the sarcode of the interior. Size of specimen which, although small, is very perfect, $\frac{4}{8}$ inch in horizontal and $\frac{3}{8}$ inch in vertical diameter.

Hab. Growing on hard objects.

Loc. King Island.

Obs. The bacilliform flesh-spicule of the surface is the chief distinguishing character of this species; but that is a common feature of certain specimens in the Bowerbank Collection which come from the S. coast of Australia, where it is often very large comparatively, being in some specimens 13 by $1\frac{1}{2}$-6000th inch in

its greatest dimensions, while that of *Stelletta bacillifera* is not more than 4-6000ths inch long with proportionate thickness.

Tethya cranium, *Johnst.*, var. robusta, nov.

This appears to be nothing more than a coarse form of *T. cranium*, wherein the radiating spicular mass, separating into bundles as it advances from the centre to the circumference, leaves large interspaces (excretory interspaces). These spaces open by equally large vents all over the surface, but more especially towards the lower part of this sponge, which is globular with the exception that it is more or less tangentially cut by its sessile attachment to the rock or object on which it may be growing. Typical specimens of *T. cranium* are more compact and the vents are at the summit (Ann. & Mag. Nat. Hist. 1872, vol. ix. p. 419, pl. xxii. fig. 9 *a*). The specimens, of which there are two of about the same size, are $2\frac{1}{2}$ inches high and $2\frac{1}{4}$ inches in their greatest horizontal diameter, which is midway between the summit and the base, that is somewhat contracted on account of the natural tendency to a globular form; while the centre of the sponge, from which the large spicules radiate, is midway between the summit and the base. The spicules of the interior, which project so abundantly as to produce a hispid condition of the surface, are so matted together by the mud in which the sponge has grown on the subjacent rock that, in taking off this crust, the "forks" and "anchors," together with the projecting ends of the "body-spicules," all come away with it. As the sponge generally is very robust in habit, the spicules are correspondingly large; in fact the body-spicules are $\frac{1}{6}$ inch long by 1-450th inch in thickness, and the bihamate flesh-spicules, which, as usual, are C- and S-shaped and contort, are 5-6000ths inch long.

Tethya dactyloidea, *Carter*.

With the exception of the colour being lightish grey or leaden white, the present specimen agrees with those of the S.E. coast of Arabia, where its colour is purple-red; while at Bombay, where it grows in the sands of the Mahim Estuary, the species is strikingly yellow. Indeed the specimen from King Island, which I have divided vertically in order to study its structure, still presents a reddish tint in the centre, so that the grey colour, like that of many of the other sponges of this collection, seems

to have been produced by the bleaching action of the strong alcohol in which the specimens were preserved.

Tethya merguiensis, n. sp. (Ann. & Mag. Nat. Hist. 1883, xi. p. 366, pl. xv. figs. 6 *a–f*, 7 *a–k*, 8 *a–h*.)

Circular, convex, sessile, depressed, rather constricted at the base (*l. c.* fig. 6, *a–f*). Consistence loose, soft. Colour black-brown. Surface hispid, interrupted by several large vents of different sizes, chiefly situated towards the circumference (*l. c.* fig. 6, *b*). Pores in the interstices of a dermal spicular reticulation whose sarcode, charged with dark-brown pigment-cells, is thus rendered cribriform (*l. c.* fig. 8, *a–h*). Internal structure as in *T. robusta*, viz. the spicules radiating in bundles from the centre, which lies, as in that species, midway between the base and the summit (*l. c.* fig. 6, *d*). The spicules diverge as they advance towards the surface and leave wide intervals between them, forming a cavernous kind of excretory canal-system which opens at the vents. Spiculation comprising five or six forms, viz.:—1, the body-spicule (which is by far the largest), acerate, nearly straight, fusiform, smooth, gradually sharp-pointed, nearly $\frac{1}{6}$ by 1-600th inch in its greatest dimensions (*l. c.* fig. 7, *a*); 2, zone-spicule, smooth, trifid, arms straight, diverging laterally and a little forwards, placed at equal angles from each other and from the shaft, which is so like them in size and shape that, when not *in situ*, it is not only almost impossible to say which is which, but whether the spicule is or is not a gigantic 4-rayed stellate, arm about 1-56th inch long, sometimes one or more are abnormally bifid (*l. c.* fig. 7, *b b*); 3 and 4, anchors and forks, heads as usual, but filiform from the great length of their whip-like, delicate shafts (*l. c.* fig. 7, *c*, *d*); 5 and 6, flesh-spicules, viz. the usual form of bihamate, $2\frac{1}{2}$-6000ths inch long (*l. c.* fig. 7, *f*, *h*), and a thin, fine acerate about 1-100th inch long (*l. c.* fig. 7, *g*). No. 1, together with nos. 3 and 4, projecting in great abundance far beyond the surface, from their extreme length give the hispid character which characterizes the sponge. Pigmental cells, which are abundantly scattered throughout the sarcode generally, and from whose brown granules the dark colour is derived, about $1\frac{1}{2}$-6000th inch in diameter. Size of specimen about 10-12ths inch in its greatest horizontal diameter (which is between the base and the summit), 6-12ths inch high.

Hab. Growing on hard objects.

Loc. King Island.

Obs. The black colour together with the presence of a circumferential line of zone-spicules distinguishes this species from *Tethya cranium* and its foregoing variety, viz. var. *robusta*, although in its general structure it is like the latter. As far back as 1869 (Ann. & Mag. Nat. Hist. vol. iv. p. 4) I noticed the presence of an *isolated patch* of zone-spicules in the circumference of *Tethya arabica*, and afterwards observed them in a small specimen from the tropics, mounted on a card in the British Museum (No. 452). In these cases they differed from those above described in the possession of a longer shaft and shorter arms (*op. cit.* 1883, xi. pl. xv. fig. 9), thus resembling the zone-spicule of *Geodia*. Sometimes the bihamate flesh-spicule is wanting in these sponges, but I only know of one instance of this, viz. in *Tethya antarctica*, Carter. Very often the heads of the anchor-spicules outside appear to be absent when they really were not during life, for they are so delicate that the least contact of their arms with any opposing object will break them off, and thus their absence may lead to the conclusion that they never existed.

The reticulate fibro-dermal structure covered by a layer of sarcode rendered cribriform by the pores, and more strikingly marked by being densely charged with the dark pigmental cells and flesh-spicules, recalls to mind that which is so characteristic of the dermal structure in *Thenea Wallichii*, just below the pileus or hat-like upper portion of this sponge. There is only one specimen of *Tethya merguiensis* in Dr. Anderson's collection.

General Observations.

On referring to the table at the commencement of this Report it will be observed that the collection consists of 89 specimens, referred to 38 species, 13 of which, including representatives of one new genus, have not been made known before, 9 are new varieties, and the rest have already been named and described. Most of the sponges have been examined and characterized in the dried state by preference, although the greater part arrived in spirit.

In estimating the sponge-productiveness of a locality, and, indeed, its fauna and flora generally, the number of species should

not be taken into account; for a short sojourn in any part of the world can only give the prevailing features, while the more exceptional ones can only come to notice by an extended residence, so that the wonder is that, in so short a time, Dr. Anderson should have done so much at King Island in respect of the Spongida.

Again, the nature of the sea-bottom makes a difference in regard to sponges, as they undoubtedly prefer clear water and a sandy or rocky sea-bed to dirty water; yet, like most animals, and even man himself, they will, if their lot has not been cast in a too uncongenial locality, adapt themselves to it, that is live and thrive there in spite of all its difficulties. Thus, even if we did not know it for a fact from Dr. Anderson himself, the appearance of the specimens of this collection would testify to their having grown more or less in the neighbourhood of dark grey mud, *i. e.* "on stones and rocks in the muddy flats of the north-eastern side of King Island," and yet they are large, numerous, and beautiful.

Although neither the Carnosa (of my classification) nor the Ceratina are represented, there are many large specimens of the Psammonemata, among which is the ubiquitous "*Polytherses*" of Duchassaing and Michelotti (Caribbean Sponges, 1864), first described and well illustrated by the late Dr. Bowerbank under the name of "*Stematumenia*" (Ann. 1845, vol. xvi. p. 406, pl. xiv. figs. 1–5), and shown by myself to be a *Hircinia* transformed into this state by, or into, a terminally-bulbed filament, for which I proposed the name of *Spongiophaga communis* in 1871 (see Ann. & Mag. Nat. Hist. 1878, vol. ii. p. 165 *et seq.* and illustration). This is not an instance of what has lately been termed "symbiosis," where two organisms live together without injuring each other, even from a very early period, but one of the *destruction* of the whole of the sarcode or vitalized portion of its host the *Hircinia*, which is thus replaced by this filament. After these comes a new and beautiful species of *Dysidea* with its varieties in large quantity. The Rhaphidonemata are not so profusely, but still well represented by a large specimen of another ubiquitous sponge, viz. *Chalina oculata*, here assuming a strongly-marked variety. Of the Echinonemata there are several specimens, but they are chiefly small, among which is the British one named by Dr. Bowerbank "*Dictyocylindrus hispidus*." It is in the Holo-

RHAPHIDOTA, however, as this is by far the largest order, that, as might be expected, the greatest number of species are to be found; while here we see the first four groups of the Renierid family together with the groups "Fibulifera" and "Esperina," and the Suberitida generally, most prominent in the matter of quantity.

That the orders HEXACTINELLIDA and CALCAREA should not in any way be represented may be probably explained by the muddy character of the locality, combined with the shallowness of the water, which therefore must be continually kept in a state of agitation by the tides and waves of the sea.

In *Tethya merguiensis* and in the new genus *Amorphinopsis* we have the addition of a trifid "zone-spicule" &c. to characterize the former; with the spiculation and excavating habit of a sponge very much in appearance like *Halichondria panicea*, Johnst., = *Amorphina*, Schmidt, to establish the latter.

But as the peculiarities of all the species have already been stated in the foregoing descriptions, I need not repeat more here. Suffice it, in conclusion, to state that there is a strong British *facies* in the collection, somewhat modified by the difference in locality.

DESCRIPTION OF THE PLATES.

PLATE V.

Figs. 1 & 2. *Chalina spinifera*, n. sp.? 1. Specimen, of natural size. 2. A portion of the same, enlarged 3 diam. to show the surface-reticulation.

Figs. 3–6. *Dictyocylindrus aceratus*, n. sp. 3. Specimen, about natural size. 4. An acerate fibre spicule. 5. An acuate setaceous spicule. 6. A short, spined echinating spicule. The spicules all magnified to the same scale.

Figs. 7–10. *Microciona acerato-obtusa*, n. sp., the various kinds of spicules, all magnified to scale. 7. Long skeleton-spicule. 8. Shorter stouter acuates. 9. A tricurvate flesh-spicule. 10. Navicular equianchorate spicules.

Fig. 11. *Axinella virgultosa*, n. sp. Represented of natural size. (Compare figs. 6 & 7, Plate VII.)

Figs. 12–15. *Amorphinopsis excavans*, nov. gen. et sp. 12. A small portion of the surface of the sponge, of natural size. 13. A similar piece considerably enlarged, showing its star-like character. 14. Two skeletal acerate spicules. 15. An acuate spicule, also magnified to the same scale.

Plate VI.

Figs. 1 & 2. *Isodictya simulans*, Bowerbank. 1. A branched fragment, var. *tubuloramosa*, nat. size. 2. The variety *incrustans*, also natural size.

Figs. 3–6. *Esperia indica*, n. sp. The various kinds of spicules, all greatly magnified to scale. 3. Two acuate skeletal spicules. 4. The inequianchorate spicules; side and front views. 5. Various-sized bihamate flesh-spicules. 6. Minute acerate flesh-spicules (trichites).

Figs. 7 & 8. *Suberites trincomaliensis*, n. sp. 7. A pin-like skeletal spicule. 8. Spinispirular flesh-spicules. All magnified to one scale.

Figs. 9–14. *Stelletta bacillifera*, n. sp. Spicules of various sorts, all highly magnified to the same scale. 9. Two zone-spicules. 10, Anchor, and 11, a fork-spicule. 12. Minute microspined bacilliform spicules. 13 and 14 (enlarged). Minute stellate flesh-spicules.

Plate VII.

Figs. 1–3. *Fibularia ramosa*, Carter. 1. A portion of the sponge on a *Gorgonia*, of nat. size. 2. The whole specimen, much reduced, showing the habit of growth. 3. A small portion, enlarged 3 diam., showing the reticulate character of the surface.

Figs. 4 & 5. *Suberites coronarius*, Carter. 4. A spinulate spicule. 5. Crown-like flesh-spicules, all magnified.

Figs. 6 & 7. *Axinella virgultosa*, var. *massa*, nov. Two different views of the exterior of this variety of sponge, both natural size. 6, the upper, and 7, the side view.

On the Ophiuridæ of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By Prof. P. Martin Duncan, M.B. Lond., F.R.S., F.L.S.

[Read 3rd June, 1886.]

(Plates VIII., IX., & XI. figs. 28–40.)

Contents:—I. Introduction. II. List of the Species. III. Description of the Species. IV. Remarks on the Species. V. Description of the Plates.

I. *Introduction.*

The species of Ophiuridæ which form the subject of this communication were handed over to me by Dr. Anderson for description and classification.

The little fauna is rich in individuals, and some are of considerable dimensions. There are thirteen species, besides some young forms of the genus *Ophioglypha*, in the collection, and four of them have been recorded from other localities. The latter are, with one exception, well-known species; they are *Ophiolepis cincta*, Müll. & Trosch., *Ophiocoma scolopendrina*, Lmk. sp., *Ophiocnemis marmorata*, Lmk. sp., and *Ophiothrix Martensi*, Lyman. These forms are characteristic of the Indian Ocean and the western Pacific Islands. The first extends to the Philippines, the second ranges from the Cape of Good Hope to the Philippines and Fijis, the third has been found in Ceylon and in the Great Ocean, and the fourth is from the Philippines. None of the Korean species are present; and one *Ophiothrix* is closely allied to a species from the Nicobars.

All the species are shallow-water dwellers; and some of the individuals appear to have suffered from a deficiency of carbonate of lime in their food.

There are some remarkable forms amongst the collection, and especially the new species of *Ophiolepis* and the new genus *Ophiocampsis*, represented by one species, which is allied to *Ophiopsammium* and *Ophiothrix*. The species of *Ophiothrix* gave much trouble in their classification; and the structures of *Ophiothrix variabilis* have been of necessity carefully studied. Their description forms the subject of a special communication, which follows this.

II. *List of the Species described or noticed in this Communication.*

Order OPHIURIDA, *J. Müller.*

Family Ophiolepidæ, *Ljn.*

Ophiolepis cincta, *Müll. & Trosch.*
—— nodosa, sp. nov.
Ophioglypha, *Lyman*, numerous young forms.

Family Amphiuridæ, *Ljn.*

Ophiophragmus affinis, sp. nov.
—— difficilis, sp. nov.
Ophiocnida sexradia, sp. nov.

Family Ophiocomidæ, *Ljn.*

Ophiocoma scolopendrina, *Lmk.*, sp.

Family Ophiothricidæ, *Ljn.*

Ophiothrix Andersoni, sp. nov.
—— merguiensis, sp. nov.
—— Martensi, *Lym.*
—— variegatus, sp. nov.
—— variabilis, sp. nov., and four varieties.
Ophiocampsis pellicula, gen. et sp. nov.
Ophiocnemis marmorata, *Lmk.*, sp.

III. *Description of the Species.*

Genus Ophiolepis, *Müll. & Trosch.*

Ophiolepis cincta, *Müll. & Trosch.*
Locality. King Island.

Ophiolepis nodosa, sp. nov. (Plate VIII. figs. 1–3.)

Disk large, much notched over the arms, covered with very small wide-apart radial shields and a thick skin ornamented with large knobs placed symmetrically and surrounded by small irregular scales. Large projecting knobs in the interbrachial spaces. Below, the scaling is both large and small, and the smaller plates surround the larger; large scaling at the margin.

Mouth-papillæ numerous, and with accessory papillæ. A supplementary plate orally to the mouth-shield. Arms short and broad; upper arm-plate nodular; small accessory plates on either side of upper and lower arm-plates; four to six very small spines along the arm. Two tentacle-scales.

Description of the Specimen.—Disk nearly as wide as the length of an arm, tumid above and at the margin between the arms, notched over them. Nodules five in centre, two in each interradial space, and five largest between the central group and the radial shields. Radial shields very small, naked, almond-shaped, widely separated by two nodules and intermediate scaling. Scales between the nodules varying in shape and size, never regular or in single series. At the margin, between the arms, the nodules are very large and five in number, and separated by a narrow scaling. Immediately below these are five

large and symmetrical plates; the rest of the plates diminish in size from the margin to the mouth-shields; and there is a row of irregularly-shaped scales between them.

Two generative slits, and the scale apparently divided into three parts.

Mouth-shields small, ovoid, narrowest externally, and with a small accessory piece between the mouth-shield and the junction of the side mouth-shields. Side mouth-shields each nearly as large as the mouth-shield, situated obliquely, and with the inner point of junction far internal to the accessory piece, triangular, and largest at the side, where they are in contact with the first lower arm-plate, the first side arm-plate, and the mouth-shield. Jaw-plate angles broad and long. Mouth-papillæ mostly projecting downwards, irregular from the intercalation of accessory papillæ; there are 13 in one angle, and 11 and 12 in the rest. There may or may not be a papilla below the teeth, which are stout and blunt, except the lowest, which is pointed. A long papilla, which is in contact with the side mouth-shield and also with the first arm-plate, is large and triangular, and might be called a tentacle-scale. The accessory pieces are small and resemble mouth-papillæ.

First lower arm-plate small, triangular, pointed within. The next is very large and is broader than any other, broader than long, straight where in contact with the first plate, slightly convex externally, and with a re-entering curve on either side of the straight part; incurved for the tentacle at the part of the side nearest the first plate, and more slantingly incurved further out for the side arm-plate. Beyond the disk the plates are as long as broad, slightly convex without and concave within, with re-entering curves on either side and a straight border for the side arm-plate. Far out they are separated by the side plates, and are triangular, the angle being towards the disk.

Upper arm-plates small, short, and moderately broad, not extending across the arm, the usual space at the side being occupied by a triangular accessory plate which reaches the side arm-plate; the surface of the upper plate is a nodular broad ridge with a blunt point at the median line. Side arm-plates large, tumid, but close to the arm, gradually having the accessory piece between them, and crossing the upper surface of the arm close to the tip. There are two close, flap-like tentacle-scales, and from four to six, usually four, very small spines placed close to the

arm. The tentacular openings are bounded, without, by a small, short, and increasingly broad accessory plate.

Arms short, with a leathery skin at the disk-notches, capable of much horizontal motion, and broad and flat below, low at the sides, and more or less angular above from the presence of the nodular upper arm-plates.

Colour in alcohol orange, with a little purple splashed on the radial shields, nearly white below.

A remarkable cribriform structure exists in many parts; for instance, on the bases of the boss-like nodules of the disk, on the sides of the radial shields, on the flanks of the nodules between the shields, on the sides of the large bosses at the margin, on the upper flap of the side arm-plates, and on the upper arm-plate except the boss.

The jaw-frames are slightly cribriform, and so are the side arm-plates, as seen from below, and here and there a few pores occur on the lower arm-plates. The cribriform character is produced by a close, shallow, circular perforation, or rather penetration, of the calcareous structures.

Diameter of disk 18 millim. Length of arm 17·5 millim., breadth of arm outside the disk 3 millim.

Locality. Elphinstone Island.

Genus Ophioglypha, *Lyman.*

Numerous young forms of indeterminable species.

Locality. Elphinstone Island.

Genus Ophiophragmus, *Lyman.*

The next two forms to be considered have given some trouble in regard to their classificatory position; for whilst having the general aspect and some of the characters of the genus *Amphiura*, there are some of the internal, as well as external, structures present of the genus *Ophiophragmus*, Lym. Some of the internal structures are, however, Amphiuran, and are not seen in the type of *Ophiophragmus* figured by Lyman, 'Challenger' Report, Ophiuroidea, pl. xl. fig. 4.

1. The junction of the mouth-frames, superiorly and at the median line adorally to the first arm-bone, is stout and projecting. The upper brachial rims of the contiguous halves, to use Lyman's words, "form an elevated crescent embracing the outer end of the mouth-slit"; moreover, the interbrachial rims are in

the form of well-developed crests; they are rather close, and the intervening muscle is well developed. These are Ophiophragman characters. But the width of the mouth-frames is greater, and the height of the interbrachial rims is less than in *O. Wurdemanni*, Lym. Probably the very narrow mouth-shield determines the narrowness of the space between the interbrachial rims of the mouth-frames, as seen from above.

2. The first three arm-bones within the disk, as seen from above, after the removal of the roof of the disk, resemble those of *Ophiophragmus*; but those further out resemble those of *Amphiura*.

3. There is a peristomial plate, and the character is not Ophiophragman, but it resembles that of *Hemipholis*.

4. The genital plate is long and slender, and simply knob-headed, and the generative scale is long and slender and longer than the plate. They resemble the corresponding structures in *Amphiura* more than those of *Ophiophragmus*.

5. The radial shields are unusually broad for an Amphiuran, yet not more so than in some recognized species.

6. The ridge of scales at the margin of the disk, although slight, is Ophiophragman; but it cannot be of any physiological importance.

Probably the species should be classified with the genus *Ophiophragmus*, although the Amphiuran alliance is evident.

Ophiophragmus affinis, sp. nov. (Plate VIII. figs. 4–6.)

The disk is circular in outline, except where slightly indented over the arms, and it is rather tumid. The scaling is small above, but distinct, and is largest centrally and in the interradial spaces. Primary plates not very conspicuous. On the underside of the disk the scaling is smaller and overlapping. A ridge of minute scales at the interbrachial margins projecting. Radial shields twice as long as broad, pip-shaped, close and joined except near their inner ends, where a single scale intervenes: a projection on the outer angle. Mouth-shields small, spear-headed, blunt, angular orally, and with a stalk-like process aborally, covered with a thin skin. Side mouth-shields small, covered.

Jaws broad; four mouth-papillæ on each side—the outer on the side mouth-shield, the two following more or less united, and the innermost below the teeth, but sloping somewhat besides projecting inwards.

Arms long, 5·5 times the diameter of the disk in length, slender,

filiform at the end, flat below, and convex above. Lower arm-plates very broad, broader than long, twice as broad as long for some distance beyond the disk, nearly quadrangular near the disk, and with a point at the median line adorally, incurved aborally lower down, with an inward curve at the sides for the tentacular opening. A low, broad elevation runs along the median line of each lower arm-plate.

Upper arm-plates large, much broader than long near the disk, slightly convex adorally from side to side; the aboral edge is the widest, and the adoral is boldly curved adorally. Further out the plates are elliptical and broader than long, but near the tip the length increases over the breadth. The side arm-plates are small flaps close to the arm, which soon encroach slightly between the upper and lower plates, and the separation of the upper arm-plates by them soon becomes considerable.

Three short, cylindrical, pointed spines stick out widely from the arm and from each other, the middle one the longest and thickest.

Two tentacle-scales over the large tentacular openings, broad and pointed—one is on the side arm-plate, and the other on the lower arm-plate. They reach far out in the arm, and the scale attached to the lower arm-plate becomes longer. Diameter of disk 4·5 millim. Length of arm 26 millim. Colour white and flesh-tinted.

Localities. Elphinstone Island and King Island.

One of the commonest species of the Ophiurida in the Archipelago is a small, slender, long-armed form, which is usually found without a top to the disk, and, moreover, the middle of the upper arm-plates is wanting for some little distance beyond the disk. The genital plates and scales, the interbrachial parts, and the whole of the top of the disk are then absent. In two instances the disk has been preserved, and it is possible therefore to describe the species fully and to classify it.

Ophiophragmus difficilis, sp. nov. (Plate VIII. figs. 7–9.)

The disk is small, flat, strongly pentangular, with a well-defined re-entering curve at the margin between the radial shields.

Diameter 5 millim. Length of arm 70 millim. Disk covered with a minute overlapping scaling except on the radial shields. A large scaling at the margin. Radial shields long and narrow, but forming much of the disk, and close except midway; the ends

project over the arm and are close; the outer sides overlapped by scaling. Genital plate slender and long, rod-like, articulated with the radial shield, and having a slight expansion at its inner part over the arm; it arches into the longer and equally slender genital scale. The aboral ends of the united genital plate and scale overhang the arm and nearly touch their neighbours at the median line.

Generative openings large. Interbrachial spaces below with a plain skin, the only scaling being on the side of the genital slit and on a line with the oral end of the generative scale, and it consists of a close row.

Mouth-shields longer than broad, broadly rounded without and narrower and more angular within. Side mouth-shields large, broad at the side of the arm, and long from side to side in front of the mouth-shield, only separated by the very small first arm-plate.

Jaw-angles broad and short, with four mouth-papillæ on either side, of which one is stout and immediately below the true teeth, the next is small, and the following pair are frequently united. These eight papillæ, which are very constant, project downward.

The arms are long, filiform, and slender, but they do not diminish much in breadth; they are rarely otherwise than straight, and usually three are in one direction, and all look like stiff wires rather than threads. Lower arm-plates: the first is very small, incurved orally, and convex at the edge without, touched on either side by a side mouth-shield; the second is much larger, is quadrangular, but longer than broad, broadest orally, and convex at the edge without. Beyond the disk the plates are much longer than broad, slightly broadest at the inner edge, which is convex, and with sides straight and slanting to the narrower outer edge, which is incurved. In mid arm the length preponderates over the breadth, and the breadth is greatest at the edge within, and this is convex, while the edge without has a decided incurve. At some distance from the disk the plates are not close, on account of the side arm-plates coming in.

Upper arm-plates broadly triangular, point without, angles at the sides and without rounded off; oral edge broad and slightly curved within. Usually with a small median ridge. The median part of the first six or eight upper arm-plates deficient.

Side arm-plates large, projecting obliquely, meeting, not far from the disk, on the underside of the arm broadly, and thus

separating the lower arm-plates there; meeting on the upper surface of the arm close to the disk by a narrow surface. The spines are on the exposed narrow edge of the plate, and are three in number except close to the disk, where there is a fourth. They are subequal, short, stout, cylindro-conical, striated, sharp, and glassy; their length is not equal to that of the width of the upper arm-plate. The tentacle-scale is small and spinulose. Tentacles long and stout. The colour of the animal is either light, brown or white.

With regard to the internal construction of the skeleton, it appears that the form of the upper part of the arm-bones resembles that seen in *Amphiura*, but there is an approach to the peculiar structure of the genus *Ophiophragmus* in the crescentic junction of the mouth-frames at the mouth-slits; moreover, the interbrachial rims of the frames project and are not widely separated. There is no peristomial plate. The position assumed in the specimens by the genital plates and scales is very remarkable, but it may be due to post-mortem causes. The oral ends of the plates and scales, instead of being parallel with the side of the arm in continuation with the general direction of the rest of the structure, are in contact with the side arm-plates immediately below the position of the aboral ends of the radial shields. The plates and scales are thus nearly vertical and the end of a radial shield is forced up to a much higher level than the top of the arm, and of course there is a considerable space between the upper surface of the arms and the underpart of the disk.

Locality. King Island.

Genus Ophiocnida, *Lyman*.

Ophiocnida sexradia, sp. nov. (Plate VIII. figs. 10, 11.)

Disk small, tumid above and at the margin, irregularly hexagonal, covered with a thick skin with numerous close, short, thorned stumps.

No scales or radial shields are visible. A skin with a very delicate, small, overlapping scaling is in the interbrachial spaces below, and there are some stumps on it near the margin. Two large generative slits, which come as far inwards as the aboral process (genital scales) of the mouth-shield. Mouth-shields small, about as long as broad, lozenge-shaped with the angles rounded. Side mouth-shields small, short orally, and largest near the arms, usually not meeting orally, and touching the first and second

arm-plates. Jaw-angles triangular, broad and short, with a median perforation. Mouth-papillæ numerous, eight to an angle, not counting the tentacle-scale on either side. There is one also beneath the teeth, so that there may be from 9 to 11. Tentacles large.

There are six long rather slender arms. First lower arm-plate small; second plate very much larger, longer than broad, broadest without, outer edge curved outwards, inner edge straight and slightly curved at the sides for the side mouth-shield. Beyond the disk the plates are longer and otherwise retain their outline, but the side arm-plate comes gradually under the arm and diminishes the width of the inner edge. Sides incurved. The large, long, flap-like, curved tentacle-scale abuts against the side of the lower arm-plate. The length of the plates increases over the breadth towards the tip of the arm, and they are separated by the side arm-plates. The tentacle-scale becomes more pointed towards the end of the arm. Upper arm-plates large, heart-shaped, broadest aborally and curved there, narrower orally and roundedly angular there; sides convex. The side arm-plates come in at the half-arm. Side arm-plates large, flap-like, projecting somewhat near the disk and more flattened to the arm further out, so that the direction of the spines differs; meeting above and below the arm slightly beyond its outer half. Four close, cylindrical, conical, short, stout spines; their length is less than that of an upper arm-plate and they are longest in mid arm. The upper spine is either the longest or it may be short, the next is the stoutest as a rule, and the others are shorter and more slender. Their surface is plain or minutely jagged. Arms six, high, flat above and below, and nodulated towards the tip. Diameter of disk 4 millim.; length of arm 18 millim. Colour light brown, without any spots.

Locality. Owen Island.

Genus Ophiocoma, *Agass.*

Ophiocoma scolopendrina, *Lmk.*, sp.; *Müll. & Trosch., Syst. Aster.* p. 101 (1842).

Several specimens of this species are in the collection from Mergui; and as there are some interesting points about their variations from the type and from one another, notice is taken of them.

In the largest specimen, which has a disk 25 millim. across and

arms 130 millim. in length, the upper, swollen, large, flat arm-spine is on every other side arm-plate, and near the end of the arm the upper spine is the longest and largest, but it is neither flat nor swollen. In one of the arms the normal repetition of a large flat spine occurs on every side arm-plate. The granulation of the disk is hemispherical, small, and not crowded; the largest nodules are on the ends of the radial shields. The granulation is smaller below. The wide generative slits come inwards so as to be bounded orally by the side mouth-shields, and these do not always meet orally. Two or three mouth-papillæ merge into a ridge, and the inner mouth-papillæ are not readily distinguished from the lower tooth-papillæ. The mouth-shields project considerably along the median line into the jaw-angles. The first three lower arm-plates form a groove. The double tentacle-scale is seen near the disk, but not very far out in the arm; there it is single, large, and flap-like. At the tip of the arm the lower arm-plates are very long.

In a smaller specimen (diameter of disk 22 millim., length of arm 120 millim.) the spines are shorter than in the form just noticed, the lower arm-plates are broadly elliptical in mid-arm, the skin coming well between them. There is no coalescence of the mouth-papillæ, and there are three on either side and one below the tooth-papillæ.

The large tentacle-scale in contact with the side mouth-shield and first arm-plate may be counted besides as a mouth-papilla.

In a small specimen (disk 9 millim. and arm 65 millim.) the granulation of the disk is crowded above and large at the margin. Underneath, the minute scaling, which is obscured by pigment in the large forms, is visible and the granulation does not extend *en masse* to the mouth-shields and only a few stray nodules occur thus far inwards.

The mouth-papillæ are either confused with the lower tooth-papillæ or are not, or one may be on the jaw-angle external to the tooth-papillæ clump. Including the large tentacle-scale, there are four mouth-papillæ on either side. The side arm-plates come under the arm and are in contact near the disk, but not further out. The lower arm-plates are rather hatchet-shaped beyond the disk, but they become very long towards the tip. The upper arm-plates are widest without and convex there. The spines are miniatures of those of the large forms. Two tentacle-scales near the disk and one further out.

The variability is remarked by Mr. Lyman in his Report on the 'Challenger' Ophiuroidea, p. 170.

Locality. Owen Island.

Genus Ophiothrix, *Müll. & Trosch.*

Ophiothrix Andersoni, sp. nov. (Plate IX. figs. 12, 13; Plate XI. figs. 28–30.)

The disk is circular in outline, large and tumid. The radial shields are large and naked. Minute scales with slender 2- to 4-thorned stumps in the centre of the disk, between the radial shields and the pairs of shields. A single series between the radial shields of a pair and four close rows in the interradial spaces. Scales overlap the radial shields somewhat. Similar small scales and stumps at the margin of the disk. Below, the disk is covered with minute scales bearing stouter stumps than those above and with five to eight long thorns to a stump.

Mouth-shields small, much broader than long, more or less elliptical, but angular within and rounded without. Side mouth-shields small, largest at their sides, and meeting in front of the mouth-shields by a narrow edge. Jaw-angles short, very broad close to the side mouth-shields, with a small opening at the median line and large tentacular orifices. Tooth-papillæ and teeth, the former in an ovoid space, small and crowded inferiorly; lower ends of the ovoids very wide apart from those opposite, so as to produce a funnel-shaped mouth.

Arms broad, arched, high and long, ten times the diameter of the disk in length. Lower arm-plates broad and flat; some, within the disk, are longer than broad, but the breadth gradually increases over the length; they are broadest aborally. The plates near the disk have the outer edge much curved, convexity towards the tip of the arm, and the edge within is slightly incurved. Further out in the arm the plates become longer than broad, and are slightly convex at both of the edges as well as curved out at the sides. A broad purple band passes down the under arm, which has a white colour.

The upper arm-plates are convex from side to side, much broader than long, short, broadest and curved at the aboral edge and narrower and incurved adorally; sometimes the aboral edge has a slight incurve at the median line. The breadth diminishes in relation to the length towards the tip of the arm. The colour of the plates is a smalt-purple, and a narrow white band crosses each plate. The first plate has a few thorned stumps on it.

The side arm-plates are small and flap-like, especially on the lower surface of the arm. They contribute to the breadth of the arm, and do not meet until near to the tip of the arm. There is a small scale as a tentacle-spine. The number of spines varies in different parts of the arm; there are nine close to the disk and then seven, six, and five, which is the usual number over the greater part of the arm. A small glassy spine with side spinules is seen on a few plates near the disk, and it becomes a true hook with four fangs at the seventh arm-joint, and the points of the hooks, which are close to the tentacle-scale, look towards the disk. The other spines are glassy and usually compressed, so that their large lateral spinules are directed parallel with the arm. The upper spine, which is the longest and slenderest, is needle-shaped, sharp, and the spinulation is near the top and slight on the stem. The next spines diminish in length, are long, compressed, very spinulose near the top and less so on the stem. The spine next to the hook is very compressed, and has long and sharp spinules. Longest spine 3·5 millim. Breadth of disk 14 millim.; length of arm 140 millim.; breadth of lower arm-plates near the disk 1 millim. Colour of disk above dark purple, darkest centrally and along the interradia and spaces between the radial shields of a pair, relieved with smalt and white in splashes and lines near the edges of the radial shields.

Localities. King Island Bay, Elphinstone Island.

Ophiothrix merguiensis, sp. nov. (Plate IX. figs. 14, 15; Plate XI. fig. 31.)

Disk nearly circular in marginal outline, covered with skin in which there are minute scales, each bearing a short three-thorned stump. Radial shields covered with a coarsely granular skin, also with a few trifid stumps; shields broadest at the margin and projecting over the arm, separated from the neighbouring pairs by a wide area covered with minute scales and bearing thorny stumps; a narrow line of the same structures between the shields of a pair.

Disk tumid beneath and covered in the interbrachial spaces with crowded trifid stumps. Mouth-shields as broad as long, broadly curved without and angular within. Side mouth-shields small, triangular, meeting at a narrow point orally to the mouth-shields, and not reaching aborally beyond the line of the mouth-shields. Jaw-angles wide and short, perforated along the median

line with immense tentacular openings; tooth-papillæ numerous and in a broad ellipse. Lower arm-plates beyond the disk flat and wide, nearly square or very slightly longer than broad, a re-entering curve at the outer edge, and a slight slanting at the sides for the side arm-plates. Further out in the arm the plates are longer than broad and widest without. Upper arm-plates broader than long, curved within and without, the convexity directed aborally, sides slanting for the side arm-plates; these are large, broad below, and flap-like at the sides, and they add to the height of the arm, which is flat below and arched above. Tentacle-opening large, and the scale is very small; tentacles large, long, and very papillose. Six spines, the lowest being a hook, small and 3-pronged; it is not found upon the first four or five joints. The next spine is small, compressed and serrate; the third spine is longer and also compressed, but is longer and blunt at the top, but it is serrate. The fourth spine is very long, but oar-shaped near its blunt broad top, it is very serrate, and is four times the length of a lower arm-plate (fig. 31). The fifth, or uppermost, spine is usually shorter than the last mentioned and its shape varies, it being often needle-ended. The spines in alcohol are dark coloured and opaque, and in balsam they are glassy with pigment-spots here and there. General colour of the disk and arms very dark red-brown. Diameter of disk 6 millim.; length of the arm 55 millim. or 1 to 9.

Locality. Owen Island.

Ophiothrix Martensi, *Lyman*, *Bull. Mus. Comp. Zool.* vol. iii. pt. 10, p. 234, pl. iv. figs. 9 & 10 (1874); and '*Challenger*' *Ophiuroidea*, p. 221.

This belongs to the group of Ophiothrices with arm-spines clubbed at the end and well-marked radial shields.

Locality. Owen Island.

Ophiothrix variegatus, sp. nov. (Plate IX. figs. 16, 17; Plate XI. figs. 37–39.)

Disk tumid, projecting in the interradial parts of the margin, covered with a growth of small, slender, long-thorned stumps; thorns one to four in number. Stumps smallest and shortest at the centre of the disk, and slightly larger and longer towards the margins. No scales visible except the very small granulated thorny radial shields. Radial shields with a V-shaped space between and this has thorny stumps, and there is a broader stumped area between the pairs.

Beneath, no large scaling occurs, and the interbrachial spaces are covered with slender, long-thorned stumps which diminish in numbers towards the mouth-shields.

Mouth-shields small, one third broader than long, either lozenge-shaped or more or less rounded aborally and angular orally, projecting on either side; with a large adoral genital scale attached on either side to the median line aborally.

Side mouth-shields small, triangular, and not meeting adorally to the mouth-shields. Jaw-angles short, broad, with a wide median opening; tentacular opening considerable, and the tentacle long and papillose. Tooth-papillæ small, crowded, especially inferiorly, in a narrow blunt ovoid space. Teeth. Genital slits large and reaching mouth-shields; genital scale in contact with slender genital plate, broad, pointed orally and arched, shorter than the plate. First lower arm-plate small, second as long as broad, flat, re-enteringly curved adorally, with an aboral convexity. Sides slightly incurved. The sixth plate is broader than long, flat, almost rectangular, with a slight outward curve at the sides; further out, the plates have the aboral margin incurved, and towards the tip of the arm the shape is preserved, but there is a projection from the adoral edge towards the next or adoral plate. Upper arm-plates broader than long, convex at the outer margin, and concave and overlapped adorally, broadest at the outer margin. Arms high in section and arched. Side arm-plates large and flap-like, adding much to the under arm. A tentacle-scale. Tentacles long, sharply papillose. Spines glassy, nine near the disk, then seven, and six, which is the usual number, not counting the hook which begins at the fifth joint. The three lowest spines next to the trifid hook are short and small, the next and the following are long, very broadly oar-shaped at the tip, serrate, and with a crowd of long terminal spinules, especially on one side (fig. 37); all are compressed. The uppermost spine is shorter than the next and is a needle. The longer spines are much longer than the breadth of an upper arm-plate. Diameter of disk 8 millim.; length of arm 50 millim., 1 to 6·25. Colour of disk above dark purple with light tints, the white stumps giving a frosted appearance. Upper arm-plates each banded with white along the aboral edge and with a longitudinal white stripe; ground-tint a smalt-purple, and lines of it interfere with the continuity of the white mark at the edge of the plates. Under surface of the disk white, with an occasional splash of purple in

the interbrachial areas and on the mouth-shields. Lower arm-plates white, with a small patch or line of purple on either side of the median line. Every four or five plates with more colour than the others, giving a banded appearance to the naked eye.

Locality. Elphinstone Island.

Ophiothrix variabilis, sp. nov. (Plate IX. figs. 18, 19; Plate XI. figs. 32–36.)

The disk is either circular or slightly pentagonal in outline, large, tumid above, covered with a skin (sometimes crumpling when dry) with very small scales, each bearing a short, stout, cylindrical, but slightly tapering stump having a crown of very small thorns, three to six (usually four) in number. About six rows of these scales with stumps in the interradial areas, and a crowd in the centre of the disk and at the margin in the interradia. Between the radial shields three rows of stumped scales. Radial shields large, longer than broad, projecting much over the arm, naked, granular, and with a few very low rounded knobs, especially towards the outer end.

Below, the disk has a skin in the interbrachial spaces extending to the adoral genital plates, which are attached to the mouth-shields aborally, covered with minute scales and rather crowded with slenderer stumps than above, and with one thorn only; they diminish in numbers towards the mouth-shield.

Genital plate in contact with the underpart of the radial shield aborally, and also articulating with a large, broad, wavy-edged genital scale. Mouth-shields small, broader than long, somewhat angular adorally or trilobed there. Side mouth-shields small, largest at the outer sides, narrow, and separated adorally to the mouth-shield, and not extending beyond the level of the long diameter of the mouth-shield aborally. Jaw-angles short, broad, separated by a considerable space, with a large tentacular area. Jaw-plate large, projecting slightly downwards, with 26 or more tooth-papillæ, the two highest being like a divided tooth, the rest large and long, except those placed near the lower margin of the plate, which is rather truncated. Teeth four.

Lower arm-plates narrow and grooved within the disk, square a little further out, then longer than broad, the length gradually increasing towards the tip of the arm. At a short distance from the disk they are slightly incurved at the aboral edge and curved, convexity adorally; the sides nearly straight or slightly incurved,

broadest near the adoral edge; either connected by skin or not, and then very closely placed.

Upper arm-plates arched from side to side slightly, broad, broader than long considerably, short, broadest without and curved at the aboral edge, near the disk, or slightly trilobed. Inner edge nearly straight or curved when the plates, as they often do, become elliptical; sometimes the sides are narrow and rounded off. Here and there a plate is split, but this condition may not occur in some arms. Side arm-plates flap-like, broad below, and not reaching over the upper arm until very far out. A small jagged tentacle-scale; tentacles large and long, crowded with whorls of papillæ. Spines, when the ectoderm is removed, glassy with large bases, hollow. At the emergence of the arms from the disk there are from seven to nine spines; further out there are six and usually five spines, the lowest being a double- or triple-fanged hook, with some minute spinules on the reverse side, which commences about the 12th joint or earlier, and then it assumes a more spiny form. The next spine is small, short, slightly compressed and very slightly spinulose; the next is longer and stouter, blunt at the top, compressed and oar-shaped at the end, where the spinules are small and crowded; serration but slight on the edges of the compressed spine, and foramina numerous. The second spine from above is the largest, longest and broadest at the end, minutely spinulose at the top, and slightly so for some distance down the shaft and then slightly serrate; perforations or foramina in several irregular rows. The blunt broad-tipped spines with their comparatively small spinules are distinctive. The first (upper) spine may be a small one and resemble the others, or it may be longer and a plain hollow needle.

Length of arms 12–14 times the diameter of the disk, which has a diameter of 13·5 millim. Colour of the disk dull purple, rather blue in tint, with a red tinge at the centre; radial shields lighter and with white background, splashed broadly with purple, low stumps and the others also whitish. Beneath, the disk is white with slight purple stains on the mouth-shields; interbrachial skin dark. Upper arm-plates purple or slate-colour, every fourth or fifth plate of a darker colour, and hence a banded appearance is given. Rarely a narrow stripe of the same colour, but of a darker tint. Lower arm-plates white within the disk, or with faint purple splashes, further out with a purple border more or less entire, with lines and dots of the same colour on a white ground. In-

tensity of colour varies in different individuals, and usually there is a banded appearance from the colour being lighter on consecutive plates. The spines are often slightly splashed with light purple.

Upper arm surface midway is 2 millim. across, and the length of the longest spine is a millimetre more.

Localities. Elphinstone Island, King Island, Owen Island.

Variety 1. Same dimensions as the type, hooks at the 10th joint. Upper arm-plates near the disk with the median aboral projection, sometimes a white line along part of the length in some plates.

Variety 2. General splitting of the upper arm-plates, near the disk, in some arms; upper arm-plates entire far out.

Variety 3. No splitting of the upper arm-plates, stumps extending in a close multitude below to the mouth-shield.

Variety 4. Stumps on the first upper arm-plate.

Genus Ophiocampsis, gen. nov.

Disk and large close radial shields covered with skin carrying a few thorned stumps. Ends of radial shields and the long knobs of the genital plates on the top of the arm; genital scale shorter, broad and large, with a curved border. Below, the disk has a plain skin carrying large, separate, irregular scales each with a thorny stump, crowded and large at the tumid interbrachial space and ceasing near the mouth-shield. Teeth, tooth-papillæ, no mouth-papillæ, and no tentacle-scales to the arms. Tentacles large, long, and papillose, coming out from the lower part of the arm. No upper arm-plates. A minutely squamous skin covers the broad, arched upper surface of the arm, and part of the sides of the arm and also the bases of the projecting flap-like side arm-plates. Spines long, slender, spinulose, glassy, seven to five in number, the lowest being a hook. Lower arm-plates narrow orally and aborally, widest in the midst, and with a projection at the sides. Arms about ten times the length of the diameter of the disk, rounded above and at the sides and rather flat below, can assume a vertical bending. Arm-bones with large umbo and without a median articulating peg.

Ophiocampsis pellicula, sp. nov. (Plate IX. figs. 20, 21; Plate XI. fig. 40.)

The disk is pentagonal, the scales at the margin are stout,

small, and white. The mouth-shields are broader than long, almost semicircular in their oral curve and more angular without. Side mouth-shields large at the side and narrow, and not always meeting orally. Jaw-angles short, much separated aborally, and having large tentacular openings and very large papillose tentacles. Teeth three in number. The tooth-papillæ are in a short oval, and the jaw-plate is very distinct. About ten to twelve rather large tooth-papillæ surround a line of from five to seven small papillæ, and the highest papillæ are like a true tooth split down the middle, and are therefore two in number. Strong second genital scales in contact with the aboral edge of the mouth-shields. Lower arm-plates feeble and thin, separated by some skin, longer than broad, narrow and slightly incurved orally and aborally, and broadest in their middle part near the disk; but further out the greatest breadth is near the aboral edge. A projection from each side, often bifurcate, causes the above-mentioned breadth and separates the consecutive tentacle-openings. Side arm-plates large, composing most of the arm, flap-like and very projecting; tentacle-openings close to the lower arm-plates, and opening below and not at the side of the arm. Seven glassy, slender, and hollow spines near the disk and far out, near the end five spines occur. The lowest spine, at a short distance from the disk, is a compressed, glassy, four- or five-pronged hook. The next three spines are on the under surface of the arm, and are longer than the hook, compressed and spinulose on both sides; the next spine is long, blunt, compressed, and has spinules near the top, some being hooked and a few on the shaft. Upper spine a needle either long or short, hollow. Longest spines longer than the breadth of the upper arm, this is 2 millim., and the spines may be 2·5 millim. The minutely squamous skin of the upper arm is coloured with wide bands of light and dark purple dots. Arm-bones formed to a certain extent after the type of *Ophiothrix*, but presenting a tall umbo and no median peg *. No upper arm-plates, and there is some nodulation far out in the arm at the joints. Colour of the disk brown, with a dot or two of purple at the ends of the radial shields and on the mouth-shields, lower scaling of disk opaque white. Diameter of disk 7 to 8 millim.; length of arm 60 to 80 millim.

Locality. King Island.

* See p. 117 in the next communication.

Genus Ophiocnemis, *Müll. & Trosch., Syst. Aster.* 1842, p. 87; *Lyman, 'Challenger' Report*, p. 228.

Ophiocnemis marmorata, *Lmk.*, sp., *Müll. & Trosch. op. cit.* p. 87.

The genus *Ophiocnemis* was insufficiently diagnosed by Müller and Troschel, and the amended definition of Lyman appears to be excellent with a doubtful exception. The lower part of the interbrachia is quite naked according to the first-mentioned authors, and scaled according to Lyman. In a specimen of *O. marmorata* from the Mergui Archipelago the skin is certainly naked and plain. The anatomy of the arms given by Lyman is as remarkable as correct, and the specimen I have examined has the peculiar characters given on Lyman's plate xlii. fig. 15.

There is no drawing of *Ophiocnemis marmorata*, Müll. and Trosch., and their definition is very short. I have therefore considered the diagnosis and allowed for the variation of such forms, and venture to suggest some few alterations.

The nodular stumps on the skin between the radial shields are not on visible scales, and they crowd the interbrachial margin, some being on the outer edge of the radial shields. They also crowd in the centre of the disk. Skin plain below. Generative scale large, broad, and arched below where free. A forked genital process on the aboral side of the mouth-shield. Side mouth-shields placed orally to the long diameter (from side to side) of the mouth-shields. First lower arm-plate very small. Beyond the disk the lower arm-plates are broader than long, incurved orally and aborally, longest at the sides, and slightly incurved there. They increase in length towards the tip. Upper arm-plates much broader than long, at least four times as broad as long, arched and semi-keeled near the end of the arm, edges within and without either slightly curved or straight. Tentacular opening well at the side of the arm in mid-arm; a very small tentacle-scale on the edge of the side arm-plate. Usually four spines, small, cylindro-conical, not sharp, striated, and not hollow, only less dense in the centre, banded with colour; dull white, opaque, and microscopically spinulose. The first becomes a glassy bifid hook at mid-arm; the fourth varies in size, and the third from the lower arm is the largest. Diameter of disk 13 millim.; length of arm 70 millim. Colour in alcohol generally brownish green with splashes of white, and dots, lines, and splashes of dark

green. Radial shields with white spots and lines. An indefinite ringing on the arms above.

Locality. Mergui. The species has been found at Ceylon, Zanzibar, and N. Australia (?).

A young form (diameter of disk 5 millim., arms 15 millim.) has the nodules on the skin of the disk well developed in the interradial areas, and there are stumps at the edge of the interbrachium where the skin below commences. There is some minute scaling at the centre of the disk, and the nodules are well seen. The upper arm-plate is arched from side to side, but the length is greater than the breadth. The hooks commence near the disk.

Localities. Elphinstone Island and Sullivan Island, 4 fathoms; King Island.

IV. *Remarks on the Species.*

The presence of *Ophiolepis cincta* was to be expected on account of the great range of the species, and the specimens show all the well-known characters of the beautiful form. The other species of *Ophiolepis*, *O. nodosa*, is new, and is a very remarkable and distinct form. Unfortunately only one specimen was found, but it was well preserved. Accessory scales and plates are in excess in this nodule-covered, bloated-looking species, for there is an unusual plate placed orally to the mouth-shields, and, besides extra mouth-papillæ, there is an accessory plate extending from the side arm-plates to the lower arm-plates transversely, and separating the consecutive tentacle-openings. This last character is seen in that extraordinary form *Astrophiura permira*, Sladen, as well as in *Ophiolepis elegans*, Lyman. The great nodules on the upper arm-plates and the cribriform texture of many, but not all, of the plates are very remarkable.

Unfortunately the specimens of *Ophioglypha* are all too young for specific determination. The *Amphiura*-like forms, whose marginal rim of scales and internal construction have caused them to be relegated to the genus *Ophiophragmus*, Lym., are very interesting. Many of the specimens are found without their upper disks and genital scales and plates, so that the upper surface of the mouth-shields and interbrachial rims besides the upper part of the jaws and teeth are exposed. Even some of the specimens which have the disk preserved appear to have had some diminution in its size, for one or two of the upper arm-plates close to the edge of the disk as it now exists are wanting. They appear to be deficient in consequence of the disk once having been larger. The position of the genital plates and scales, which

has been noticed in describing the species, is most suggestive, and it is quite possible that the almost vertical direction, instead of the usual horizontal one, assumed by the plates and scales may have been necessary whilst the ovarian sac was filled with ova. Knowing how frequently Ophiurans die after parting with their ova, and how they sometimes suffer from defective amounts of carbonate of lime, I think that it will be worth while for the future to pay attention to the position of the genital plates and scales of Ophiurans which are living under unusual as well as under normal conditions. The anatomical details show that the characters of *Ophiophragmus* and *Amphiura* can be combined; and it is very probable that future research will place the genera closer together, or even decide that the first-named must become a subgenus of the latter. The importance of the differences of the internal construction of the mouth-frames mentioned and excellently illustrated by Lyman (*op. cit.*, 'Challenger' Report, pl. xl. fig. 4) may not be so great as is now considered, especially in view of the structure of the particular organs in *Ophiothrix variabilis*, nob., which will be considered in the next communication.

The new *Ophiocnida* with six arms, four arm-spines, and numerous mouth-papillæ is unfortunately founded upon a solitary specimen. Now that attention has been directed to this species, there is a possibility of larger specimens being obtained; it would be interesting to know whether the sixth limb is always retained.

The *Ophiothrices* are numerous in individuals, and there are some very interesting forms amongst them. Almost all have long arms, stumpy, thorned disks, and purple or sombre tints, and with some of the glassy spines on the arm broad at the top, oar-shaped, hollow, and compressed. In most of the species hooks are seen very near to the disk. In the majority the tentacles are large, long, and covered with whorls of papillæ. There is one species which has given much trouble in classification, for not only are there four fairly marked varieties, but the type has considerable external resemblances to *O. galatea*, Ltk., whilst the internal structures present shapes which remove the forms from the type chosen by Lyman in illustration of the anatomy of the mouth-frames and arms within the disk, namely *O. quinquemaculata*, Müll. & Trosch. ('Challenger' Report, pl. xlii. fig. 5).

The nature of these structural differences will be noticed in the following communication. The species *Ophiocampsis pellicula*, which can bend its arm in a vertical downward plane

and which has no upper arm-plates, being covered on the upper arm with a minutely squamous skin, has very interesting arm-bones; they will be considered and described in the succeeding pages. There is nothing to be added to the knowledge already published regarding the common *Ophiocoma scolopendrina*; but I have added some notes concerning *Ophiocnemis marmorata*.

DESCRIPTION OF THE PLATES.

Plate VIII.

Fig. 1. *Ophiolepis nodosa*, sp. nov. Upper surface, nat. size.
2. Part of the under surface of disk and arm, magnified.
3. Upper arm in part, magnified.
4. *Ophiophragmus affinis*, sp. nov. Upper view, magnified.
5. Part of disk below, magnified.
6. Upper surface of arm and mouth-frame within disk, magnified.
7. *Ophiophragmus difficilis*, sp. nov. Upper view, magnified.
8. Arm and mouth-frames from above, magnified.
9. Disk from below, magnified.
10. *Ophiocnida sexradia*, sp. nov. From above.
11. Part of under surface, magnified.

Plate IX.

12. *Ophiothrix Andersoni*, sp. nov. Upper view.
13. Part of under surface, magnified.
14. *Ophiothrix merguiensis*, sp. nov. Upper surface.
15. Part of the under surface, magnified.
16. *Ophiothrix variegatus*, sp. nov. Upper surface.
17. Part of the lower surface, magnified.
18. *Ophiothrix variabilis*, sp. nov. Upper surface.
19. Part of the lower surface, magnified.
20. *Ophiocampsis pellicula*, sp. nov. Upper surface.
21. Under surface, magnified.

Plate XI.

(For description of the other figures (21–27) on this Plate, see p. 120.)

28. Spine of *Ophiothrix Andersoni*, magnified.
29. Hook, magnified.
30. Disk-stumps, magnified.
31. Spine of *Ophiothrix merguiensis*, magnified.
32. Spine of *Ophiothrix variabilis*, magnified.
33. Section of spine, magnified.
34. Small spine, magnified.
35. Disk-stumps, magnified.
36. Hook, magnified.
37. Spines of *Ophiothrix Andersoni*, magnified.
38. Hook, magnified.
39. Disk-stump, magnified.
40. Spine of *Ophiocampsis pellicula*, magnified.

On some Parts of the Anatomy of *Ophiothrix variabilis*, Dunc., and *Ophiocampsis pellicula*, Dunc., based on materials furnished by the Trustees of the Indian Museum, Calcutta.

By Prof. P. Martin Duncan, M.B. Lond., F.R.S., F.L.S.

[Read 3rd June, 1886.]

(Plates X. & XI. figs. 21–27.)

Contents.—I. Distinctions between *Ophiothrix variabilis* and Lyman's type, *O. quinquemaculata*, Müll. & Trosch.—II. Mouth-frames; Jaw-plates; Teeth and Tooth-papillæ; Muscles.—III. Radial Shields; Genital Plates, Scales, and Muscles.—IV. Structure of the Arm-bones.—V. Special and general Remarks upon the Muscles.—VI. The Arm-bones of *Ophiocampsis*.—VII. Description of Plates.

I. *Distinctions between* Ophiothrix variabilis, *Dunc., and Lyman's type,* O. quinquemaculata, *Müll. & Trosch.*

The structures of the upper surface of the arms within the disk, the genital plates and scales, the mouth-frames and the dental apparatus, which are seen after clearing out the inside of the disk, are exceedingly interesting in *Ophiothrix variabilis* (Plate X. fig. 1), and it is evident that they differ somewhat from those of the species *O. quinquemaculata*, Müll. & Trosch., which was chosen by Lyman as his type of *Ophiothrix* (see Lyman's excellent figures, 'Challenger' Report, pl. xlii. figs. 5–8). In *O. variabilis* there are six arm-bones between the conjoined mouth-frames and the nodular heads of the genital plates, whilst in Lyman's type there are only four. In this type the upper parts of the first and second arm-bones are not very wide, but the corresponding parts of the first and second arm-bones of the Mergui form are wide; moreover, when the arms are straight the genital plates of the new form only reach inwards to the level of the second, or the interval between the second and third arm-bones, and not to the first arm-bone as in Lyman's type. When the arm is bent sideways and fixed so, after becoming dry, the genital plate of the inwardly curved side of the arm of course reaches further adorally in *O. variabilis*. The length of the genital plates of both forms is much the same, but the greater number of arm-bones in *O. variabilis*, placed adorally to the outer and more or less fixed part of the plates, permits of greater sideways-bending movements of the arms. The shape of the upper parts of the arm-bones is very similar in both species; perhaps the first plate is the larger in the

Mergui form, fig. 1, and it is Ophiothrician. The shape of the genital plates and scales is slightly different. There is a peristomial plate in Lyman's type, but not in *O. variabilis*.

II. *Mouth-frames, and Muscles*; *Jaw-plates*; *Teeth and Tooth-papillæ, and their Muscles.*

The aboral edge of the conjoined mouth-frames, seen from above, is broad, and their union is by a stout, upward projecting, long nodule (Pl. X. fig. 1). The edges of the mouth-frames on either side of the mouth-slit are upwards projecting and crescentic in their outline; but the arch formed at the mouth-slit is imperfect, there being a small outer indentation at the median line which gives, with the outlines of the brachial edges of the mouth-frames, a trefoil shape to the brachial extension of the mouth. The incurving close to the junction of the mouth-frames at the median line of the brachial region is small.

The width of the brachial area of the region of the mouth is limited by the comparatively radial direction of the jaws, and this direction evidently has some connection with the size of the space between the interbrachial edges of the mouth-frames in each interbrachial space. These opposed edges are long from within outwards, and slightly curved, and they are united by the fibres of the interradialis aboralis muscle. The mouth-frames much resemble those of *Ophiophragmus* as figured by Lyman in the 'Challenger' Report, plate xl. fig. 4.

It is evident that the distance between the interbrachial edges, and therefore between adjacent mouth-frames, can be increased or diminished by the action of the muscular fibres, and the distance does vary in the dead specimen. When the edges are far apart, the obliquity of the jaws from the radial direction is greater than when the edges are closer; when that is the case, the direction of the jaws is more radial. The jaws are rather long, and there is the usual well-marked depression for the vessels and nerves.

It will be noticed in the description of the underpart of the disk of the species (p. 99) that the side mouth-shields are not united together orally to the mouth-shields, and that a skin intervenes; moreover the separation along the median line of every jaw-angle is considerable. Hence there is a space which extends from the neighbourhood of the jaw-plate outwards between the side mouth-shields to the adoral edge of the mouth-shield. The skin of this

space is overlain, in the proper position of the animal, by a very thin muscular layer belonging to the interradialis aboralis, and the fibres are attached to the sides of the slit between the jaws, between the separated side mouth-shields, and between these last and the adoral edge of the mouth-shield.

Considering these lower and superficial muscular fibres as acting in combination with the stouter and higher ones of the interradialis, it follows that contraction or expansion of the interbrachial spaces can occur, aborally, to the jaws. The contraction, or the opposite condition, would increase or diminish, as the case might be, the radial direction of the jaws in relation to the jaw-plate, and would push this last inwards or the reverse. The movement of the jaws on the jaw-plate, however slight it might be, would influence the muscles which traverse the jaw-plate and are fixed on the outer or basal part of the teeth (Pl. X. fig. 3), as well as those which unite the approximated adoral ends of the mouth-frames—that is to say, the interradiales adorales superiores and inferiores.

Probably expansion or relaxation of the interbrachial muscles would produce an opposite condition of the tooth-muscles. During expansion, on account of the increased obliquity of the jaws in relation to the jaw-plates, the mouth-opening would slightly enlarge and the muscles of the teeth would be tightened, and the teeth would assume the horizontal position. With contraction there would be diminution of the space around the mouth, narrowing of the interbrachial areas, and relaxation of the tooth-muscles, accompanied by diminution of the size of the mouth.

The possible nature of these movements may be gleaned from the following details of the jaw-plates, teeth, and muscles.

The jaw-plate (torus angularis) is tall, broad and thin (fig. 2), and it projects slightly beyond the line of the sides of the jaws as well as above them and considerably below. It is a very distinct structure in this species, and it is broadest and most projecting inferiorly and rounded there, thence it slopes at the sides upwards and gradually diminishes in breadth as far as the spot where the true teeth commence. The upper part of the plate which gives attachment to the teeth is not as broad as the inferior portion, but it is rounded off above where it is free.

The oral surface of the plate is covered on the lower half by the 20 or 21 tooth-papillæ, and the upper half carries the four teeth.

When the papillæ and teeth are removed, a number of rather

regularly placed, elongate or circular, low projections become visible on the broad inferior portion of the plate; and on the upper part four vertical double rows of foramina. The double rows are separated by low horizontal ridges, and a median low ridge is placed vertically along the median line so as to separate the foramina into two lateral series. The foramina are large and pass quite through the jaw-plate (figs. 2 & 3).

The slightly expanded bases of the tooth-papillæ (fig. 4) cover the low projections, but the base of a tooth covers two of the horizontally placed foramina besides some of the surface of the ridges just above and below them (figs. 2, 3, 6). The outer, or rather the side, tooth-papillæ are usually with elongate bases, and are placed on correspondingly shaped projections which are more or less oblique, and the papillæ which are along the median line of the plate are upon wider apart and circular low knobs. The papillæ (fig. 4) have their bases hollowed out so as to fit the projections, and connective tissue unites them with the plate around the edges of the projections. The highest papillæ are two in number, and resemble a true tooth divided along the median line and with an incurved free edge (fig. 5). But there are really two papillæ, and their bases are wide and elliptical in shape; moreover each has a pair of depressions in the base, and the union with the jaw-plate is by connective tissue only along a wide space (fig. 2). No muscular structures are found connected with the tooth-papillæ.

The four teeth are long, broad and thick at the base. They are composed of opaque carbonate of lime except at their free, sharp, yet broad, edge, where the mineral is semitransparent (fig. 6). On separating the teeth from the jaw-plate, it will be observed that their bases are elliptical and broad as well as hollowed-out. There is a double hollowing, and each hollow corresponds with a foramen in the jaw-plate (fig. 2). The upper and lower edges of the bases rest on the ridges between the pairs of foramina.

A small muscle passes out of each foramen and is inserted at the hollow of the base of a tooth, so that a tooth has two muscles, one on each side of the median line, and the direction of the muscles is rather oblique (figs. 3 (*c*), 7).

It may be noticed in some specimens that the side rows of tooth-papillæ are close to their neighbours of the next plates, and that on turning the animal on its back a very decided funnel-

shaped space exists leading to the two large papillæ which come next to the true teeth. It is evident that whilst the two papillæ just noticed can come in contact by their free edges with those of the opposite jaw-plates, none of the other papillæ can ever touch their opposite and similar structures.

The tooth-papillæ do not therefore form any part of what has been inelegantly termed a "chewing-apparatus."

On removing the jaw-plate from the mouth-frames the adoral surfaces of the jaws are seen side by side (fig. 8). Each jaw surface is tall from below upwards, narrow from side to side, hollow along the median line inferiorly, and with four irregular depressions in the upper part.

The four depressions correspond to the four foramina of one side of the jaw-plate, and the long hollow with the aboral surface of the jaw-plate on one side of the median line. The depressions give attachment to the muscles which pass through the foramina of the plate and are attached to the bases of the teeth (fig. 3). The long hollow below is for connective tissue which unites the converging jaw-ends and also the jaw-plates, and the groove of the hollow is completed by the approximation of the jaws. But there are about seven minute hollows or pits on the interradial side of each jaw, close to the projecting part which is in contact with the jaw-plate, and as many minute grooves pass from them over the edge and reach the long hollow. They appear to have no connection with the seven side tooth-papillæ, and they give attachment to muscular fibres (interradiales adorales inferiores) and connective tissue which bind the side of the jaw-plate to the jaw. It is possible that slight sliding movements of the jaw-plate upon the jaw-ends are thus rendered possible. It is evident that the duty of the muscles (interradiales adorales superiores) which pass through the foramina is to make the teeth stick out from the jaw-plate perpendicularly to it, and allow them to move slightly upwards or downwards at their free edge during the period when contraction does not occur. Chewing is, however, not possible, but the process of filtering occurs.

III. *The Radial Shields, Genital Plates, Scales, and Muscles.*

The aboral end of the radial shield is rather narrow, is slightly separated from that of the other shield, and projects over an aboral ridge of the genital plate, and both are placed well over the

upper surface of the arm. On turning the radial shield up and separating it from the head of the genital plate, the following structures are seen (Pl. X. fig. 9). Close to the aboral edge is a short curved, transverse space which gives attachment to a rather broad, thin muscle (*r*), which passes downwards and is inserted into a corresponding space on the aboral and upper end of the genital plate (fig. 11, *r*). This extensor muscle passes aborally to a downward projection of the radial shield, and also to the globose head of the genital plate, and it is covered with thin skin (figs. 10, 11). Adorally to this space, on the under surface of the radial shield, is a downward projection resembling a slightly flattened hemisphere. Its lower, slightly flattened, and more or less curved surface articulates with the globiform head of the genital plate below (figs. 11, 13). Situated adorally to the projection on the under surface of the radial shield, and separated from it by a narrow transverse space, is a fan-shaped muscular attachment (fig. 9, *am*), the arch of the space being placed orally, and the chord of the arc being transverse and bounding the narrow transverse space for the perihæmal canal adorally. The muscular marking is large and the fibres pass downwards and slightly aborally, form a stout little mass, and again expand and are inserted into an expansion on the upper surface of a genital plate (figs. 9, 11, 13, *am*). This adductor muscle is very distinct, and is evidently capable of considerable extension during the contraction of the extensor, and of corresponding contraction when in positive action.

There is a very thin slip of fibres, which seems to be muscular, passing from the outer edge of the radial shield below, and on a line with the origin of the adductor, to the radial-shield side of the broad genital scale (fig. 12, *m*).

On removing the radial shield and looking downwards upon the upper surface of the arm, the genital plate is seen with the scale attached to the side remote from the arm. The genital plate is moderately long, longer than the scale (*gs*), but much narrower (figs. 12–15). It has a head not very unlike that of a human thigh-bone, continuous with a shaft by a broad neck, and at the interbrachial side of the neck is a nodular surface which has a little gibbosity for the articulation of the genital scale (figs. 13–15). Aborally to the nodular part, and extending beyond and below the head, is an expansion which ends aborally in the ridge already noticed as giving insertion to the extensor muscle (figs. 11, 12, 15). Situated orally to the head on the upper surface of the genital plate is a

raised, irregularly triangular surface (fig. 13), corresponding in size to the fan-shaped muscular impression on the underpart of the radial shield (figs. 9, 11). It is for the insertion of the adductor muscle (*am*). Orally to this muscular insertion the genital plate narrows, is sharply rounded, and ends in a blunt point. A transverse section of the genital plate made orally to the triangular surface is not circular in outline, although the plate seems to be cylindrical when seen from above ; it is more or less a bent curve in outline (fig. 15), and the outer surface, which looks towards the genital slit, is rounded and large, whilst the inner surface, which is in contact with the side of the arm, is not so large and is concave. Seen from below, the genital plate shows a furrow and the projection at the side of the raised part for the insertion of the adductor, a rather narrow rod-like oral end, and a decided enlargement aborally, the aboral edge being below the insertion of the retractor (fig. 14). A side view shows foramina close to the neck, the globose head, the projecting aboral ridge, the nodule for articulation with the scale, and a foramen on the shaft (fig. 15).

The genital scale (fig. 13) is long, wide, irregularly triangular, and boldly curved at its free interbrachial edge. The process for the junction or, rather, articulation with the genital plate is small, and has a slight concavity on its side towards the genital plate's convex projection (or there may be an indefinite nodule). The articulation is by an indefinite arrangement not worthy of the name of ball-and-socket, but belonging to that category. The free brachial edge of the genital scale, which extends from the projection to the oral end of the scale, is nearly straight, long, and thin. This edge bounds the genital slit on the interbrachial side. There is some part of the edge of the scale free, but most of the upper surface is covered by the derm of the disk and is only seen after dissection. The specimen which showed these details has a trace of a slip, apparently muscular (fig. 13), which arises on the genital plate close to the neck, and from the trochanter-like side projection close to the head ; it passes between the raised surface for the adductor and the projection for articulation with the genital scale and is inserted along the brachial edge of the scale just orally to the projection for articulation. The slip is very thin, and crosses over the outer end of the genital slit to reach the edge of the genital scale.

It is perfectly evident that the genital plate may have its position altered by the arm being depressed or elevated as much as is possible, and that the plate may be parallel with the arm, or may form a wide angle with it. The genital plate being on the side, and over the arm, may have the adductor relaxed so as to allow the radial plate and the dome of the disk to rise. It appears that under these circumstances the relative positions of the plate and scale alter, and that there must be a considerable movement of the scale on the pivot of the brachial projection.

A few small overlapping scales are placed on the interradial edge of the genital slits between the oral termination of the genital scale and a process which is in contact with the aboral edge of the mouth-shield. These processes appear, on a superficial examination, to be parts of the mouth-shields passing outwards in the interradial spaces, and limiting, orally, the derm of the underpart of the disk. Lyman has shown that they are really only closely attached to the mouth-shields with connective tissue, and maceration separates them. Each of these processes is double and each touches its fellow at the median line; they are broadly attached to the aboral edge of the mouth-shield and are collar-shaped. At the median line aborally their edges diverge, sloping outward and then towards the arm, and reaching the genital slit. The derm is attached to the edges of these processes, which are properly genital scales, instead of to the aboral edge of the mouth-shields.

IV. *The Structure of the Arm-bones.*

These are formed generally after the type of the Ophiothricidæ, as described and figured in Lyman's 'Challenger' Report on the Ophiuroidea (pl. xlii. figs. 5–8).

There are, however, some points of difference. On the aboral surface of an arm-bone (Pl. X. fig. 16) the cavity for the reception of the umbo of the opposed bone is large, and below it is a prominent ridge which passes downwards, in the median line, to the peg. The projection in the median line may be narrow or considerably swollen; and in either case the peg at the lower end is broad, projects aborally, and has a transparent, long and rather narrow articulating surface on each flank (Pl. X. figs. 16, 17; Pl. XI. figs. 21, 22). The surfaces project so much as to give the appearance of two lateral pegs; but that is not the case,

for there is but one, and it is concave at its lower part between the lateral articulating surfaces. Indeed, the breadth of the peg is very striking, as is also its amount of aboral projection. The expansion on either side of the ridge is considerable; and in some bones there is a swelling almost knob-like at the outer side of the usual socket for the knob of the next bone (Pl. X. figs. 16, 17, *k*). The adoral surface of a bone, corresponding to the aboral surface just noticed, has a broad, bluntly triangular projecting umbo (*u*) beneath the slot-shaped surface of the apophysis (Pl. X. figs. 18, 19). Below the umbo is a considerable depression for the median ridge of the opposed aboral surface, and the side continuation and its enlargements. The knobs (*k*) are large and project, and the cavity between them, and which merges below into the inferior notch, and which is for the reception of the broad peg, is rather large. The inferior notch is tall and wide. The apophysis is bent forwards above and is convex below. The upper muscle-fields of both surfaces are large, that of the aboral predominating, and the lower fields are, as is usual, small and oblique.

V. *Special and General Remarks upon the Muscles.*

Some of the muscles of *Ophiothrix variabilis* have already been noticed in the description of the specimens, but it is necessary to consider others and to refer slightly to all. It is evident that the muscular development and distribution is not similar in all Ophiuridæ. Simroth has given the muscles of *Ophiactis virens* his careful attention, and his descriptions are very valuable ("Anat. und Schiz. der *Ophiactis virens*, Sars," Zeitschr. f. wiss. Zool. Bd. xxvii. p. 417, 1876).

The muscles of the teeth ("interradiales adorales superiores"), according to Simroth's type, arise from the upper part of the adoral edge of the adjoining mouth-frames external to the jaw-plate or torus. There is one muscle to a tooth, and it may have a double insertion into the base of the tooth, there being two horizontal foramina in the jaw-plate at the base of the tooth, or a single one, the double foramen then being absent and represented by a slit.

In *Ophiothrix variabilis*, however, there are four and sometimes five depressions, diminishing in size from above downwards, in the substance of the adoral vertical edge of each mouth-frame (Pl. X. fig. 8); and consequently, when the two mouth-frames are combined, there is a double series of cavities placed side by side. A

muscle arises in each of the depressions (fig. 8, *c*), and the fibres pass adorally through the foramen in the jaw-plate, which is internal to them, and are attached to one side of the hollowed-out base of a tooth (figs. 3, 6, 7). The muscles are radial in direction, and there are two of them to each tooth, and eight in all. They are evidently the interradiales adorales superiores; and their action, by becoming tense and contracting, would be to fix the teeth tightly on the jaw-plate, so that they could project horizontally. On the other hand, as the muscles become lax, the bases of the teeth would be less tightly in contact with the jaw-plate, and some movement, up and down, of the free edge of the teeth would be possible. A muscle attaches the outside edges of the jaw-plate, on the brachial as well as the interbrachial sides, to the vertical processes (jaws) or adoral ends of the mouth-frames in the lower half; it arises from the oblique grooves near the edge, and is inserted on the edge of the jaw-plate. There are, according to Simroth, muscles between the vertical broad groove, formed by the union of the adoral surfaces of the jaws (fig. 8), and the aboral surface of the jaw-plate, and it is possible that they exist in *Ophiothrix variabilis*, but I have not verified the fact; at the same time there is connective tissue in the vertical groove uniting the conjoined skeletal parts.

The "interradiales aborales" (Pl. X. fig. 1, *mi*) are the largest and most important muscles of the mouth-frame regions; the fibres are not radial in direction, but conform in direction to the circle formed by the adjacent mouth-frames. The fibres arise on the interradial flank of one, and are inserted into the flank of the opposite mouth-frame, that is, on the other side of the interbrachial space. The greater part of the flanks is covered, and the fibres extend below to between the unjoined edges of the side mouth-shields, and touch the adoral edge of the mouth-shield at the median line.

I have not found any muscular fibres in the space between the brachial flanks of the mouth-frames, such as the "radiales" of Simroth, although their existence is evident in *Ophiactis*.

It is not necessary to do more than mention the existence of the adductor and retractor muscles of the genital plate and radial shield, since they have already been described. They are not mentioned by Simroth as occurring in his type. Lyman gives some excellent drawings of the adductores, but does not mention the retractor, which is, however, very visible in some

forms. Ludwig appears to be the only describer of retractores, of which he gives a very diagrammatic view.

The little slips of fibres, possibly muscular, which connect the genital scale with the genital plate and the radial shield are formed of very delicate fibres which differ materially from those of the adductores for instance, but neither set is striated. It will be interesting to seek these unimportant slips in other species of *Ophiothrix*. (I have not found them in the British species.)

The muscles of the upper and lower fields of the arm-bones are large, and are readily seen in broken-across joints. There is a good deal of connective tissue, more or less fibrous, extending from the adoral to the aboral surfaces of opposed bones; and it is attached at the edges of the median projection and of the lateral continuation of the aboral surface, and to the edges of the umbo and median edges of the muscle-fields in the adoral surface.

Besides this tissue two sets of muscles are visible in well-preserved specimens. One set is a single stout fibre on either side of the ridge leading down to the peg, and it arises above and a little external to the socket for the knob of the adoral bone (Pl. X. fig. 16, *m*). Its direction is almost from within outwards, and it is attached to the side of the depression below the umbo.

The other set of muscles arise from the sides of the convex aboral surface of the apophysis, and they pass on either side to be attached to the edges of the upper muscle-field on the side of the adoral surface. The fibres are numerous, and there appear to be two sets of them, one being higher up than the other (Pl. XI. figs. 25, 26, 27). They appear to be necessary in order to restrain the lateral dislocation of the apophysis. They occur in all the Mergui Ophiothrices.

VI. *The Arm-bones of* Ophiocampsis pellicula, *Dunc.*

The absence of upper arm-plates and the ability of the arms to curl downwards would imply that the arm-bones could not be made exactly upon the Ophiothrician type. The opposed surfaces of the arm-bones are remarkable; and the first thing that strikes the eye is the enormous upper muscle-area on the aboral surface of the arm-bones (Pl. XI. fig. 23). The lower area is decidedly small, and the tentacle-opening is large near the disk and smaller further out. The next point to be observed is the upper and aborally projecting apophysis, which is like that of *Ophiothrix*,

but possibly more inclined than is usual in that genus. The hollow for the reception of the umbo of the opposed arm-bone is deep and long from above downwards, and it occupies all the median line as far down as the upper edge of the notch of the inferior canal. There is no "peg." On either side of the hollow for the umbo is a raised, rounded ridge extending from the apophysis downwards and on either side to reach the outer part of the upper edge of the lower muscle-area. On each rounded ridge is a nodule situated far above the notch for the lower canal (Pl. XI. fig. 23), so that a nodule occurs on either side of the median hollow for the umbo, and it is placed above the origin of the downward projecting roots of the canal-notch. The nodules are slightly elongate and project aborally, and are articulating surfaces. Beyond the nodules, on the side remote from the median line, are slight depressions.

The lower canal is large, and the edges of the lower muscle-area are raised.

On the corresponding adoral surface of an arm-bone (fig. 24), the upper process, or slot for the reception of the apophysis of the adorally placed bone, is large. Below is a long umbo, rounded, broad and projecting in the upper part, narrow and with a median projecting narrow ridge midway, and tumid, broad and projecting at the lowest part, which is at the upper edge of the comparatively small lower canal. This long umbo is therefore most tumid, largest, and most projecting at its upper and lower extremities, and is narrow and less projecting midway.

There are no knobs on this surface, and the only approach to any such articulating process is a pair of indefinite enlargements where the upper edge of the lower muscle-area unites with the descending raised ridge of the sides of the lower canal. But the depressions for the nodules of the opposed aboral surface of the next bone are seen on the sides of the umbo close above its lower enlargement.

The absence of a peg or its analogue, the length of the hollow for the umbo, and the presence of a pair of nodules characterize this species in reference to the aboral surface of the arm-bone. On the other hand, the long umbo and the defective knobs of the adoral surface are just as peculiar *.

The large size of the slot and the obliquity of the apophysis

* The description is taken from joints near the disk; much modification occurs far out in the arm.

would enable great downward bending as well as lateral movement to occur; the long umbo and the corresponding socket would allow of a much greater amount of movement than is usual in *Ophiothrix* for instance, and the nodules on the aboral side would keep the umbo from slipping out.

DESCRIPTION OF THE PLATES.

Plate X.

Fig. 1. The upper part of the arm, four of the six arm-bones, mouth-frames, jaws, and teeth of *Ophiothrix variabilis*, nob. Magnified and partly diagrammatic. *g*, genital plate; *a*, top of arm-bones; *mf*, mouth-frame; *j*, jaw; *mi*, interradialis aboralis muscle of one side of the mouth-frames.

2. Jaw-plate, magnified, adoral surface. Foramina for the muscles, projections for the bases of the tooth-papillæ.

3. Side view of a longitudinal section made, radially, through teeth, jaw-plate, and jaw. *j*, jaw; *jp*, jaw-plate; *c*, depressions in the adoral surface of the jaw for the interradiales adorales muscles, which may be seen passing through the section of the foramina in the jaw-plate to the bases of the teeth, *t*. Diagrammatic and magnified.

4. Side and basal view of a large tooth-papilla. Magnified.

5. Lower surface of the uppermost tooth-papillæ.

6. Upper view of a tooth and of its base. Magnified.

7. The two upper foramina of a jaw-plate, showing muscle-slips coming out, to be inserted in the base of a tooth, one on each side, magnified.

8. Adoral view of combined jaws: *c*, depressions for the muscles. Below are the vertical ridges on either side of the central groove.

9. Under surface of the radial shield, magnified, showing the tuberosity, *t*, the ridge, *r*, for the retractor, and the remains of the adductor, *am*. Magnified.

10. Aboral end of the radial shield and genital plate: *r*, ridge for retractor; *r**, ridge for the same on the genital plate; *g*, head of genital plate, in contact above with the tuberosity of the radial shield; the fibres of the retractor are indicated. Magnified.

11. Side view of radial shield and genital plate. Same letters as before. Magnified.

12. Side view of the aboral end of the radial shield and genital plate, showing the small muscular slip, *m*, to the genital scale, which is not figured. Magnified.

13. Upperside of genital plate and shield: *gs*, genital scale; *ms*, muscle-slip from genital plate to shield; *am*, adductor muscle on its raised attachment. Magnified.

14. Under view of the genital plate, magnified.

15. Genital plate, side view towards the genital scale: *r**, ridge; *p*, nodule for articulation with the scale. Magnified.

Fig. 15*. Transverse section through the genital plate, magnified.

16. The central part of the aboral surface of an arm-bone of *Ophiothrix variabilis* not far from the disk, magnified. The apophysis has a triangular depression at its root for the umbo of the next bone; below is the median ridge ending in a broad double-faced peg. On either side of the ridge is a slender muscle, *m*, and at the side of the muscle remote from the median line the indefinite swelling, *k*.

17. The same view of an aboral surface, further out in the arm; the median ridge is nodular and broad above; the peg is double-faced and broad. The position of the muscle is on the edge of the sockets on the side of the median ridge. Magnified.

18. The aboral surface of the arm-bone opposed to fig. 17: *u*, the umbo, with a descending short part and a wide upper expansion; *k*, the knobs; between them is the arched hollow for the double-faced broad peg of the opposed bone. Magnified.

19. An aboral surface nearer the disk, and corresponding nearly with fig. 16: *s*, the upper part of the apophysis, with a slot or groove for the reception of the aborally placed apophysis; *u*, the large broad umbo, with a hollow below, and the knobs are placed on the side of the hollow for the peg. Magnified.

20. A view of the same from above obliquely downwards, showing the projecting umbo and knobs. The hollow below the umbo is not seen on account of the foreshortening. Magnified.

Plate XI.

Fig. 21. *Ophiothrix variabilis*. The double-faced peg, magnified.

22. The peg projecting, side view, magnified.

23. Arm-bone of *Ophiocampsis pellicula*, aboral surface near the disk: *u d*, the depression along the median line for the long umbo of the adoral surface of the next bone. The knobs are large, and the transverse ridges between the muscle-fields are well developed. Magnified. Diagrammatic.

24. An adoral surface: *u*, the long umbo, with a projecting convex part above the lower notch; depressions for the knobs of the opposed surface on each side of the median umbo, just above the transverse inter-muscle-field ridges. Magnified. Diagrammatic.

25. Part of the aboral surface of an arm-bone of *Ophiothrix variegatus*, magnified, showing muscles attached to the sides of the apophysis, and passing transversely so as to be attached to the inner edge of the upper muscle-field. Magnified.

26. Muscle-fibres attached to the inner edge of the upper notch upon the upper muscle-field, magnified.

27. The apophysis, seen from above obliquely, showing the two layers of muscular fibres on the sides of its convex surface. Magnified.

(For description of figures 28–40 see page 106.)

On the Polyzoa and Hydroida of the Mergui Archipelago collected for the Trustees of the Indian Museum, Calcutta, by Dr. J. Anderson, F.R.S., Superintendent of the Museum.

By the Rev. Thomas Hincks, B.A., F.R.S. (Communicated by Dr. John Anderson, F.R.S., F.L.S.)

[Read 20th January, 1887.]

(Plate XII.)

Dr. Anderson has placed in my hands for examination the Hydroida and Polyzoa which were obtained in the course of his investigations in the Mergui Archipelago. I have already (Annals and Mag. Nat. Hist. for May 1884) given some account of the Polyzoa, and described and figured several new forms. A list of these, with a diagnosis of each, is included in the present report.

A small quantity of material has since been forwarded to me, which has yielded one or two interesting species hitherto undescribed, and it also enables me to extend the range of some well-known forms. Seven additional species have been noticed, which, with the fourteen already recorded, make a total of 21 species of Polyzoa from the Burmese waters.

Six species of Hydroida have been recognized, of which two appear to be undescribed.

The new material is insignificant in amount, and its chief interest centres in a fine mass of *Nellia oculata*, Busk (fortunately preserved in spirit), which proves to be rich in minute forms both of Polyzoa and Hydroida. The following is a list of all the species observed which are not included in my former paper.

Class POLYZOA.

Suborder Cheilostomata.

Family Cellariidæ.

Nellia, *Busk*.

Nellia oculata, *Busk*.

A very large specimen of this species occurs, composed of many clustering shoots, and attached to a seaweed by a dense matted mass of delicate interlacing fibres.

[Torres Strait; Victoria; Gulf of Florida; coast of Arracan; Trincomalee; off Bahia; off Heard Island.

Bathymetrical range. 10 to 550 fathoms ('Challenger' Report).]

Family Bicellariidæ.

Bugulella, *Verrill.*

Zoarium erect, composed of single series of zoœcia, each of them rising from the upper portion of the dorsal surface of the one below it; branches given off from the sides of the cells.

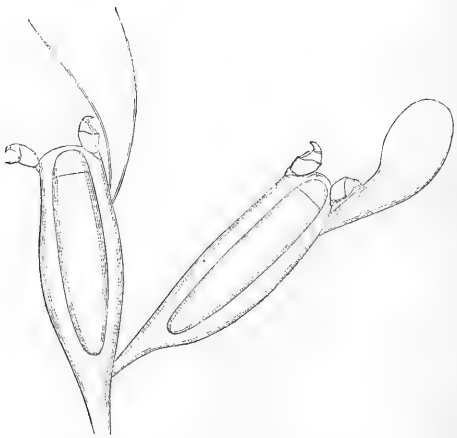
Zoœcia elongate, clavate, much attenuated below; aperture occupying a large proportion of the front. *Avicularia* articulated and capitate.

Bugulella clavata, n. sp. [Woodcut.]

Zoœcia large, elongate, subtruncate at the top, ovate above, tapering off below the aperture; aperture elongate-oval, occupying about two thirds of the length of the cell, destitute of spines, with a membranous covering; orifice semicircular, at the very top of the aperture; a rather small articulated *avicularium* on each side, at the summit of the zoœcium. *Oœcium* (?).

Hab. On *Nellia oculata*, Busk.

I am only able to give a very imperfect account of this species. Two or three small specimens occurred, and several camera-lucida sketches were taken from them. But before I had the opportunity of making a careful study of the characters, the specimens were unfortunately lost. As several sketches were made, all



Bugulella clavata, greatly enlarged.

agreeing substantially, there can be no doubt about the leading characters; and I hope the brief diagnosis given above, in conjunction

with the woodcut, may be sufficient for identification should the species occur again. The specimens were small and immature, and did not enable me to determine with certainty the habit of growth, but it seemed to be eminently simple.

In one or two cases a cell was present on each side of one of the zoœcia in a main shoot (see Woodcut), which was probably the commencement of a branch.

The zoœcium is clavate in figure, elongate-ovate above, and produced below the aperture into a peduncular extension.

It is impossible to determine the systematic position of this form with certainty in the absence of a fuller diagnosis, but it will rank amongst the *Bicellariidæ*, and probably in the genus *Bugulella* of Verrill.

Family Steganoporellidæ.

Thalamoporella, *Hincks* *.

Thalamoporella Smittii, *Hincks*.

Syn. Steganoporella Smittii, *id. History Brit. Mar. Polyzoa*, p. 178, plate xxiv. figs. 5, 6.

Hab. On stone, forming a large spreading crust.

[Coast of Cornwall.]

The Mergui *Thalamoporella* is undoubtedly identical with the Cornish species. It also closely resembles *T. Rozieri*, Audouin, form *indica*, mihi; the two forms only differ in the structure of the avicularium. In *T. Smittii* the mandible is elongate and spatulate; the margin of the beak is elevated on each side in the centre, and bends inwards at this point over the cavity, constricting the aperture and reducing it to a narrow passage. In *T. Rozieri*, form *indica*, the avicularium is comparatively short, rather broad and of about equal width throughout, and rounded above. The essential structure of the *mandible* is the same in both forms. It is composed of two distinct portions—a central piece which is slender, somewhat incurved on each side a little above the base, subacuminate at the upper extremity, and composed of solid chitinous material; this central portion is surrounded by a membranaceous extension or edging, which fills up the space between it and the stony framework of the beak.

* I have proposed this genus for the section of Smitt's *Steganoporella* of which *Thalamoporella Rozieri*, Audouin, sp., may be taken as the type. "Critical Notes on the Polyzoa," Ann. & Mag. Nat. Hist. for February 1887.

In all the other elements of structure the two forms agree; and I am inclined to think that *T. Smittii* (notwithstanding the very distinctive character of the appendage) should rank amongst the varietal forms grouped about the *T. Rozieri* of Audouin*.

The calcareous bar across the cavity of the beak immediately below the mandible, which is a very usual element of avicularian structure, is wanting in *T. Smittii* (as in other cases), and the mandible is simply articulated to a denticular process on each side. The avicularium (which replaces a cell) is developed on a distinct area, extending for some distance below the mandibular portion of the structure.

Family Myriozoidæ (part.), *Smitt.*

Schizoporella, *Hincks.*

Schizoporella spongites, *Smitt*, var. (Plate XII. figs. 7 & 8.)

Zoœcia disposed in lines, moderately convex (sutures shallow), subquadrangular or ovate, destitute of raised boundary-lines; surface reticulate; orifice arched above, the lower margin occupied by a rather deep sinus, broad at the opening and tapering off to a rounded point, a small notch at each side, where the sinus commences; usually a slightly raised border encircling the orifice, which is carried across the front of the cell a little below the sinus; peristome unarmed: a small *avicularium*, with pointed mandible directed upwards, placed obliquely close to one side of the orifice, suberect (occasionally one on each side); commonly a similar *avicularium* towards the base of the cell, pointing downwards. Large spatulate *avicularia*, replacing a cell, distributed over the zoarium, frequent—the mandible much enlarged towards the upper extremity. *Oœcia* ample, covering entirely the front of the cell above them, and encroaching on those at each side, prominent, rounded, rather broader than high, narrowing towards the front, with a very small orifice; surface reticulate.

Hab. Forming a spreading crust, white and silvery, on stone. [Coast of Florida; Mazatlan.]

This form, I believe, is rightly referred to *Schizoporella spon-*

* "Contributions, &c.—II. Foreign *Membraniporina* (continued)," Ann. & Mag. Nat. Hist. 5th ser. vol. vi. p. 380, plate xvi. fig. 1 (1880). In this paper I have described the form *indica* as having a slender pointed mandible, but this description only applies to the more solid central portion of it.

gites, Smitt* and Manzoni, though in several points it differs from the description and figure which these authors have given us. The cells of the latter are more decidedly rectangular, and are separated by conspicuous raised lines. The œcium, though of large size and rounded above, as in the present form, is of great breadth and subtruncate in front (see Smitt's figure 161); whereas that of the Mergui variety narrows off towards the oral extremity, which presents a rounded contour. There is also a striking dissimilarity in the structure of the oral sinus, which in the Mergui variety is small and slit-like, slightly enlarged below, and occupies the centre of the lower margin, which is perfectly straight. The same difference, however, and perhaps in a more marked degree, is met with in the case of *Schizoporella unicornis*, and it can hardly be taken in itself to indicate a specific distinction. In the normal *S. spongites* the zoarium is composed of several layers of cells placed one upon the other, and in the upper stratum at least the zoœcia are very irregularly disposed; they are turned in all directions, and without definite plan. In the only specimen of the present form (a finely developed one) which I have examined, the zoarium consists of a single layer of cells, and the latter are arranged with much regularity in lines. These differences, however, may depend upon age. The large scattered avicularia differ somewhat in shape in the two forms, that of the Mergui variety being broadly spatulate.

Family Selenariidæ, *Busk*.

Cupularia, *Lamouroux*.

Cupularia umbellata, *Defrance*†. (*Smitt*; *Manzoni*.)

A considerable number of specimens occur in Dr. Anderson's collection of a species of *Cupularia*, which I believe to be identical with the above. In its perfect condition the front of the cells is covered with a semiopaque membranous investment, which carries the orifice and opercular valve. In a specimen from which this

* 'Floridan Bryozoa,' part ii. p. 42, pl. viii. figs. 161–163. Smitt identifies his Floridan species with *Eschara spongites* of Pallas and Moll, but this identification must, I think, be accounted doubtful. Moll's figure seems to represent a form of *S. unicornis*, Johnston, which is at once distinguishable from *S. spongites* by the characters of the œcium and the presence of the large spatulate avicularia.

† This form clearly belongs to the *Steganoporellidan* series, and must be transferred to it.

outer wall (ectocyst) has been removed, the cells in the centre of the colony, and in a zone extending for a short distance round it, are furnished with an internal calcareous lamina, more or less complete and perforated—in some cases closing in the cavity of the cell entirely, and with a line of punctures round the margin. The cells in the outer zone of the colony (towards the margin), occupying about two thirds of the disk, show no trace of a lamina. The inner margin of the cells is minutely but strongly granulated, the dividing line between them thin and smooth, and the aperture irregular-oblong, occasionally oval. Both Smitt and Manzoni figure a calcareous lamina with a single line of rather large pores round the edge, and at the upper extremity a semicircular opening (*opesia* of Jullien), distinct from the true orifice in the membranous outer wall. This condition I have not been able to observe, owing to the presence of the ectocyst in almost all the specimens. The cells in the centre of one of the colonies, to which I have just referred as possessing a lamina which completely fills in the cavity, and is altogether destitute of an opening (*opesia*), are no doubt abnormally developed. In every colony the centre is occupied by the primary zoœcium, which is oval in shape, and is surrounded by a belt of seven or eight cells which are disposed radiately about it. These are partially developed, and are destitute of an oral valve, although furnished with the membranous front wall. Probably in this region of the zoarium the internal calcareous lamina also is abnormal. The *dorsal surface* presents a very different appearance, according to the degree in which calcification has taken place. In young states the centre is occupied by a fragment of stone or coral (?), the base on which the colony was originally planted. This disappears after a time and its place is occupied by a central depression or hollow. The large vibracular cells, which project round the margin of the colony, are traversed by a smooth, keel-like raised line, on each side of which small granules are ranged. The divisions between the zoœcia show distinctly on the inferior surface of the disk, which is more or less covered with minute granules. In the youngest states these are very feebly developed. In older colonies the dorsal surface is covered with elongate, radiating areas, separated by grooved, bifurcating lines, on which the granules are disposed longitudinally. As calcification proceeds a large part of the surface becomes coarsely granulous, while at the same time

a smooth and thickened border forms round the marginal region, which is occupied by the vibracular cells. This crust gradually extends until it covers a large proportion of the disk, patches only of the strongly granulated surface appearing here and there.

Suborder CTENOSTOMATA.

Family BUSKIIDÆ, *Hincks*.

BUSKIA, *Alder*.

BUSKIA SETIGERA, n. sp. (Plate XII. figs. 9–13.)

Stem creeping, slender, jointed at intervals; short, opposite branches given off at the joints, usually bearing zoœcia, the main lines of the stem anastomosing (?). *Zoœcia* perfectly transparent and smooth, enlarged and rounded below, narrowing towards the upper extremity (somewhat flask-shaped), attached to the stem by a small basal process, the portion of the cell immediately above the lower extremity decumbent and adherent, the rest suberect; the ventral side occupied by a large aperture, closed in by a membranous wall, which extends from near the bottom to the top of the cell; orifice terminal; four slender setæ of considerable length, each springing from an expanded base, placed on the margin of the oral extremity of the cell*; one or two short tubular adherent fibres given off from the side of the basal portion of the zoœcium. *Polypide* small, and of very simple structure; the tentacular sheath with its pencil of setæ, when fully extended, of great length; the setæ, before expanding, loosely twisted subspirally.

Hab. On the stems of *Nellia oculata*, Busk, over which it creeps in profusion.

The occurrence of a second species of *Buskia* has a positive interest, as throwing further light on a peculiar type of structure. Hitherto the genus has been represented by *Buskia nitens*, Alder, a smaller form than the present, which is not uncommon on the English coasts and ranges from the Mediterranean to the extreme north (Davis Strait, Barents Sea, White Sea) and to the Queen Charlotte Islands in the North Pacific. *B. setigera* is compara-

* In one or two of the figures (*e. g.* Plate XII. figs. 9 & 10) the spines are represented as taking their origin at some distance below the top of the chitinous portion of the zoœcium; they are really situated on the margin.

tively large, and from the suberect habit of the cell, the ventral aperture, extending from the bottom (or nearly so) to the top, is more apparent and more readily studied (Plate XII. fig. 9). The solid or chitinous portion of the zoœcium forms a kind of carapace closed in below by a membranous wall. The polypide stretches along the upper portion of the cell immediately beneath the chitinous shell and issues at the top of the oral area. The structure, so far as it can be determined in spirit-specimens, is extremely simple; there seems to be no trace of a gizzard. In the setose portion of the tentacular sheath there is an interesting peculiarity. The setæ before expanding, instead of being packed together so as to form a straight pencil, are seen to be subspirally arranged, some tending to one side, some to the other, and bear some resemblance to loosely twisted strands in a cord. As the tentacular corona moves upward and presses upon the base of the operculum, the setæ disentangle themselves and expand into the usual funnel-shaped figure. The setæ with the reversible portion of the sheath from which they rise equal the cell in length. The four setose appendages placed round the upper portion of the cell-margin form a very conspicuous and striking feature. When the polypide is exserted, they are thrown back and stand out from the cell; when it withdraws they are brought together and project at the summit.

The tubular adherent processes given off from the lower part of the cell correspond to the spines round the base of the zoœcium in *B. nitens*. The cells are developed in large numbers on the creeping stem, and the growth is luxuriant.

Family Cylindrœciidæ.

Cylindrœcium, *Hincks*.

Cylindrœcium giganteum, *Busk*.

I can detect no difference between the Mergui form and our British species.

Hab. On *Nellia oculata*, Busk.

[English coast; Adriatic; Bay of Naples; Queen Charlotte Islands, North Pacific.]

Species of Polyzoa from Mergui already recorded *.

Family Cellulariidæ.

Scrupocellaria, *Van Beneden*.

Scrupocellaria diadema, *Busk*. (Plate XII. fig. 6.)

The Mergui form agrees, on the whole, with figure 3 (plate xxviii.) in the B. M. Catalogue, and with the figure of *S. ciliata*, Audouin (=*S. diadema*, according to Busk), in the 'Challenger' Report (plate xi. fig. 5); but there are differences between them which are worth noting. In the Mergui specimens the lowest spine on each side, when mature, is bifid at the extremity, and I have little doubt that where the spines are perfect this will be found to be a constant feature. The characteristic form of the scutum is shown in fig. 3 of the B.M. Catalogue, and, so far as I have seen, there is little variability in shape, except such as is dependent on the degree of development. The regular rounded outline represented in the 'Challenger' figure is certainly not met with in Mergui examples. The scutum has a rather long, suberect pedicel; the shield is triangular, depressed in the centre, the sides very much elevated, running out into a strong dentate projection, the anterior margin also dentate. The anterior avicularia are commonly large and more or less elevated, with an elongated mandible pointing obliquely downwards; sometimes a smaller form occurs. I have seen no approach to the tall columnar form which is represented in figure 1 of the B. M. Catalogue. In the 'Challenger' Report Mr. Busk has referred *S. diadema* to Audouin's *Crisia ciliata*; but the identification is purely conjectural, and can only serve, as it seems to me, to perplex the student. To take a single point, the scutum of *Crisia ciliata* as delineated by Savigny, which is very definite and peculiar in character, is quite unlike that of *S. diadema*.

Family Bicellariidæ.

Beania, *Johnston*.

Beania mirabilis, *Johnston*.

* "Contributions towards a General History of the Marine Polyzoa.—XII. Polyzoa from India (Coast of Burmah)." Ann. & Mag. Nat. Hist. 5th ser. vol. xiii. pp. 356–362, pl. xiii. (1884).

Family Membraniporidæ.

Membranipora, *De Blainville.*

Membranipora favus, *Hincks* *.

"*Zoœcia* oval, or hexagonal, or suborbicular (presenting many irregularities both in form and arrangement), of considerable depth, closely packed together, surrounded by a narrow brown line, which forms a kind of keel on the top of the cell-wall; inner surface of the margin granular; aperture occupying the whole front of the cell, closed in by a delicate membrane; numerous small cells of various shapes (sometimes quadrate, with an orbicular aperture) interspersed amongst the larger ones. *Avicularia* none.

"*Zoarium* forming a rather thick crust, and (especially in the absence of the membranous front wall) closely resembling a honeycomb."

Membranipora marginella, *Hincks* †.

"*Zoœcia* rather small, quincuncially arranged, ovate or pyriform, sometimes pointed below, with a rather thick, unarmed, minutely granular margin; aperture occupying about two thirds of the front and closed in by membrane, contracted above and expanded and rounded below; a small oval *avicularium*, borne on the margin of the zoœcia, usually placed on the side, near the top. Occasionally cells with a very large oral operculum of a dark horn-colour, occupying nearly half the aperture, and inclosed by a thin raised border (? avicularian or reproductive)."

Family Steganoporellidæ.

Steganoporella, *Smitt.*

Steganoporella magnilabris, *Busk.*
Hab. Spreading over stone.

Smittipora, *J. Jullien.*

Smittipora abyssicola, *Smitt.*

* Ann. & Mag. Nat. Hist. ser. 5, vol. xiii. p. 357, pl. xiii. fig. 2 (1884).
† *Ibid.* p. 358, pl. xiii. fig. 1 (1884).

Family Microporellidæ.

Microporella, *Hincks*.

Microporella violacea, *Johnston*, form plagiopora, *Busk*.

[Eschara Fuegensis, *Busk*. Provisionally placed in this family.]

Family Myriozoidæ (part.), *Smitt*.

Schizoporella, *Hincks*.

Schizoporella biaperta, *Michelin*.

Family Escharidæ (part.), *Smitt*.

Lepralia, *Johnston* (part.).

Lepralia robusta, *Hincks* *.

"*Zoœcia* very large, ovate, quincuncial, flattish, separated by a rather deep furrow, which is occupied by a line of large punctures; surface uneven, rather coarsely granulose, usually a small depression in the centre; orifice large, much taller than wide, arched and expanded above, somewhat contracted below, constricted a short distance above the inferior margin, which curves outwards; on each side of the orifice (or sometimes on one side only) a much elongated subspatulate *avicularium*, which originates some way below the orifice and slants obliquely upwards to a little above the top of it; mandible long, blunt and slightly expanded at the extremity, and directed upwards. *Oœcium* rounded, somewhat prominent, moderate in size, surface roughened."

Porella, *Gray*.

Porella malleolus, *Hincks* †.

"*Zoœcia* rectangular, disposed in linear series, depressed, separated by delicate raised lines; surface covered with small punctures and nodulous ridges; a line of larger foramina round the sides; orifice arched and expanded above, much contracted below, the margin about the centre projecting inward on each side,

* Ann. & Mag. Nat. Hist. ser. 5, vol. xiii. p. 360, pl. xiii. fig. 4 (1884).

† *Ibid.* p. 361, pl. xiii. fig. 5 (1884).

lower lip slightly curved (nearly straight); within it an *avicularium* with a hammer-shaped mandible. Occasionally an *avicularium* at one side, which takes its origin some way down the cell and slopes upward to the top of the orifice; mandible elongate, slightly expanded at the base, slender above it, and pointed at the extremity, directed upwards. *Œcium* (?).

"*Zoarium* incrusting, whitish, of very delicate material."

SMITTIA, *Hincks*.

SMITTIA TRISPINOSA, *Johnston*, vars.*

Family CELLEPORIDÆ.

CELLEPORA, *Fabricius* (part.).

CELLEPORA, ? n. sp.

Identical with *C. brunnea* (provisional name) of my "Report on the Polyzoa of Queen Charlotte Islands"†.

Suborder CYCLOSTOMATA.

Family LICHENOPORIDÆ.

LICHENOPORA, *Defrance*.

LICHENOPORA NOVÆ-ZEALANDIÆ, *Busk*.

HYDROIDA.

The following species of Hydroida occur amongst Dr. Anderson's dredgings:—

Suborder THECAPHORA, *Hincks*.

Family CAMPANULARIIDÆ.

OBELIA, *Péron & Lesueur*.

OBELIA ANDERSONI, n. sp. (Plate XII. figs. 2–4.)

Stem straightish, slightly angulated at the origin of the pedicels

* Ann. & Mag. Nat. Hist. ser. 5, vol. xiii. p. 361, pl. xiii. figs. 6 & 7 (1884).

† 'Geological and Natural History Survey of Canada,' Ottawa, 1884. [Reprinted from the Ann. & Mag. Nat. Hist. for 1883 and 1884.]

which support the calycles, and annulated above them. *Hydrothecæ* alternate, borne on short pedicels ringed throughout (about 7–8 rings), narrow, contracted at the base, from which point the wall slopes outward for a short distance, so that the lower extremity of the calycle is funnel-shaped, the upper three fourths subcylindrical (expanding very slightly towards the orifice); the rim cut into 10–16 narrow, rather tall, blunt denticles.

Gonothecæ springing from the main stem near the base of the pedicels, borne on short ringed stalks, narrow at the base, expanding upwards, truncate at the top. *Gonozooids* medusiform.

Hab. On *Nellia oculata*, Busk.

The peculiar form of the lower portion of the calycle is characteristic.

? Obelia bifurca, n. sp. (Plate XII. fig. 1.)

Stem simple, straightish, annulated above the pedicels. *Hydrothecæ* alternate, of large size, tall, contracted below, expanding gradually towards the oral extremity, at which point they are about three times as wide as at the base, borne on short stalks, annulated throughout and not tapering; the rim cut into about a dozen (?) broad, bicuspid denticles. *Gonothecæ* (?).

Hab. On *Nellia oculata*.

In the absence of the reproductive zooids this species is referred provisionally to the genus *Obelia*.

In some respects it is allied to *O. bicuspidata*, Clarke, obtained off Thimble Islands, coast of New England; but the latter seems to be smaller and of much more delicate habit, the calycles are very slender and lineated longitudinally (8–10 distinct lines extending from the top almost to the base), the pedicels are comparatively long and are represented as tapering upwards, and the stem is compound.

Campanularia, *Lamarck* (part.).

Campanularia raridentata, *Alder*. (Plate XII. fig. 5.)

Hab. On *Nellia oculata*.

[Great Britain.]

So far as the calycle is concerned, the Mergui form is not distinguishable from Alder's species. The reproductive capsules were not observed.

Family Plumulariidæ.

Aglaophenia, *Lamouroux*.

Subgenus Lytocarpia, *Kirchenpauer*.

Aglaophenia crispata, *Kirchenpauer*.
[Java; Formosa.]

Subgenus Macrorhyncha, *Kirchenpauer*.

Aglaophenia urens, *Kirchenpauer*.
Hab. Coral-bed.
[Java sea; Batang; Brisbane; ? Singapore, var.]

The following remark by Capt. Werner, who obtained this species in the Java sea, is given by Kirchenpauer*:—"Diese Pflanze fand ich beim Baden auf der Insel Onrust, in der Java See. Sie war an einen Stein angewachsen, und brannte beim Beruhren wie Brennesseln, könnte also wohl ein *Urtica navalis* sein."

Dr. Anderson also mentions its remarkable stinging properties. The specimen from Mergui is about a foot in length.

Family Sertulariidæ.

Idia, *Lamouroux*.

Idia pristis, *Lamouroux*.

Several specimens occur amongst the dredgings. I have met with no notice of this interesting form but the original description of it by Lamouroux. It is clearly entitled to generic rank, though the diagnosis given by this author is quite inadequate. Prof. Allman informs me that the species occurs amongst the 'Challenger' dredgings, and will be described and figured in the forthcoming part of his monograph on the Hydroida. The gonothecæ are not noticed by Lamouroux; they occur in some abundance on the Mergui specimens. They are borne on the main stem, and are urn-shaped, rounded below, expanding very slightly upwards, and narrowing at the top into a short tubular, neck-like orifice. They are prettily ribbed longitudinally, and supported on a short peduncle.

[Australian seas.]

* 'Ueber die Hydroidenfamilie Plumularidæ, einzelne Gruppen derselben, und ihre Fruchtbehälten.' Hamburg, 1872.

DESCRIPTION OF PLATE XII.

Fig. 1. ? *Obelia bifurca*, n. sp.
2 & 3. *Obelia Andersoni*, n. sp. Calycles, magnified. 4. Gonotheca.
5. *Campanularia raridentata*, Alder.
6. *Scrupocellaria diadema*, Busk.
7. *Schizoporella spongites*, Smitt, var. n. 8. Oœcium.
9–12. *Buskia setigera*, n. sp. 13. The opercular setæ, showing the subspiral arrangement.

On a new Species of *Brachyonychus* from the Mergui Archipelago. By Henry Walter Bates, F.R.S., F.L.S.

[Read 2nd December, 1886.]

Family Carabidæ, subfam. Panagæinæ.

Brachyonychus Andersoni, n. sp.

Allied to the Siamese species, *B. lævipennis*, Chaudoir, from which it differs by its smaller size, its rather less rounded elytra, and the fine punctuation of the base, as well as of the ninth and external half of the eighth (lateral) interstices. Convex; thorax hexagonal, with the lateral angles rounded, sides explanate but not reflexed; elytra relatively short, ovate, more broadly ovate than in the well-known *Eudema angulatum*, F., striate-punctate, with nearly plane interstices (rather more convex on the sides), very finely alutaceous and impunctate, except at the base and sides. The epistome is faintly rugose, the forehead coarsely intricate-rugose, without trace of punctures; the thorax closely confluent-punctulate, more distantly punctured on the broadly flattened margins. The elytra have each two transverse red spots or fasciæ; the anterior extending from the third stria to the lateral margin, and composed of elongate spots which are shorter on the fifth and seventh interstices; the posterior, much more dentate, extending from the third to the eighth stria, and composed of spots which project alternately in front and behind. The prosternum, metathoracic episterna, and sides of the basal ventral segments are sparsely and rather coarsely punctured.

Length 25 millim.

The species is intermediate between *Brachyonychus lævipennis* and *B. sublævis* Chaudoir, both known only from Siam and Cochin China. The genus contains only one other described species, *B. humeratus*, which is also from Cochin China.

Loc. Elphinstone Island.

List of Birds, chiefly from the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta.

By John Anderson, M.D., LL.D., F.R.S., F.L.S.

[Read 17th June, 1886.]

The following list of Birds chiefly records the distribution, in some of the more outlying islands of the Mergui Archipelago, of a few of the species enumerated by Messrs. Hume and Davison from the neighbouring mainland of Tenasserim.

It appears from the list of localities appended to the 'Birds of Tenasserim,' and from the text of the work itself, that Mr. Davison's researches in the Archipelago were confined to the islands of Kolan and Patoe (Pataw), and to some of the small islands in the immediate neighbourhood of Mergui; and it is stated that the island of Kolan* is 25 miles south of Mergui, whilst Patoe or Patoi is described as "forming as it were the S.W. pier of Mergui harbour." On the other hand, Mr. Davison made a preliminary reconnaissance of the avifauna of that enormous and difficult tract of country known as the province of Tenasserim, which extends from the Pah-choung in the north to the Pakchan in the south, an area 625 miles in length and over 70 miles in breadth†.

The following list is therefore published merely as a small supplementary contribution, if I may be permitted so to call it, to Mr. Davison's herculean labours in the Province; seeing it somewhat extends our knowledge of the distribution of some of the species in the northern portion of the Archipelago, a region to which his labours were very partially directed.

The islands to which my attention was chiefly confined were King Island, Elphinstone Island, and Sullivan Island. In the first 37 days, in the second 14 days, and in the third 9 days were all I could devote to bird-collecting. In King Island and Elphinstone Island I had to entrust the work to a Karen, as the other numerous duties to which I had to attend fully occupied my time, and because the Museum collectors I had brought with me from

* In the chart of the northern part of the Mergui Archipelago, published in 1875 by the Hydrographic Office of the Admiralty, the only island called Kolan lies 5 miles directly to the west of the town of Mergui; while in the map of the southern portion of the Archipelago no island of that name is to be found; but there are in both charts many unnamed islands.

† 'Stray Feathers,' vol. vi. p. ii.

Calcutta had proved thoroughly incapable and so timid that they would not enter the forest. Such a course had this great disadvantage, that it necessarily restricted my enumeration of the birds obtained to the limit of a mere list with localities.

The birds were identified in India before they were brought to this country; but in order to ensure accuracy it was desirable that they should be gone over by one thoroughly familiar with the subject, who would correct any errors of identification, and be able also to direct attention to any birds presenting features worthy of remark. I esteem myself fortunate in having secured for these ends the services of Major Wardlaw Ramsay, who possesses an intimate acquaintance with the birds of Tenasserim. I have indicated the few observations he has recorded by appending his name to them.

In the collection only one bird, *Butreron Cappelli*, appears as an addition to the fauna of Tenasserim; but at the same time the distribution of some of the species recorded in Messrs. Hume and Davison's 'Birds of Tenasserim' has been extended. While pointing out these few instances, I have not thought it necessary to repeat the distribution of species already fully recorded by these authors.

Having been present in the islands only for the very short periods already mentioned, the list gives no information regarding the migrations of species beyond recording the presence of well-known migratory birds. Considering, however, the very different climatic conditions which prevail in the islands during the two monsoons, it is probable that the birds which frequent the smaller and more exposed islets and islands during the north-east monsoon congregate on the larger and more sheltered islands until the strength of the storms of the south-west monsoon is past,—if they are not in many instances driven for shelter to the mainland. Davison records that *Halcyon chloris* in December kept entirely to the sea-coast and banks of the creeks; but that in June, after the rains had commenced, it became very numerous about the gardens and even in the town of Mergui itself*.

Judging from my observations in the localities I have mentioned (and I may state that I crossed King Island and Elphinstone

* *Op. cit.* p. 78.

Island, and ascended the highest point, 1500 feet, of Sullivan Island), my impression is that bird-life is less richly represented than on the mainland; but of course this can only be accurately ascertained by a thorough investigation of the islands. This list, if it serves as a beginning to this end, will have fulfilled its purpose.

The islands, with the exception of a very limited portion of King Island, where there are a few scattered Burmese and Karen settlers, are uninhabited except by the sea-gipsies, the Selungs, who spend the greater part of the year on the sea in their boats, in which they eat and sleep while not fishing, or hunting with their dogs for pigs in the forest. During the south-west monsoon they betake themselves to sheltered bays, where they erect miserable temporary dwelling-places on stakes driven into the sands immediately above high-water mark. The absence of regular villages, the existence of strong and dangerous currents between the islands, and the presence of sunken rocks not yet indicated in the charts, make the Mergui Archipelago a difficult region to investigate. Moreover, during the south-west monsoon navigation among the islands towards the sea is almost impracticable to sailing vessels, so that unless steam were used, or the observer settled down in one of the groups for the season, observations would have to be confined to the north-east monsoon, when the sea is generally calm and the breezes moderate.

With regard to the first locality, King Island, or Padaw* as known to the Burmese, it is situated about 10 miles due west of the town of Mergui. The island is 24 miles in length by 10 miles in breadth; it is hilly throughout, and its highest point, which lies nearest its southern end, the ridge running north and south, is 2123 feet high, but to the north and throughout the range there are other heights but little below 2000 feet. It is covered with a dense forest infested with tigers, pigs, and mouse-deer; and on the very summits of the highest peaks are to be found trees attaining nearly 200 feet in height. Apparently more streams water the eastern than the western side, and at their mouths, and, indeed, all along the sea-margin on this aspect of the island, are extensive Mangrove-forests, succeeded by undulating and hilly ground, on which are occasionally to be seen an orchard of Mangosteens, Dorians Areca-nuts, and Cocoa-nut Palms. On the western side,

* Lat. 12° 18′ to 12° 42′ N.

which is exposed to the full force of the sea-breezes, and the slope of which is more steep, there are fewer Mangrove-swamps, and in place of orchards there are temporary fishing-stations. At Yimiki, in the centre of the island, towards the north, there are a few clearings made by Karens, Burmese, and some advanced Selungs; but the attempts at cultivation are insignificant considering the size of the island, which retains its character as a great primeval forest.

Elphinstone Island* is the most seaward member of a group of beautiful islands lying to the south-west of King Island, and known to the Selungs as the Doang group. The three other principal islands of the group are Ross, Grant, and MacLeod Islands. Elphinstone Island is distant about 30 miles in a straight line from the town of Mergui. It is of irregular form, being cut up by numerous bays, and its highest point, which has not yet been measured, is visible 10 to 11 leagues at sea. The island is about 10 miles long and 8 in its extreme breadth; there is only one high peak, the rest of the island consisting of low hills, and the peak presents this peculiarity as compared with the other hills I have seen in the Archipelago, that a considerable area of its eastern aspect seems to be free of trees and to be rocky; but all the remainder of the island is covered with forest. No tigers are found in the Doang group, but pigs and mouse-deer are numerous.

Sullivan Island† is considerably to the south of King Island, as it lies 17 miles off the mainland and more or less parallel to it. It is a long and narrow island, being only 5 to 6 miles broad in its widest part, its average width not being more than 3 miles. It is traversed throughout its length by a ridge of hills rising to 1523 feet. It is also covered by a dense forest comparatively clear of undergrowth on some parts of the hill-slopes, and so dense overhead as to exclude the direct rays of the sun; the trees not unfrequently attaining to an altitude of 250 feet. In this island I first met with *Casuarina equisetifolia* growing wild along its western shore associated with *Cycas Rumphii*, two outlying members of the Austro-Malayan subregion.

* Lat. 12° 16′ to 12° 26′ N.
† Lat. 10° 41′ 30″ to 10° 59′ 30″ N.

Geocichla citrina (*Lath.*), *Oates, Birds of British Burmah*, vol. i. p. 3.

a. ♂, Elphinstone Island, 1st; *b*. ♂, 4th; and *c*. ♀, 5th March, 1882. *d*. Owen Island, 3rd Jan. 1882.

This bird is probably distributed over all the islands of the Archipelago of any size, with the exception of the more seaward chain of islands, which extends from Cabosa southwards to the Great Western Torres group. I observed it in the Elphinstone group and in Sullivan Island, almost the northern and southern extremes of the Archipelago.

Monticola cyanus (*Linn.*), *Oates, op. cit.* vol. i. p. 11.

a. ♂, Ngã Islet, King Island, 11th Feb. 1882. *b*. ♀, Crow Islet, 27th Feb. 1882. *c*. ♀, Zediwon, Mergui, 23rd Dec. 1881. *d*. ♂ (variety), Mergui, 23rd March, 1882.

"The specimen, *d*, belongs to the intermediate form which Mr. Seebohm has called *M. cyanus solitaria*, Cat. Birds Brit. Mus. vol. v. p. 318." (*Wardlaw Ramsay.*)

A rocky islet, about 50 yards in length, 30 in width, and probably not more than 25 feet high, lies four miles to the west of King Island, the largest island in the Archipelago, and three miles to the south of Maingy Island, which rises to 2000 feet in height. This little islet consists chiefly of a mass of bare rock, but on a flattened portion of its summit were a few stunted scraggy shrubs and a profusion of long grass. A miniature cliff overhangs a little cave, with a muddy and sandy shelving shore, on which struggle some dwarfed mangrove-trees, while in a tiny gorge, down which trickles some fresh water, grows an abundance of ferns. On this sequestered spot I found *Monticola cyanus* associated with the following birds: *Corvus macrorhynchus*, *Halcyon chloris*, *Hypothornis azurea*, and *Anthreptes malaccensis*, some of which had built their nests and were breeding.

Copsychus saularis (*Linn.*), *Oates, op. cit.* vol. i. p. 20.

a. Thaing, King Island, 1st Feb. 1882. *b*. ♂, Elphinstone Island, 3rd March, 1882.

Cittocincla macrura (*Gm.*), *Oates, op. cit.* vol. i. p. 22.

a. ♂, Elphinstone Island, 7th March, 1882. *b*. ♂, Yimiki, King Island, 24th Feb. 1882. *c, d*. Thaing, King Island, 31st Jan. 1882. *e*. ♂, Mergui, 23rd March, 1882.

Mixornis rubricapillus (*Tick.*), *Oates, op. cit.* vol. i. p. 50.

a, b, c. Sullivan Island, 9th Jan. 1882. *d*. Thaing, King

Island, 24th Jan. 1882. *e.* ♂, Elphinstone Island, 13th March, 1882.

Mr. W. Davison*, in his invaluable notes on the Birds of Tenasserim, says that this bird is very abundant throughout the Province as far south as 13° N. lat. I, however, found it to be common in Sullivan Island, which lies between lat. 10° 42′ and 10° 59′ 50″ N.

Turdinus Abbotti (*Bl.*), *Oates, op. cit.* vol. i. p. 58.

a. Sullivan Island, 12th Jan. 1882. *b, c.* Thaing, King Island, 31st Jan. 1882.

Pellorneum subochraceum, *Swinhoe, Oates, op. cit.* vol. i. p. 66.

a. Thaing, King Island, 23rd Jan. 1882. *b.* ♂, Elphinstone Island, 14th March, 1882.

"These specimens are remarkable for the rusty hue of their plumage; otherwise they are identical with Tenasserim specimens." (*Wardlaw Ramsay.*)

Phylloscopus borealis (*Blas.*), *Oates, op. cit.* vol. i. p. 77.

a. ♀, Yimiki, King Island, 24th Feb. 1882.

Sutoria sutoria (*Forst.*), *Oates, op. cit.* vol. i. p. 107.

a. Sullivan Island, 12th Jan. 1882. *b.* Mergui, 14th Dec. 1881.

Mr. Davison found this bird generally distributed throughout the province as far south as Mergui, but he does not appear to have found it to the south of that town.

Orthotomus atrigularis, *Temm., Oates, op. cit.* vol. i. p. 109.

a. Thaing, King Island, 24th Jan. 1882.

Sitta frontalis, *Horsf., Oates, op. cit.* vol. i. p. 134.

a. ♂, Elphinstone Island, 5th; *b, c.* ♂, 6th March, 1882.

Herpornis xantholeuca (*Hodgs.*), *Oates, op. cit.* vol. i. p. 151.

a. Sullivan Island, 13th Jan. 1882.

Calobates melanope (*Pall.*), *Oates, op. cit.* vol. i. p. 159.

a. ♀, Elphinstone Island, 13th March, 1882.

* 'Stray Feathers,' vol. vi. p. 266.

Limonidromus indicus (*Gm.*), *Oates, op. cit.* vol. i. p. 164.
a. ♂, Elphinstone Island, 14th; *b.* ♀, 13th March, 1882.

Iole viridescens, *Bl.*, *Oates, op. cit.* vol. i. p. 177.
a. King Island.

Micropus melanocephalus (*Gm.*), *Oates, op. cit.* vol. i. p. 181.
a. Minthantoung, Mergui, 22nd Dec. 1881. *b.* ♂, Mergui, 27th Dec. 1881.

Criniger gutturalis (*Bp.*), *Oates, op. cit.* vol. i. p. 185.
a. Thaing, King Island, 24th Jan. 1882. *b.* ♂, Yimiki, King Island.

Trachycomus ochrocephalus (*Gm.*), *Oates, op. cit.* vol. i. p. 188.
a. ♂, Zediwon, Mergui, 23rd Dec. 1881.

Pycnonotus analis (*Horsf.*), *Oates, op. cit.* vol. i. p. 191.
a. ♂, Mergui, 23rd; *b.* ♀, 26th March, 1882.

Pycnonotus Finlaysoni, *Strickl.*, *Oates, op. cit.* vol. i. p. 193.
a. ♀, Elphinstone Island, 1st; *b.* ♀, 2nd March, 1882. *c.* Thaing, King Island, 12th Feb. 1882. *d.* ♂, Mergui, 23rd March, 1882. *e.* ♂, Minthantoung, Mergui, 22nd Dec. 1881.

Otocompsa jacosa (*Linn.*), *Oates, op. cit.* vol. i. p. 198.
a. ♂, *b.* ♀, Mergui, 19th March, 1882. *c, d.* ♂ ♀, Mergui, 27th Dec. 1881.

Otocompsa flaviventris (*Tick.*), *Oates, op. cit.* vol. i. p. 199.
a, b. ♀, Minthantoung, Mergui, 22nd Dec. 1881.

Ægithina tiphia (*Linn.*), *Oates, op. cit.* vol. i. p. 202.
a, b. ♂, Mergui, 23rd March, 1882. *c.* ♀, Minthantoung, Mergui, 22nd Dec. 1881.

Æthorhynchus Lafresnayii (*Hartl.*), *Oates, op. cit.* vol. i. p. 204.
a. ♂, Minthantoung, Mergui, 22nd Dec. 1881.
"In the yellow colour of the ear-coverts and margins of the wing-coverts this specimen approaches *Æ. xanthotis*, Sharpe." (*Wardlaw Ramsay.*)

Chloropsis chlorocephala (*Wald.*), *Oates, op. cit.* vol. i. p. 208.

a. Sullivan Island, 9th; *b*, *c*. 11th Jan. 1882. *d*. ♂, Elphinstone Island, 1st March, 1882.

Irena puella (*Lath.*), *Oates, op. cit.* vol. i. p. 209.

a. ♂, *b*. ♀, Elphinstone Island, 4th; *c*. ♂, 9th; *d*. ♀, 1st March, 1882. *e*. ♂, Yimiki, King Island, 24th Feb. 1882. *f*. ♀, Zediwon, Mergui, 23rd Dec. 1881.

Oriolus indicus, *Jerd.*, *Oates, op. cit.* vol. ii. p. 211.

a. ♂, Elphinstone Island, 9th; *b*. ♀, 13th March, 1882. *c*. ♂, King Island, 15th; *d*. ♂, 18th Feb. 1882. *e*. ♀, Mergui, 23rd March, 1882.

Buchanga atra (*Herm.*), *Oates, op. cit.* vol. i. p. 218.

a. Sullivan Island, 9th Jan. 1882. *b*. ♀, Mergui, 20th; *c*. ♂, 23rd March, 1882. *d*. Zediwon, Mergui, 23rd Dec. 1881.

Buchanga longicaudata (*A. Hay*), *Oates, op. cit.* vol. i. p. 220.

a. ♂, Mergui, 19th March, 1882.

Buchanga leucogenys, *Wald.*, *Oates, op. cit.* vol. i. p. 222.

a. ♂, Ngā or Fish Islet, King Island Bay, 18th Feb. 1882. *b*. ♀, Elphinstone Island, 13th March, 1882.

Dissemurus paradiseus (*Linn.*), *Oates, op. cit.* vol. i. p. 225.

a. ♀, Elphinstone Island, 4th; *b*, *c*. ♂, 5th; *d*, *e*. ♂ ♀, 9th March, 1882.

"The intermediate race with a moderate crest." (*Wardlaw Ramsay.*)

Pericrocotus cinereus, *Lafres.*, *Oates, op. cit.* vol. i. p. 241.

a. ♂, Elphinstone Island, 13th March, 1882.

Mr. Oates first met with this species at Kyeikpadien, near Pegu, in the cold weather, where he also in the same season obtained *P. cantonensis*, and he mentions that Mr. Davison also procured this species at various places in the Malay Peninsula.

Pericrocotus peregrinus (*Linn.*), *Oates, op. cit.* vol. i. p. 245.

a. ♂, Elphinstone Island, 1st Feb. 1882. *b*, *c*. ♂ ♀, Elphinstone Island, 1st; *d*. ♀, *e*. ♀, 5th March, 1882. *f*. ♂, Thaing, King Island, 31st Jan. 1882. *g*. ♂, Ihapo, King Island, 23rd Jan. 1882.

The prevalence of this Minivet in these islands seems to verify Mr. Davison's observation that it is a frequenter of the sea-coast.

Muscitrea grisola (*Bl.*), *Oates, op. cit.* vol. i. p. 257.

a. ♂, *b*. ♀, Elphinstone Island, 5th March, 1882.

In the "Birds of Tenasserim"* it is remarked that this is a rare visitant to the Province, and that if common anywhere it is only so in the islands of the Mergui Archipelago. Mr. Davison procured it fifty-two miles north-west of Moulmein and at Kolan Island, twenty-five miles south of Mergui.

Hypothymis azurea (*Bodd.*), *Oates, op. cit.* vol. i. p. 265.

a, *b*. Sullivan Island, 12th; *c*. 9th Jan. 1882. *d*. ♂, Elphinstone Island, 4th; *e*. ♂, 9th March, 1882. *f*. ♀, Yimiki, King Island, 24th Feb. 1882. *g*. Thapo, King Island, 25th Jan. 1882. *h*. Thaing, King Island, 24th Jan. 1882. *i*. Zediwon, Mergui, 23rd Dec. 1881.

I observed this bird on the small rocky islet previously mentioned under *Monticola cyanus*. It is common in King, Elphinstone, and Sullivan Islands.

Rhipidura javanica (*Sparrm.*), *Oates, op. cit.* vol. i. p. 267.

a. ♂, Mergui, 23rd March, 1882.

Hemichelidon sibirica (*Gm.*), *Oates, op. cit.* vol. i. p. 275.

a. Thaing, King Island, 21st Jan. 1882. *b*. Thaing, King Island, 1st Feb. 1882.

Alseonax latirostris (*Raffl.*), *Oates, op. cit.* vol. i. p. 277.

a. Thaing, King Island, 24th; *b*. 31st Jan. 1882. *c*. ♀, Ngā, King Island Bay, 9th Feb. 1882. *d*. ♀, Minthantoung, Mergui, 22nd Dec. 1881.

Siphia rubeculoides (*Vig.*), *Oates, op. cit.* vol. i. p. 287.

a. Thaing, King Island, 31st Jan. 1882. *b*. Minthantoung, Mergui, 22nd Dec. 1881.

"In this specimen (*b*) the rufous extends in a narrow line almost to the chin." (*Wardlaw Ramsay.*)

Hirundo rustica, *Linn.*, *Oates, op. cit.* vol. i. p. 302.

a. Minthantoung, Mergui, Jan. 1882. *b*. ♂, Mergui, 24th March, 1882.

Hypurolepis javanica (*Sparrm.*), *Oates, op. cit.* vol. i. p. 308.

a. ♀, Mergui, 20th Feb. 1882. *b*. ♀, Elphinstone Island, 13th Feb. 1882. *c* Ngā Islet, King Island, 14th Feb. 1882.

* *Op. cit.* p. 206.

Mr. Davison met with a few examples of this species at Mergui in June, but they are not numerous, and he believed that they were then migrating. He never observed them in any other part of Tenasserim; but Mr. Theobald states that he found this species breeding at Tenasserim in April, and Mr. Oates seems disposed to regard it as a resident species.

Æthopyga cara, *Hume*, *Oates*, *op. cit.* vol. i. p. 316.

a, *b*. ♂, Sullivan Island, 9th; *c*. ♀, 11th Jan. 1882. *d*. ♂, Zimiki, King Island, 24th Feb. 1882.

Mr. Davison * observed this bird only as far south as the town of Tenasserim; but I found it not at all uncommon at Sullivan Island, among shrubs close to a beach which was fringed by *Casuarina equisetifolia*, Forsk.

Cinnyris Hasselti (*Temm.*), *Oates*, *op. cit.* vol. i. p. 318.

a. ♀, Sullivan Island, 9th; *b*, *c*. ♂, 11th Jan. 1882. *d*. ♀, Thaing, King Island, 31st Jan. 1882.

This species I found associated with the previous Sun-bird in the same locality in Sullivan Island. Both were equally common.

Cinnyris flammaxillaris (*Bl.*), *Oates*, *op. cit.* vol. i. p. 320.

a, *b*. Sullivan Island, 9th Jan. 1882. *c*. ♂, Elphinstone Island, 5th; *d*. ♂, 9th March, 1882.

From the same locality in Sullivan Island as the two foregoing species.

Anthreptes malaccensis (*Scop.*), *Oates*, *op. cit.* vol. i. p. 324.

a. ♂, Sullivan Island, 1st Jan. 1882. *b*. ♂, *c*. ♀, *d*. ♂, Thaing, King Island, 24th Jan. 1882, 1st Feb. 1882. *e*. ♂, Thapo, King Island, 25th Jan. 1882. *f*. ♀, Ngā Islet, King Island Bay, 9th; *g*, *h*. ♂, *i*. ♀, 11th Feb. 1882. *k*. ♂, *l*. ♀, Crow Islet, 27th Feb. 1882. *m*. ♀, Elphinstone Island, 7th March, 1882.

The presence of this Sun-bird on the little rocky island mentioned in the beginning of this list, and also in King Island, Elphinstone Island, and Sullivan Island, indicates its wide distribution among the islands of the Archipelago. In King Island I found it generally on old clearings in the neighbourhood of the villages of Thaing and Thapo, at the head of King Island Bay, and on Ngā Island.

* 'Stray Feathers,' vol. vi. p. 179.

Anthreptes singalensis (*Temm.*), *Oates, op. cit.* vol. i. p. 326.
a. ♀, Yimiki, King Island, 24th Feb. 1882.
On clearings in the forest in the centre of the island.

Dicæum cruentatum (*Linn.*), *Oates, op. cit.* vol. i. p. 332.
a. Thaing, King Island, 1st Feb. 1882. *b*. ♀, Elphinstone Island, 4th; *c*. ♀, 5th March, 1882. *d*. Mergui, 27th Dec. 1881.

Dicæum trigonostigma (*Scop.*), *Oates, op. cit.* vol. i. p. 336.
a. ♂, Elphinstone Island, 4th; *b*, *c*. ♂ ♀, 5th March, 1882. *d*. Thapo, King Island, 25th Jan. 1882. *e*. King Island, 16th Feb. 1882.

Passer montanus (*Linn.*), *Oates, op. cit.* vol. i. p. 348.
a, *b*. ♂, Mergui, 23rd March, 1882.

Amadina acuticauda (*Hodgs.*), *Oates, op. cit.* vol. i. p. 364.
a, *b*. ♀, Yimiki, King Island, 24th Feb. 1882.
On clearings in the centre of the island.

Sturnopastor superciliaris, *Bl.*, *Oates, op. cit.* vol. i. p. 378.
a. Mergui, 20th; *b*. ♂, 19th; *c*, ♀, 29th March, 1882.

Acridotheres fuscus (*Temm.*), *Oates, op. cit.* vol. i. p. 380.
a. ♂, Mergui, 9th; *b*, ♀, 20th; *c*. ♀, 23rd March, 1882.

Calornis chalybea (*Horsf.*), *Oates, op. cit.* vol. i. p. 390.
a. ♂, Elphinstone Island, 5th Feb. 1882; *b*. ♀, 2nd; *c*, ♂, 4th; *d*, ♂, *e*. ♂, *f*. ♂, *g*. ♀, *h*. ♀, 9th; *i*. ♀, 13th March, 1882; *k*. ♂, 3rd July, 1882. *l*. ♂, Thaing, King Island, 31st Jan. 1882.
This bird is very common along the margins of the forest at the head of the great bay on the south-eastern side of Elphinstone Island, and I observed a large colony on a rocky islet on the western side of Sullivan Island, where it was breeding in recesses in the rocks, finding cover among some small shrubs on the summit of the islet.

Gracula javanensis (*Osbeck*), *Oates, op. cit.* vol. i. p. 393.
a, *b*. Sullivan Island, 12th; *c*. ♀, 12th; *d*. 13th Jan. 1882. *e*. ♀, *f*. ♀, Elphinstone Island, 9th March, 1882. *g*. Thaing, King Island, 27th Jan. 1882.
This species was not uncommon at Sullivan Island, and its

favourite resort was the tops of the highest trees in the forest. Its noisy calls became a familiar sound just before sundown.

Corvus macrorhynchus, *Wagler*, *Oates*, *op. cit.* vol. i. p. 397.

a. ♂, Yimiki, King Island, 24th Feb. 1882.

This Crow appears to be generally distributed throughout the islands, and, as already mentioned, I found a pair even breeding on a small rocky islet. There were four young ones in the nest.

Corvus insolens, *Hume*, *Oates*, *op. cit.* vol. i. p. 399.

a. ♀, Mergui, 20th; *b*. ♂, 19th March, 1882.

Crypsirhina varians (*Lath.*), *Oates*, *op. cit.* vol. i. p. 404.

a, *b*. ♂ ♀, Mergui, 23rd March, 1882.

Cymborhynchus macrorhynchus (*Gm.*), *Oates*, *op. cit.* vol. i. p. 428.

a, *b*. ♂, *c*, *d*. ♂, Mergui, 23rd March, 1882. *e*. ♂, *f*. ♀, Zediwon, Mergui, 23rd Dec. 1881.

Among shrubs in dense shade on the outskirts of a mangrove-swamp.

Collocalia Linchi, *Horsf. & Moore*, *Oates*, *op. cit.* vol. ii. p. 10.

a. ♀, Yimiki, King Island, 24th Feb. 1882.

Blyth* has recorded this bird from the Mergui Archipelago. Mr. Davison says it does not occur on Mergui Island itself nor in any of the small islands near it.

Lyncornis cerviniceps, *Gould*, *Oates*, *op. cit.* vol. ii. p. 22.

a. Elphinstone Island, 3rd March, 1882.

Alophonerpes pulverulentus (*Temm.*), *Oates*, *op. cit.* vol. ii. p. 29.

a. ♀, Elphinstone Island, 13th March, 1882.

Hemicercus canente (*Less.*), *Oates*, *op. cit.* vol. ii. p. 30.

a, *b*. ♀, Elphinstone Island, 9th March, 1882.

Picus canicapillus, *Bl.*, *Oates*, *op. cit.* vol. ii. p. 36.

a. ♀, Elphinstone Island, 9th; *b*. ♀, 13th March, 1882.

* Journ. As. Soc. Beng. pt. ii. (extra no.) vol. xliii. 1875, p. 85.

Gecinus viridanus (*Bl.*), *Oates, op. cit.* vol. ii. p. 48.

a. ♂, Yimiki, King Island, 24th Feb. 1882. *b.* Mergui, 23rd March, 1882.

Chrysocolaptes strictus (*Horsf.*), *Oates, op. cit.* vol. ii. p. 53.

a. ♀, Yimiki, King Island, 29th Feb. 1882. *b, c.* ♂, *d.* ♀, Elphinstone Island, 9th; *e.* ♀, 13th March, 1882.

Melittophagus Leschenaulti (*Vieill.*), *Oates, op. cit.* vol. ii. p. 68.

a. Thaing, King Island, 24th Jan. 1882; *b.* ♀, 24th Feb. 1881; *c.* ♂, 22nd Dec. 1881.

Eurystomus orientalis (*Linn.*), *Oates, op. cit.* vol. ii. p. 70.

a. ♂, Yimiki, King Island, 24th Feb. 1882.

Alcedo bengalensis, *Gm.*, *Oates, op. cit.* vol. ii. p. 72.

a. ♀, King Island Bay, 17th Feb. 1882. *b.* ♂, Elphinstone Island, 5th; *c.* ♀, 9th; *d.* ♂, 13th March, 1882.

Pelargopsis amauroptera (*Pears.*), *Oates, op. cit.* vol. ii. p. 78.

a. ♂, Elphinstone Island, 13th March, 1882. *b.* ♂, Yimiki, King Island, 24th Feb. 1882.

Halcyon pileata (*Bodd.*), *Oates, op. cit.* vol. ii. p. 83.

a. Thaing, King Island, 31st Jan. 1882.

Halcyon chloris (*Bodd.*), *Oates, op. cit.* vol. ii. p. 85.

a. ♀, Elphinstone Island, 1st; *b.* ♀, 9th March, 1882. *c.* ♂, *d.* ♀, King Island Bay, 17th Feb. 1882. *e.* ♂, *f.* ♀, *g.* ♀, Crow Islet, 27th Feb. 1882.

This is the most prevalent Kingfisher among the northern islands. In February it was found breeding on Crow Islet.

Dichoceros bicornis (*Linn.*), *Oates, op. cit.* vol. ii. p. 87.

a. Thaing, King Island, 31st Jan. 1882. *b.* Elphinstone Island, 13th March, 1882.

This species is doubtless distributed thoughout the Archipelago, but is relatively rare compared with *Rhytidoceros subruficollis*.

Anthracoceros albirostris (*Shaw*), *Oates, op. cit.* vol. ii. p. 90.

a. Thaing, King Island, 30th Jan. 1882. *b, c.* ♂ ♀, King Island, 8th Feb. 1882. *d.* ♂, Elphinstone Island, 7th; *e.* ♀, 13th March, 1882.

Rhytidoceros subruficollis (*Bl.*), *Oates, op. cit.* vol. ii. p. 91.

a. ♂, *b.* ♂, *c.* ♂, *d.* ♂, King Island, 29th Jan. 1882. *e.* ♀,

6th; *f.* ♀, 8th Feb. 1882. *g.* ♀, Yimiki, King Island, 24th Feb. 1882.

This Hornbill occurs in great numbers in islands of the Archipelago, especially in those towards the north. On the mainland, however, south of Tavoy, Davison records that he only obtained a single straggler, while to the north of Tavoy as far as Moulmein the species was common.

In the morning and evening large flocks were being constantly seen at great heights flying long distances, and crossing the sea from island to island, their approach being heralded by the loud croaking noise so characteristic of their flight generally, associated with a peculiar harsh call, which, when the birds hustled each other, whether in sport or anger I knew not, became converted into a noise resembling the bark of a dog. It is a very wary bird, and keeps to the tops of the highest trees.

A Karen brought to me at King Island, on the 8th March, a female bird and her egg, both of which he had removed from a hole in a large tree which he had recklessly felled, with the assistance of some other Karens, for the sole purpose of obtaining these objects, in the hope that I would purchase them. Along with the bird and egg he also brought a part of the nest itself, which was made up of a resin which is common in these islands and of a substance which he described as a gum. The pure white egg had a somewhat leathery shell deficient in lime.

Harpactes oreskios (*Temm.*), *Oatès*, *op. cit.* vol. ii. p. 100.

a. Thaing, King Island, 1st Feb. 1882. *b.* ♂, Zimiki, King Island, 24th Feb. 1882.

In clearings surrounded by forest.

Cuculus striatus, *Drap.*, *Oates*, *op. cit.* vol. ii. p. 105.

a. ♀, Elphinstone Island, 9th March, 1882.

Hierococcyx sparverioides (*Vig.*), *Oates*, *op. cit.* vol. ii. p. 108.

a. ♂, Elphinstone Island, 9th March, 1882.

Mr. Davison met with this Cuckoo only as far south as Amherst.

Hierococcyx nanus, *Hume*, *Oates*, *op. cit.* vol. ii. p. 110.

a. ♀, Elphinstone Island, 5th; *b.* 6th March, 1882.

Mr. Davison discovered this species at Bankasoon in the extreme south of the province of Tenasserim, but afterwards found it "in

April in the forests at the base of Nwalabo, and between that place and Tavoy" *.

Cacomantis threnodes, *Cab. et Hein.*, *Oates*, *op. cit.* vol. ii. p. 111.

a. ♂, Mergui, 23rd March, 1882.

Surniculus lugubris (*Horsf.*), *Oates*, *op. cit.* vol. ii. p. 112.

a. Thaing, King Island, 24th Jan. 1882. *b.* ♂, Elphinstone Island, 9th March, 1882.

Rhopodytes tristis (*Less.*), *Oates*, *op. cit.* vol. ii. p. 121.

a. ♂, *b.* ♀, Yimiki, King Island, 24th Feb. 1882. *c.* ♀, Elphinstone Island, 1st; *d.* ♂, 14th March, 1882. *e.* Minthantoung, Mergui, 22nd Dec. 1881.

Centrococcyx intermedius, *Hume*, *Oates*, *op. cit.* vol. ii. p. 126.

a. ♀, Yimiki, King Island, 24th Feb. 1882. *b.* ♀, Elphinstone Island, 9th; *c.* ♀, 14th March, 1882.

Xantholæma hæmacephala (*Müll.*), *Oates*, *op. cit.* vol. ii. p. 136.

a. ♂, Yimiki, King Island, 24th Feb. 1882.

Palæornis fasciatus (*Müll.*), *Oates*, *op. cit.* vol. ii. p. 143.

a. Thaing, King Island, 31st Jan. 1882. *b.* ♂, King Island Bay, 19th Feb. 1882.

Loriculus vernalis (*Sparrm.*), *Oates*, *op. cit.* vol. ii. p. 146.

a. ♂, *b.* ♂, Thaing, King Island, 2nd Feb. 1882.

Ketupa javanensis, *Less.*, *Oates*, *op. cit.* vol. ii. p. 149.

a. ♀, Elphinstone Island, 13th March, 1882. *b.* King Island, 19th Feb. 1882.

Scops pennatus, *Hodgs.*, *Oates*, *op. cit.* vol. ii. p. 154.

a. ♂, Ngā Islet, King Island Bay, 18th Feb. 1882.

"This belongs to the race named *S. stictonotus* by Sharpe, Cat. Birds Brit. Mus. vol. ii. p. 54." (*Wardlaw Ramsay.*)

Scops Lempiji (*Horsf.*), *Oates*, *op. cit.* vol. ii. p. 156.

A young bird, probably of this species.

Ninox scutulata (*Raffl.*), *Oates*, *op. cit.* vol. ii. p. 159.

a. ♀, Elphinstone Island, 7th March, 1882.

* 'Stray Feathers,' vol. vi. pp. 157, 502.

Astur trivirgatus (*Temm.*), *Oates, op. cit.* vol. ii. p. 177.
a. Thaing, King Island, 1st Feb. 1882.

Butastur indicus (*Gm.*), *Oates, op. cit.* vol. ii. p. 197.
a. ♂, Mergui, 23rd March, 1882.

Haliastur indus (*Bodd.*), *Oates, op. cit.* vol. ii. p. 201.
a. ♂, King Island, 24th Feb. 1882. *b*. ♀ juv., King Island Bay, 11th Feb. 1882.

Pernis ptilorhynchus (*Temm.*), *Oates, op. cit.* vol. ii. p. 207.
a. ♂, Elphinstone Island, 14th March, 1882.
This rare bird was recorded many years ago by Blyth * from Mergui, and more recently by Hume and Davison from Moulmein and Amherst.

Baza lophotes (*Cuv.*), *Oates, op. cit.* vol. ii. p. 208.
a. ♂, Elphinstone Island, 1st March, 1882.

Ardea sumatrana, *Raffl.*, *Oates, op. cit.* vol. ii. p. 244.
a. ♀, King Island Bay, 19th Feb. 1882.
I only observed this large Heron on one occasion, when the extensive mud-flats in King Island Bay were exposed at spring-tide, on which occasion they were visited by about half a dozen of these birds.

Herodias garzetta (*Linn.*), *Oates, op. cit.* vol. ii. p. 248.
a. Ngā Islet, King Island Bay, 18th Feb. 1882.

Demiegretta sacra (*Gm.*), *Oates, op. cit.* vol. ii. p. 250.
a. ♂, Sullivan Island, 6th Jan. 1882. *b*. ♂, King Island, 17th Feb. 1882. *c*. ♂, King Island Bay, 20th; *d*, *e*. ♂ ♀, 26th Feb. 1882.
Common throughout the islands and much frequenting the mud-flats at King Island Bay.

Butorides javanica (*Horsf.*), *Oates, op. cit.* vol. ii. p. 254.
a. ♀, *b*. Imm., Elphinstone Island, 1st; *c*. ♂, 7th March, 1882.

Alsocomus puniceus, *Tick.*, *Oates, op. cit.* vol. ii. p. 289.
a, *b*. ♂, Ngā Islet, King Island Bay, 18th Feb. 1882.
Ngā Islet is a small well-wooded island about a quarter of a mile long and 80 feet high, situated at the head of King Island Bay, with some other and similar islands close beside it. These

* Trans. As. Soc. Beng. vol. xxi. p. 436.

islands, besides supporting a small population of their own, were visited by many birds from the main island (King Island) during their daily wanderings in search of food, and this Pigeon was among those visitors. It ranges from Tonghoo through Pegu to Tenasserim, and in the latter province Davison observed it near Mergui.

Turtur tigrinus (*Temm.*), *Oates, op. cit.* vol. ii. p. 290.

a. Juv., Thapo, King Island, 23rd Jan. 1882. *b.* Thaing, King Island, 31st Jan. 1882. *c.* ♂, Yimiki, 24th Feb. 1882.

Chalcophaps indica (*Linn.*), *Oates, op. cit.* vol. ii. p. 297.

a. ♂, Elphinstone Island, 4th; *b.* ♂, 5th March, 1882.

Carpophaga ænea (*Linn.*), *Oates, op. cit.* vol. ii. p. 301.

a. Thaing, King Island, 31st Jan. 1882. *b.* ♀, Elphinstone Island, 9th; *c*, *d.* ♂, 13th March, 1882.

I observed a large Imperial Pigeon in Sullivan Island, but as it was extremely wary, and frequented only the tops of the highest trees in the densest parts of the forest, I did not succeed in obtaining any examples. It may probably be *C. insularis* from the Nicobar Islands, a species which Oates has suggested may occur in the Archipelago.

Treron nipalensis (*Hodgs.*), *Oates, op. cit.* vol. ii. p. 306.

a. ♂, Elphinstone Island, 5th March, 1882.

Osmotreron bicincta (*Jerd.*), *Oates, op. cit.* vol. ii. p. 308.

a. ♂, Elphinstone Island, 9th; *b.* ♂, 13th March, 1882.

Osmotreron vernans (*Linn.*), *Oates, op. cit.* vol. ii. p. 309.

a. Yimiki, King Island, 24th Feb. 1882. *b.* ♂, Elphinstone Island, 9th March, 1882.

This Pigeon has been found on the mainland from Mergui south to Malewoon.

Butreron Cappelli.—Treron Cappelli (*Temm.*), *Salvad. Ann. Mus. Civ. Genov.* vol. v. p. 285 (1874).

a. ♂, Elphinstone Island, 13th March, 1882.

"The occurrence of this species is interesting. So far as I know, there is no record of its having been obtained so far north before." (*Wardlaw Ramsay.*)

Turnix plumbipes (*Hodgs.*), *Oates, op. cit.* vol. ii. p. 337.

a. ♀, Mergui, 23rd March, 1882.

Gallicrex cinereus (*Gm.*), *Oates, op. cit.* vol. ii. p. 349.
a. ♂, Mergui, 19th March, 1882.
Davison only observed this species as far south as the mouth of the Tavoy estuary.

Podica personata (*Gray*), *Oates, op. cit.* vol. ii. p. 353.
a. ♂, Elphinstone Island, 13th March, 1882.
This rare bird, which was originally described from a Malacca specimen, has been found by Davison at Bankasoon, Mergui, and Amherst.

Ægialitis Geoffroyi (*Wagl.*), *Oates, op. cit.* vol. ii. p. 366.
a. ♀, Elphinstone Island, 5th March, 1882.
Mr. Davison never met with this bird in Tenasserim, but Mr. Hume's collectors obtained it 52 miles N.W. of Moulmein, and Dr. Armstrong at Amherst.

Ægialitis mongolicus (*Pall.*), *Oates, op. cit.* vol. ii. p. 368.
a, b. ♀, Elphinstone Island, 5th March, 1882.

Ægialitis cantiana (*Lath.*), *Oates, op. cit.* vol. ii. p. 368.
a. ♀, Elphinstone Island, 8th March 1882. *b* *.

Lobivanellus atronuchalis (*Bl.*), *Oates, op. cit.* vol. ii. p. 374.
a. ♂, *b*. ♀, Yimiki, King Island, 24th Feb. 1882.

Strepsilas interpres (*Linn.*), *Oates, op. cit.* vol. ii. p. 376.
a. ♂, Gnā or Fish Islet, King Island Bay, 4th; *b*. ♂, 9th Feb. 1882.
This bird does not appear in Hume and Davison's list.

Gallinago cœlestis (*Frenzel*), *Oates, op. cit.* vol. ii. p. 381.
a †.

Tringa minuta (*Leisl.*), *Oates, op. cit.* vol. ii. p. 389.
a, b. ♀, Mergui, 23rd March, 1882.

Tringoïdes hypoleucus (*Linn.*), *Oates, op. cit.* vol. ii. p. 399.
a. ♀, King Island, 17th Feb. 1882.

* Label lost. † With no information.

On *Dichelaspis pellucida*, Darwin, from the scales of an Hydrophid obtained at Mergui.

By Dr. P. P. C. Hoek, Member Royal Academy of Science of the Netherlands, Leiden. (Communicated by Dr. J. Anderson, F.R.S., F.L.S.)

[Read 17th February, 1887.]

(Plate XIII.)

Dr. Anderson collected many specimens of this species from an Hydrophid obtained among the fishing-stakes at Mergui. They were attached to the scales of the snake, and were so numerous as to give a rough appearance to the entire body. On an average the Cirriped measured about 9 millim. in length.

So far as my knowledge goes, this species has not been observed since Darwin published his description * from specimens obtained in the Indian Ocean, which were also attached to a sea-snake, and for which he was indebted to the kindness of Mr. Busk.

Although I believe there can be no question as to the identity of Darwin's *D. pellucida* and the specimens from the Mergui Archipelago, I may be permitted to point out such small differences as I have been able to observe.

The shape of the valves closely resembles Darwin's description and figures. The basal segment of the scutum is much narrower than the occludent segment, and about half as long. The tergum (fig. 2) has the form of a battle-axe; its handle, however, is not narrower than the occludent segment of the scuta (as Darwin says it is), but considerably thicker, or about as thick. The occludent segment of the scutum forms with the handle of the battle-axe an angle (fig. 2, *a*, *b*, *c*) of more than 45°. The carina agrees perfectly with Darwin's description, and so does the peduncle, of which Darwin says, "its narrowness and transparency are its only remarkable characters."

The size of the specimens from Mergui considerably exceeds the dimensions given by Darwin. In the specimens he studied the capitulum measured 0·15 of an inch in length, which is about 3·8 millim. The Mergui specimen figured (fig. 1) has a capitulum 5·3 millim. long, while another measures even 6·2 millim. On the contrary, the peduncle is only about once and a half as long as the capitulum. Most probably these differences in size, as well as those very inconsiderable ones in the valves which I have

* Monograph of the Cirripedia, vol. i. p. 125, pl. ii. fig. 7.

pointed out as existing between Darwin's specimens and those from Mergui, are due to difference in age. A specimen I dissected was furnished with ovigerous lamellæ.

In figure 3 I have given a representation of the penis of this species. Whereas the probosciformed organ, except in certain species of *Scalpellum*, is very long, the present species has a very thick and short penis, its tip being pointed and somewhat hooked. Darwin does not describe the penis of this nor of any other species of the genus.

DESCRIPTION OF PLATE XIII.

Fig. 1. *Dichelaspis pellucida*, Darwin, side view: ×14 diam.

2. View of a part of the capitulum, to show A & B, the terga, C & D, the occludent segments of the scuta, and *a*, *b*, *c*, the angle the occludent segment of the scutum forms with the handle of the battle-axe-shaped tergum: ×30 diam.

3. Representation of the penis: ×30 diam.

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Fig. 3. Representation of the penis: × 30 diam.

List of the Shells of Mergui and its Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By Prof. Eduard von Martens, M.D., C.M.Z.S., of the University of Berlin. (Communicated by Dr. John Anderson, F.R.S., F.L.S.)

[Read 17th June, 1886.]

(Plates XIV.–XVI.)

Introductory Remarks.

The following is a list of the species of Mollusca collected by Dr. John Anderson at Mergui and some of the islands of the Tenasserim coast. The species have been determined chiefly by comparison with the shells in the Zoological Museum of the University of Berlin, and by consulting the leading illustrative works of this department of science, the figures of which are here cited, so far as they have been compared with the objects themselves, and may help to secure the determination. Concerning the land and freshwater Mollusca, I have derived very valuable information from Hanley and Theobald's 'Conchologia Indica,' and from G. Nevill's 'Hand-list of the Mollusca of the Indian Museum,' vols. i. (1878) and ii. (1884); also from the paper by A. Gould in

the 'Boston Journal of Natural History,' vol. iv. 1844, which is the first treatise on the land-shells of that country. Besides Reeve's 'Conchologia Iconica,' several conchological publications by R. A. Philippi have been very useful to me in determining the marine shells, as this author mentions and describes various shells collected by his brother, Theodor Philippi, at Mergui, about the year 1846. Descriptions and figures are only given in the few cases of new or very little-known species. In several other cases some remarks are added concerning the more striking and easily observable differences of the species, chiefly if several nearly allied species are mentioned; they are not intended, however, to give a sufficient description, but only to help the memory of the conchologist in the discrimination of those species.

Dr. Anderson noted on the spot the conditions under which many of the species occurred; and his notes I have given *verbatim*. These are very valuable, as they afford an idea of the circumstances under which the animals live, which are of great importance owing to the influence the surroundings of a species exercise in modifying the general external appearance of the shell, a consideration which is as yet not sufficiently known and appreciated in foreign shells. Many of Dr. Anderson's statements, contained in his notes, coincide with my own observations made during a stay of about two years in the Malayan Archipelago. Chiefly on this account, I have arranged the list into several parts, separating the land-, freshwater-, and sea-shells, and have even attempted to make a peculiar division for those which live in mangrove-swamps and at the mouths of rivers, as we there find intermingled at the same spot air- and water-breathing mollusca and species of genera which are generally admitted as marine with others of a more fluviatile character. I am well aware that this division of submarine Mollusca cannot be strictly limited either from the marine or from the fluviatile forms; but it may, nevertheless, be useful to emphasize them in this way, as, otherwise, even the distinction between marine and fluviatile occurrence remains doubtful and arbitrary for some species.

I have also tried to add, for distinction's sake *in italics*, a sketch of the geographical distribution of the single species, by naming the chief localities in which they have hitherto been found; many of these statements are taken from the collections in the Berlin Museum, the rest from the more reliable conchological authors. If hitherto the "habitat" of the species

was unknown (or at least not stated in the standard conchological works), the sign † is added. By this the reader will arrive easily at the following conclusions:—

A. Terrestrial Mollusca: the greater number of the species are either confined to the Tenasserim coast or range only into the next adjacent countries, as Pegu, Arakan, or the Malayan Peninsula. Only the small-sized *Stenogyra gracilis* is spread throughout continental India and the Malayan Archipelago.

B, C. Fluviatile and Submarine Mollusca: most of them are wider spread, chiefly in the direction of Siam and the Malayan Archipelago, and are also found in Bengal; but only few range much further to the west.

D. Marine Mollusca: a very considerable number of species range westwards to the shores of Eastern Africa, even into the Red Sea, and eastwards to the Polynesian islands, several southwards to Natal and to the subtropical parts of Australia, and northwards to China and Southern Japan. Only one (*Natica unifasciata*) is stated with tolerable certainty to live also on the west coast of America; and very few (*Octopus rugosus*, *Lima squamosa*, and *Pholas striata*) are known also as inhabitants of the Atlantic; among these are some which are liable to be spread by currents and drift-wood. Several Oriental species, however, are represented in the West Indies by species so nearly allied, that even the specific discrimination remains doubtful (*Littorina scabra*, *L. intermedia*, and *L. angulifera*, *Planaxis pyramidalis* and *P. sulcatus*, and *Asaphis deflorata*).

List of Shells collected at Mergui and its Archipelago.

A. TERRESTRIAL MOLLUSCA.

OPERCULATA.

1. Cyclophorus aurantiacus, *Schumacher*. (Plate XIV. figs. 1–6, and Plate XV. figs. 1–6.)

A number of rather large-sized specimens of *Cyclophorus* have been collected, which are very near to one another, but exhibit some differences in the elevation of the spire, the width of the umbilicus, and the colours of the peristome. They form a nearly continuous chain from the flat widely-umbilicated *C. pernobilis*, Gould, to the more turbinated narrowly-umbilicated *C. malayanus*, Reeve; so much so that I dare not venture to

break up this chain into several distinct species, but shall enumerate the different forms as varieties, and quote for each the corresponding figures in published conchological works. The following characters are common to all these forms:—

(1) A prominent, somewhat mammillate apex with moderately deep sutures and moderately vaulted, worn, reddish-brown surface of the upper whorls.

(2) Faint spiral striæ, sometimes almost imperceptible, and rather coarse, often wrinkle-like lines of growth on the last two whorls.

(3) The periphery of the shell is slightly keeled at the beginning of the last whorl; this angularity either remains throughout to the aperture, or vanishes altogether in the larger part of the last whorl.

(4) The upper surface of the last two whorls is densely marked with chestnut-brown, more or less dark, only there is a very narrow pale or whitish bandlet just above the periphery; the lower surface of the last whorl is nearly continuously dark brown near the periphery, then the brown is broken up into several narrow bandlets separated by a whitish underground, and the sides of the umbilicus are whitish, with or without brown bandlets.

(5) The peristome thickened, reflected, and in most of the specimens distinctly double; its colour varies from pure yellow to pale scarlet. The aperture is somewhat more broad than high.

(*a*) *typicus*: depressus, umbilico perlato, subangulato; subcarinatus, subtus maxima ex parte albus, peristomate intense aurantiaco. Diameter major testæ 55–60, altitudo 33–36, aperturæ (incluso peristomate) diameter 28–31, altitudo 27–30 millim. (Pl. XIV. figs. 1, 2.)

Chemnitz, Conchylien-Cabinet, vol. ix. figs. 1064, 1065, copied in the new edition by *Küster and Pfeiffer*, Cyclostoma, pl. 4. figs. 8, 9. Type of *Annularia aurantiaca*, Schumacher, 1817.

The figures are drawn from a specimen found on *Salang Island* by Capt. John Weber, and preserved in the Zoological Museum of Berlin, for comparison's sake, as specimens of this extreme form have not been found in the localities explored by Dr. Anderson. The locality of the original specimen, described by Chemnitz, cannot be ascertained. Nevill, Hand-list, i. p. 266, mentions it from *Moulmein* and *Pegu*.

(*b*) *pernobilis*: maximus, subdepressus, umbilico paulum arctiore, subangulato; subcarinatus, peristomate rufo-aurantiaco. Diam. maj. 69, alt. 47; apert. diam. 39, alt. 35 millim. (Pl. XIV. figs. 3, 4.)

Cyclostoma pernobile, *Gould, Boston Journ. of Nat. Hist.* 1844, iv. p. 458, pl. 24. fig. 11, copied in *Pfeiffer & Küster, Cyclost.* pl. 3. fig. 15. —Cyclophorus aurantiacus, *Reeve, Conch. Icon.* vol. xiii. pl. i. fig. 3.

King Island. Gould's specimens are from *Tavoy*.

(*bb*) Paulo minor. Diam. maj. 60, alt. 40; apert. diam. 31–34, alt. 30 millim. (Pl. XIV. figs. 5, 6.)

King Island.

Numerous distinct dark spiral bandlets on the lower face, and even within the umbilicus, are to be seen in the figure given by Gould and in the smaller specimens from King Island; they are scarcely perceptible in the larger specimens from King Island.

(*c*) *Nevilli*: magnus, subturbinatus, umbilico arctiore, rotundatus, periomphalio fusco-fasciolato, peristomate aurantio. Diam. maj. 55–58, alt. 37–41; apert. diam. 30–33½, alt. 29–31 millim. (Pl. XV. figs. 1, 2.)

Cyclostoma aurantiacum, *Pfeiffer & Küster, Cyclostoma*, pl. 23. figs. 4, 5. —Cyclophorus pernobilis, *Nevill, Hand-list*, i. p. 266 (specimens given to the Berlin Museum); *Theobald & Hanley, Conchologia Indica*, pl. 1. fig. 7.

Sullivan Island. *Salang Island* (Weber).

(*d*) *Reevei*: mediocris, subturbinatus, umbilico multo arctiore, infra fasciolatus, apertura subcirculari, peristomate aurantio. Diam. maj. 52, alt. 37; apert. diam. 28, alt. 27 millim. (Pl. XV. figs. 3, 4.)

Cyclophorus speciosus (*Philippi*), *Reeve, Conch. Icon.* xiii. pl. i. fig. 4.— C. malayanus (*Benson*), *Theobald & Hanley, Conch. Ind.* pl. 28. fig. 4.

Mergui; King Island, Sullivan Island.

(*dd*) minor.

Elphinstone Island.

(*e*) *Andersoni*: minor, subturbinatus, umbilico sat arcto, subangulatus, apertura subcirculari, peristomate rubescente. Diam. maj. 44–48, alt. 31–36; apert. diam. 24–27, alt. 23–25 millim. (Pl. XV. figs. 5, 6.)

Cyclophorus malayanus (*Benson*), *Reeve, Conch. Icon.* xiii. pl. i. fig. 2.

Much like *C. sublævigatus*, Blanford, in the 'Conchologia Indica,' pl. 37. fig. 4.

Owen Island.

N.B.—*Cyclophorus speciosus*, Philippi, Zeitschr. f. Malacozoologie, 1847, p. 123 (*Cyclostoma*), figured by Pfeiffer & Küster, Cyclost. pl. 25. figs. 1–3; Pfeiffer, Mon. Pneum. i. p. 56, locality unknown, appears to be a species distinct from all these forms, and perhaps the same as that figured in the 'Conchologia Indica,' pl. 33. fig. 4, under the name of *aurantiacus*; the figure called *C. speciosus* in this last work, pl. 104. figs. 4 & 7, is again different. The true *C. malayanus*, Bens., from Penang Island, is, according to the figure given by F. Stoliczka in Journ. As. Soc. Bengal, vol. xli. pt. 2, pl. 10. fig. 5, remarkably more conical and elevated than any of the varieties of *aurantiacus* here described.

2. Cyclophorus ophis, *Benson*; *Theob. & Hanl. Conchol. Ind.* pl. 144. fig. 6.

Allied to *C. aquila*, Sow., but the peristome very broad.

Elphinstone Island.

3. Cyclophorus expansus, *Pfeiffer*, *Proc. Zool. Soc.* 1851, p. 242; *Mon. Pneum.* i. p. 65; *Pfeiffer & Küster*, Cyclostoma, pl. 39. figs. 20, 21; *Reeve, Conch. Icon.* xiii. pl. v. fig. 18; *Conchol. Indica*, pl. 2. figs. 3, 4. (Pl. XV. figs. 7, 8.)

Mergui. (Seems confined to the Tenasserim coast.)

In the specimens collected by Dr. Anderson the expansion of the peristome is still broader than in the figures given by Reeve and the Conchol. Ind.

4. Cyclophorus zebrinus, *Benson*.

(*a*) *typicus*: acute angulatus, peristomate albo.—*Benson, Asiat. Journ.* v. 1836, p. 355; *Pfeiffer & Küster*, Cyclost. pl. 34. figs. 21–23; *Mon. Pneum.* i. p. 71; *Conchol. Ind.* pl. 2. fig. 2; *Nevill, Hand-list*, i. p. 268.

King Island. I cannot distinguish the specimens collected on that island from the normal *zebrinus*, which is stated to live on the Khasi hills. *Khasi hills*, *Bhamo* (Anderson).

(*b*) *aureolabris*.—*Nevill, Hand-list Moll. Ind. Mus.* i. p. 268. Peristome intensely yellow.

Mergui. *Sibsagar* (Peale).

(*c*) *ambiguus*: minor, obtuse angulatus, costulis spiralibus obsolescentibus, fulvus, infra suturam maculis fuscis et albidis ornatus, subtus fasciolatus, umbilico sat angusto, peristomate albido. Diam. maj. 28, alt. 21; apert. diam. et alt. 15 millim. (Pl. XV. fig. 9.)

Mergui, Owen and Sullivan Islands. Allied to *C. Cantori*, Bens., from Penang Island, in which, however, the last whorl is distinctly more inflated above and below; also *C. Cantori* varies considerably in size at the same locality, for instance, between diam. maj. 21 and 27.

5. Lagochilus scissimargo, *Benson*; *Blanford, Ann. & Mag. Nat. Hist.* (3) xiii. p. 452; *Conchol. Ind.* pl. 6. fig. 7.

Sullivan Island.

6. Leptopoma vitreum, *Chemnitz*; *Reeve, Conch. Icon.* xiii. pl. iii. fig. 15.

Uniformly white variety. Diam. 16, alt. 16, apert. 10 millim.

Sullivan Island. *Nicobars, Salang, most islands of Malayan Archipelago.*

7. Leptopoma aspirans, *Benson, Conchol. Ind.* pl. 6. fig. 4.

Sullivan Island; only a young specimen. *Tenasserim and Pegu.*

8. Megalomastoma (Coptochilus) sectilabre, *Gould, Bost. Journ. Nat. Hist.* 1844, vol. iv. p. 459, pl. 24. fig. 10; *Conchol. Ind.* pl. 7. fig. 3.

King Island. *Penang, Perak.*

9. Helicina arakanensis, *Blanford, Contributions to Indian Malacology*, v. 1865, p. 21; *Conchol. Ind.* pl. 6. fig. 9; *Pfeiffer, Mon. Pneum.* iv. p. 283.

Sullivan Island. *Arakan, Pegu, Andaman Islands.*

STYLOMMATOPHORA.

10. Nanina (Hemiplecta) retrorsa, *Gould, Bost. Journ. Nat. Hist.* 1844, iv. p. 455, pl. 24. fig. 5; *Pfeiffer, Monogr. Heliceorum*, i. p. 77, Helix, pl. 110. figs. 4–6; *Conchologia Indica*, pl. 25. fig. 6.

Sinistral, distinctly perforate, the keel blunt in full-grown specimens. Young specimens are comparatively higher than adult ones.

Pataw, Mergui; Elphinstone, Sullivan, King, and Owen Islands. Also collected previously by Rev. Fr. Mason at *Tavoy*, and by Theod. Philippi at *Mergui*.

11. Nanina (Rotularia) anceps, *Gould, loc. cit.* iv. p. 454, pl. 24. fig. 4; *Pfeiffer, Mon. Hel.* i. p. 80, Helix, pl. 88. figs. 8–10; *Stoliczka, Journ. As. Soc. Bengal*, vol. xl. pt. 2, p. 231, pl. 17. figs. 1–3; *Conchol. Ind.* pl. 30. fig. 1.

Sharply carinated, nearly imperforate.

Mergui and Sullivan Island. *Tavoy, Moulmein.*

12. Nanina (Durgella?) honesta, *Gould*; *Pfeiffer*, *Mon. Hel.* i. p. 57; *Stoliczka*, *loc. cit.* p. 248, pl. 17. figs. 6–14; *Conchol. Ind.* pl. 90. fig. 10.

Sullivan Island, Owen Island. *Moulmein*, *Arakan*.

13. Macrochlamys resplendens, *Philippi*, *Zeitschr. f. Malakozool.* 1846, p. 192; *Pfeiffer*, *Mon. Hel.* i. p. 56, Helix, pl. 110. figs. 7–9; *Conchol. Ind.* pl. 51. fig. 4; *Godwin-Austen*, *Land-Moll. of India*, iv. pl. 26. fig. 1.

Zediwon, near Mergui, Sullivan Island, King Island. *Mergui* (Th. Philippi), *Salang* (Weber), *Bhamo* (Anderson).

14. Macrochlamys acerra, *Benson*; *Pfeiffer*, *Mon. Hel.* v. p. 100; *Conchol. Ind.* pl. 51. fig. 2.

Mergui, King Island, Owen Island. Hitherto only known from Mergui.

15. Macrochlamys convallata, *Benson*; *Pfeiffer*, *Mon. Hel.* iv. p. 46; *Novitat. Conchol.* pl. 36. figs. 14–16; *Conchol. Ind.* pl. 88. figs. 2, 3.

Recognizable by the very narrow whorls.

Mergui, Sullivan and Owen Islands. *Tenasserim and Pegu*.

16. Macrochlamys pansa, *Benson*; *Pfeiffer*, *Mon. Hel.* iv. p. 28; *Novitat. Conch.* pl. 36. figs. 11–13; *Conchol. Ind.* pl. 56. fig. 1.

Upper surface rather flat and somewhat costulated.

Sullivan Island. *Ava*, *Prome*.

17. Helix (Philidora*) gabata, *Gould*, *loc. cit.* iv. p. 454, pl. 24. fig. 9 (1844); *Reeve*, *Conch. Icon.* vii. Helix, pl. 127. fig. 766; *Conchol. Ind.* pl. 14. fig. 4 (not good).

Helix merguiensis, *Philippi*, *Zeitschr. f. Malakozool.* 1846, p. 192; *Pfeiffer*, *Mon. Hel.* i. p. 397, Helix, pl. 106. figs. 7–9; *Reeve*, *Conch. Icon.* vii. pl. 176. fig. 1205; *Conchol. Ind.* pl. 14. fig. 7.

Mergui, King Island. *Tavoy*.

A very similar species lives on the northern and eastern part of the island of Celebes; it has been identified with *H. gabata* by H. Adams (Proc. Zool. Soc. 1865, p. 408); but by comparing the specimens collected by Dr. Anderson with those collected by Mr. Staudinger, and named *H. pilisparsa* by me (Sitzungsberichte d. Gesellsch. naturf. Freunde in Berlin, 1885, p. 192), I find the following differences:—

* J. de Morgan, "Moll. terr. et fluv. de Perak," in Bull. Soc. Zool. de France, 1885, x. p. 384, a paper with which the author became acquainted whilst this list was in the press.

H. gabata.	*H. pilisparsa.*
Mergui.	Minahassa.
Diam. maj. 18–20½, alt. 9–10 millim.	Diam. maj. 23, alt. 10.
The upper whorls rising each a little above the following.	The three upper whorls not rising one above the other.
Pale horn-colour, the keel somewhat darker brown, also in the last whorl; no peculiar coloration of the suture.	Pale greenish grey, the suture marked with a chestnut-brown band, the keel of the last whorl of the same colour as the rest of the shell.
Reflected part of the peristome narrow, about 1 millim.	Reflected part of the peristome broad, about 2 millim.
Umbilicus with nearly perpendicular walls.	Umbilicus with more sloping walls.

Helix pilisparsa is beset with short hairlets on its upper and lower face. Gould mentions no hairs in his description of *H. gabata*; and Anderson's specimens have no hairs, but they are all somewhat worn, and they show some roughness, which may be due to the presence of hairs in the fresh state. Philippi describes his *H. merguiensis* as "pilis sparsis brevibus obsita."

18. Bulimus (Amphidromus) atricallosus, *Gould*, *loc. cit.* (1844) vol. iv. p. 457, pl. 24. fig. 3; *Reeve*, *Conch. Icon.* v. Bul. pl. 31. fig. 188; *v. Martens*, *Ostasiat. Landschnecken*, p. 77.

Bulimus perversus, var., *Pfeiffer*, *Mon. Hel.* iii. p. 309, Bulimus *and* Achatina, pl. 40. figs. 10, 11.

Mergui forest and King Island. 17 dextral and 4 sinistral specimens have been collected. *Tavoy*, *Salang* (Weber), *Penang*.

19. Stenogyra gracilis, *Hutton*, *Journ. As. Soc. Bengal*, iii. p. 84 (Bulimus); *Pfeiffer*, *Mon. Hel.* ii. p. 157; *Reeve*, *Conch. Icon.* v. Bulimus, pl. 69. fig. 495; *v. Martens*, *Ostasiat. Landschnecken*, p. 375, pl. 22. fig. 13, pl. 19. fig. 5; *Conchol. Ind.* pl. 23. fig. 4.

Mergui.

Widely distributed from *Cisgangetic India* to *Amboina* and *Timor*, probably sometimes transported by human agency with vegetables, earth, &c.

20. Clausilia (Oospira) Philippiana, *Pfeiffer*, *Zeitschr. f.*

Malakazool. 1846, p. 69; *Mon. Hel.* ii. p. 423; *Küster, Monogr. of Clausilia*, pl. 11. figs. 7–9; *Conchol. Ind.* pl. 118. fig. 10.
Sullivan Island. *Mergui* (Th. Philippi).

20 a. Clausilia Andersoniana, *Möllendorff, Journ. As. Soc. Beng.* vol. li. pt. 2, p. 12, pl. 1. fig. 12.
"Nearly related to *Cl. insignis*, Gould, of the same province."
Mergui (*Nevill & Möllendorff*).

21. Streptaxis solidulus, *Stoliczka, Journ. As. Soc. Bengal*, xl. pt. 2, p. 166, pl. 7. fig. 10; *Pfeiffer, Mon. Hel.* vii. p. 493; *Conchol. Ind.* pl. 98. fig. 7.
Sullivan Island. *Moulmein.*

22. Succinea semiserica, *Gould, Proc. Bost. Soc. Nat. Hist.* ii. 1846, p. 100; *Pfeiffer, Mon. Hel.* iii. p. 10; *Conchol. Ind.* pl. 67. figs. 2, 3.
Mergui. *Tavoy, Moulmein, Rangoon, Arakan, Bengal.*

B. FRESH ATER MOLLUSCA.

23. Paludina digona, *Blanford, Proc. Zool. Soc.* 1869, p. 445; *Conchol. Ind.* pl. 115. fig. 7.
Perhaps only a variety of *P. bengalensis*, Lam. (see Nevill, Hand-list, vol. ii. p. 22), from which it is only distinguished by smaller size and by the two blunt keels continued also on the last whorl.
Rangoon. *Tavoy, Moulmein, Pegu.*

24. Ampullaria conica, *Gray*, var. expansa, *Nevill, Hand-list Moll. Indian Mus.* ii. p. 5.
Ampullaria paludinoides (*Cristofori Philippi* from Mangalore), *Conchol. Ind.* pl. 114. fig. 5.
Rangoon, with the preceding. *Pegu.*

25. Neritina (Neripteron) auriculata, *Lamarck in Encycl. Méthodique, Vers*, pl. 455. fig. 6; *Hist. Nat. Anim. s. Vert.* ed. 1, vi. p. 106, ed. 2, viii. p. 572; *Quoy & Gaimard, Voy. 'Astrolabe,' Atlas Zool.* pl. 65. figs. 6–8; *v. Martens, Neritina*, p. 30, pl. 6. figs. 13–15.
Sullivan Island, in fresh water. Fresh specimens marked with dark radiating bandlets. The species is widely distributed from *Ceylon* to the *Philippines, Moluccas*, and *New Ireland*; and lives elsewhere also in brackish water.

26. Neritina (Clithon) brevispina, *Lamarck, Hist. Nat. Anim. s. Vert.* ed. 1, vol. vi. p. 185, ed. 2, vol. viii. p. 572; *Sowerby, Thesaur. Conch.* vol. ii. pl. 110. figs. 45, 51, 52; *Reeve, Conch. Icon.* vol. ix. *Neritina*, pl. vi. fig. 28; *v. Martens, loc. cit.* p. 156, pl. 17. figs. 1–4.

King Island Bay, rocks in fresh water. Widely distributed from the *Nicobar* Islands to *New Caledonia*.

Var. mutica (without spines), *Sowerby, Thes. Conch.* ii. pl. 110. fig. 48; *v. Martens, loc. cit.* figs. 2, 3.

Neritina subgranosa, *Sowerby, Conchol. Illustr.* no. 41, fig. 14; *Thesaur. Conch.* ii. p. 524, pl. 110. fig. 35; *Reeve, Conch. Icon.* ix. Ner. pl. v. fig. 24.

On rocks, freshwater, Sullivan and King Island, with the preceding.

27. Neritina (Clithon) avellana, *Récluz, Revue zoologique*, 1842, p. 76; *Sowerby, Thesaur. Conch.* ii. p. 527, pl. 109. figs. 9, 10; *Reeve, Conch. Icon.* ix. Ner. pl. xiv. fig. 64; *v. Martens, Monogr. Neritina*, p. 174, pl. 18. figs. 5–9, & 11, 12.

Sullivan Island, with *N. auriculata* and *N. brevispina*, var. *mutica*.

The coloration is somewhat variable, yellowish or reddish or greenish, with scattered pale spots; some specimens also with interrupted dark bands.

Borneo, Philippines, Formosa.

Some other species of *Neritina*, see below nos. 56–59.

28. Unio marginalis, *Lamarck, Hist. Nat. Anim. s. Vert.*; *Reeve, Conch. Icon.* xvi. Unio, fig. 297; *Conchol. Ind.* pl. 43. fig. 2.

Rangoon. *Bengal.*

29. Cyrena proxima, *Prime, Annals of the Lyceum of Nat. Hist. of New York*, viii. 1864, p. 85, with woodcut.

Sullivan Island, fresh water. *Salang* (Weber), *Siam.*

C. SUBMARINE MOLLUSCA.

The estuaries of the rivers and the mangrove-swamps nourish a certain number of peculiar species of Mollusca, some of which are air-breathing, others truly aquatic; but all may be found at the same spot and are quasi-intermediate between the freshwater and truly marine fauna.

a. PULMONATA.

Auriculidæ.

30. Pythia plicata, *Férussac, Prodrome Tabl. Moll. Terr.* p. 101, no. 2 (Scarabus); *Küster, Monogr. Auriculacea*, p. 9, pl. 1. figs. 3, 4; *Pfeiffer, Mon. Auricul.* p. 76; *Reeve, Conch. Icon.* xii. Scarabus, fig. 23.

Rangoon, Zediwon near Mergui in mangrove-swamps. Among decaying vegetation flooded at spring-tides, King Island; on trunks of mangrove-trees, King Island. Found also in *Bengal*, the coast of *Coromandel*, *Rangoon*, *Moulmein*, *Pulo Penang*, and *Siam*.

31. Pythia trigona, *Troschel, Archiv f. Naturgeschichte*, 1838, p. 207, pl. 4. fig. 3; *Reeve, Annals & Mag. Nat. Hist.* 1st ser. vol. ix. 1842, p. 219, pl. 4. fig. 2; *Küster, Auricul.* pl. 1. fig. 6; *Pfeiffer, Mon. Auricul.* p. 75; *A. Adams and Reeve, Voy. of the 'Samarang,' Moll.* p. 56, pl. 14. fig. 12; *Reeve, Conch. Icon.* xii. Scarabus, fig. 22.

Still more compressed and comparatively shorter than the preceding.

Thapo, King Island; Sullivan Island. *Ceylon*, *Rangoon*, *Bintang*, *Borneo*, *Luzon*.

32. Cassidula auris-felis, *Bruguière, Pfeiffer, Mon. Auricul.* p. 118; *Küster, Auricul.* p. 13, pl. 4. figs. 9, 10, copied from *Chemnitz, Conch.-Cab.* ix. pl. 121. figs. 1043, 1044.

Auricula fusca, *Hombron et Jacquinot, Voy. au Pôle Sud, Moll.* pl. 9. figs. 7–0; *Reeve, Conch. Icon.* xx. Auricula, pl. iv. fig. 25.

Mergui, on mud-flats; King Island, mangrove-swamps; Kisseraing Island. Widely distributed in the *Malayan Archipelago* (*Java*, *Moluccas*, *Philippines*).

33. Cassidula Bensoni, *Pfeiffer, Novitat. Conchol.* i. pl. 12. figs. 17, 18; *Mon. Auricul.* p. 111.

Recognizable in fresh state by vertical rows of stout hairs.

Elphinstone Bay. *Port Canning*, *Singapore*, *Amboina*, *Luzon*.

34. Auricula Judæ, *L.*, *Pfeiffer, Monogr. Auricul.* p. 130; *Woodward, Man. Moll.* pl. 12. fig. 35; *Reeve, Conch. Icon.* xx. pl. iii. fig. 16, &c.; *Souleyet, Zool. of the Voy. of Bonite*, ii. p. 515, pl. 29. figs. 19, 20 (living animal).

Very variable in form and size; largest specimen 60 millim. long.

King Island and Kisseraing Island, Mergui. *Port Canning, Arakan, Penang, Andamans, Singapore.* Widely distributed in the *Malayan Archipelago*, extending to the *Philippines* and *Northern Australia.*

35. Auricula (Auriculastra) subula, *Quoy and Gaimard, Voy.* '*Astrolabe*,' *Moll.* ii. p. 171, pl. 13. figs. 39, 40; *Adams and Reeve, Voy.* '*Samarang*,' *Zool.* pl. 14. fig. 15, copied *Adams, Gen.* pl. 82. fig. 1; *Reeve, Conch. Icon.* xx. pl. ii. fig. 12; *v. Martens, Moll. Mauritius*, p. 207.

Mergui, on mud-flats. *Port Canning.* Throughout the *Malayan Archipelago* to *New Ireland.*

36. Melampus ceilonicus, *Petit, Proc. Zool. Soc.* 1842, p. 202; *Pfeiffer, Mon. Auricul.* p. 31.

King and Elphinstone Islands. Nearly one-coloured specimens. *Ceylon, Bombay.*

Onchidiidæ.

37. Onchidium verruculatum, *Cuvier, Semper, Reisen im Archipel der Philippinen*, vol. iii. 1877, p. 255, pl. 21. fig. 1, pl. 22. figs. 3, 4; *Bergh, Zool. Challenger*, vol. x. p. 148, pl. 8. fig. 14.

Dorsal tubercles rounded, rather large, nearly equal, some on the hinder part compound, brush-like; eye-spots in small groups on retractile tubercles. Colour above grey or greyish brown, with few scattered black spots; below pale, one-coloured.

Owen Island, littoral. *Red Sea, Nicobars, Moluccas, Timor, Australia, Japan.*

38. Onchidium tigrinum, *Stoliczka, Journ. As. Soc. Bengal*, vol. xxxviii. pt. 2, 1869, p. 105, pl. 15. fig. 2.

Dorsal tubercles very small and numerous, not crowded, intermixed with some larger ones, which are sometimes very long and soft; some with eye-spots. Colour above brown, marbled with large black spots, which are often confluent in a longitudinal direction; below pale yellow; only the head grey or nearly black. Also in this species the dorsal eye-spots are grouped to 2–3 on large retractile tubercles, as in the preceding and the following species.

Sullivan Island. *Port Canning.*

39. Onchidium coriaceum, *Semper, loc. cit.*

Dorsal tubercles small, unequal; eye-spots in small groups. Colour above brown, with very large black patches, one longitudinal in the median line; under surface of the mantle blackish. Mantle rather rigid.

Sullivan Island, highest "level of beach." *Nicobars, Singapore, Siam, Philippines, Moluccas, Australia.*

Amphibolidæ.

40. Ampullarina burmana, *Nevill, Journ. As. Soc. Bengal*, 1867, pl. 2. figs. 7–10.

Mergui, on mud-flats. *Mouth of the Irawaddi, Pegu, Bombay.*

b. PECTINIBRANCHIA and SCUTIBRANCHIA.

Columbellidæ.

41. Columbella (Pusiostoma) Duclosiana, *Sow.*, *Reeve, Conch. Icon.* xi. pl. xv. fig. 76.

Mergui, mud-flats, in society with *Neritina crepidularia*. King and Elphinstone Islands.

This is the only species of Rhachiglossate proboscidiferous Gastropods; its dull-brown colour differs remarkably from that of other *Columbellæ*, and agrees more with that of the inhabitants of brackish water. *Malacca, Singapore.*

Cerithiidæ.

42. Cerithium patulum, *Sow. Thes. Conch.* vol. ii. p. 871, pl. 179. fig. 74; *Reeve, Conch. Icon.* xv. pl. v. fig. 33.

Cerithium gibberosum, *Dunker, Moll. d. Novara Exped.* pl. 1. fig. 7.

Recognizable by a strong rough varix on the back of the last whorl opposite to the aperture.

Mergui, King Island Bay, littoral. Elphinstone Island Bay, on trunks of mangrove-trees; Kisseraing Island. *Singapore, Celebes, Moluccas, Philippines, Carolines.*

43. Potamides (Cerithidea) obtusus, *Sow.*, *Kiener, Species d. Coq.*, Cerithium, pl. 29. fig. 2; *Hombron & Jacquinot, Voy. Pôle Sud, Moll.* pl. 23. fig. 3; *Reeve, l. c.* xv. Cerithidea, pl. i. fig. 4.

Mergui, King Island Bay, on mangroves. *Nicobars?, Salang, Singapore, Celebes, Caroline Islands.*

44. Potamides (Cerithidea) quadratus, *Sow.*, *Reeve, Conch. Icon.* xv. Cerithidea, pl. i. fig. 5.

King Island. *Salang, Malacca, Singapore.*

45. Potamides (Cerithidea) fluviatilis, *Potiez and Michaud, Galérie d. Moll.* pl. 31. figs. 19, 20; *Kiener*, Cerithium, pl. 29. fig. 3; *Reeve, Conch. Icon.* xv. Tympanotonos, pl. ii. fig. 9.

Murex cingulatus, Gmelin, Chemnitz, Conch. Cab. vol. iv. fig. 1492, is probably the same species.

Mergui, King Island Bay, littoral; Elphinstone Island, on trunks of mangrove-trees and on sand below them, immediately below high-water mark; Sullivan Island, 4 fathoms; Sullivan, high-water mark. *Salang, Singapore.*

46. Potamides (Cerithidea) alatus, *Philippi, Abbildungen*, Cerithium, pl. 1. fig. 11.

Very near *Cerithium micropterum*, Kiener.

Mergui, mud-flats; Kisseraing Island; Laloon Bay, Elphinstone Island. *Madras.*

47. Planaxis pyramidalis, *Gmelin, Chemnitz, Conch.-Cab.* vol. iv. figs. 1170, 1171; *Reeve, Conch. Icon.* xx. pl. i. fig. 4; *Quoy & Gaimard, Voy. 'Astrolabe,' Moll.* pl. 33. figs. 25–29.

Ngā Islet in King Island Bay, in grass at the spring-tide level; Owen and Sullivan Islands. *Red Sea, Zanzibar, Mauritius, Seychelles, Tranquebar, Ceylon, Salang, Penang, Singapore, Celebes, Philippines, Vanikoro, New Caledonia.*

Very near *P. sulcatus*, Born, from the West Indies.

Littorinidæ.

48. Littorina scabra, *L.*, *Rumph. Amboinsche Rariteitkamer*, p. 98, pl. 29. fig. Y (Buccinum foliorum); *Philippi, Abbild.*, Lit. pl. 5. figs. 3–5; *Reeve, Conch. Icon.* vol. x. Littorina, pl. v. fig. 21.

Mergui, King Island, mangrove-swamps; Cruro islet, between King Island and Hayes Island, on mangrove-trees flooded at spring-tides; Elphinstone Island, on stems of mangrove-trees at high-water level; Sullivan Island. *Zanzibar, Mauritius, Seychelles, Ceylon, Salang, Singapore, Moluccas, New Guinea, Tonga.*

49. Littorina intermedia, *Philippi, Abbildungen*, Lit. pl. 5. figs. 8, 9 (not *Reeve, Conch. Icon.* x. pl. xviii. fig. 101).

Near to the preceding; but the last whorl quite round, without keel, and of smaller size.

Mergui, mud-flats; King Island; Elphinstone Island Bay, on

mangrove-trunks; Kisseraing. *Red Sea, Natal, Madagascar, Maldives, Ceylon, Nicobars, Mergui, Philippines, Samoa Islands, Tahiti.*

50. Littorina melanostoma, *Gray, Philippi, Abbild.*, Lit. pl. 5. fig. 16; *Reeve, Conch. Icon.* x. pl. ix. fig. 45.

Mergui, King Island Bay, in grass and on mangrove-trees at spring-tide level. *Ceylon, Singapore, Borneo.*

51. Littorina rubropicta, n. sp. (Pl. XVI. fig. 2, *a–f.*) Testa elato-conica, solida, anfractibus plano-declivibus, spiratim sulcatis, ultimo ad basin carina crassiuscula prominula cincto; pallide flava, strigis sanguineis rectis vel obliquis, interdum interruptis picta; apertura parviuscula, margine columellari sat dilatato. Long. 18, diam. 11; aperturæ long. $9\frac{1}{2}$, diam. 6 millim.

Number of the spiral furrows on the last whorl between the suture and the keel 7–9, on the base 10–12; keel in some specimens subnodulose.

King Island Bay, in grass and on mangrove-trees flooded at spring-tides.

L. conica, Philippi, *loc. cit.* vol. iii. p. 9, pl. 6. figs. 1, 2, and Reeve, *l. c.* x. pl. viii. fig. 36, Nevill, Hand-list, ii. p. 149, found by Th. Philippi at Mergui, appears to be very near to this variety; but is described as being a thin shell, and its colours are different. The variety of *L. carinifera* figured by Philippi, *loc. cit.* pl. 5. fig. 24, agrees very much with our specimens. *L. arboricola*, Reeve, *l. c.* x. pl. vi. fig. 27, is quasi-intermediate between this species and *L. scabra.*

Paludinidæ.

52. Stenothyra monilifera, *Benson, Annals & Mag. Nat. Hist.* (2) xvii. 1856, p. 497; *Conchol. Indica*, pl. 37. fig. 4; *Nevill, Hand-list*, ii. p. 44.

Mergui, on mud-flats in society with *Assiminea* and *Ampullarina. Tavoy.*

Assimineidæ.

53. Assiminea brevicula, *Pfeiffer* (Hydrocena), *Mon. Pneum.* ii. *Suppl.* p. 156; *Nevill, Journ. As. Soc. Bengal*, vol. l. pt. 2, 1881, p. 159, pl. 7. figs. 6, 6*a*; *Hand-list*, ii. p. 67.

Assiminea miniata, *v. Martens, Ann. & Mag. Nat. Hist.* 1866, 3rd ser. vol. xvii. p. 204.

Recognizable by its bright red colour and an impressed line below the suture.

Mergui, on mud-flats, with the preceding. *Irawady delta, Arakan, Andamans, Malacca, Singapore, Borneo, Philippines, Amoy.*

Neritidæ.

54. Nerita lineata, *Chemnitz, Reeve, Conch. Icon.* vol. ix. Nerita, pl. iii. fig. 13; *Hombron & Jacquinot, Voy. Pôle Sud, Moll.* pl. 17. figs. 23–25; *Tenison-Woods, Proc. Linn. Soc. of N. S. Wales*, vol. v. 1880, p. 120; *v. Martens, Monogr. of* Nerita, p. 15, pl. 4. figs. 12–15.

Mergui, mud-flats; King Island; Elphinstone Island, on sands immediately below high-water mark, on mangrove-trees; Crow Islet between King and Hayes Islands, high-water level; Kisseraing Island.

Ranges from Mergui and the Nicobars to North-eastern Australia and Viti Islands. *Mergui, Nicobars, Penang, Singapore, Siam, Philippines, Northern Australia, Samoa and Viti Islands.*

55. Nerita planospira, *Anton, Verzeichniss der Conchylien*, 1839, p. 30; *Philippi, Abbildungen*, Nerita, fig. 1; *v. Martens, Nerita*, p. 23, pl. 4. figs. 4–7.

Nerita atropurpurea, *Récluz, Revue Zool.* 1841, p. 107; *Journal de Conchyliologie*, i. pl. 11. fig. 3; *Reeve, l. c.* ix. pl. viii. fig. 38.

Elphinstone Island Bay, on mangrove-trunks. *Nicobars, Singapore, Java, Celebes, Moluccas, West Australia, Philippines, Samoa Islands, Carolines.*

56. Neritina (Dostia) crepidularia, *Lam. Hist. Nat. Anim. s. Vert.* ed. 1, vi. p. 185, ed. 2, viii. p. 572; *Sowerby, Conchol. Illustr.* Neritina, fig. 25; *Thes. Conch.* ii. pl. 113. figs. 139–144; *Reeve, Conch. Icon.* vol. ix. Neritina, pl. viii. fig. 38; *v. Martens, Monogr.* Neritina, p. 37, pl. 7. figs. 1–14.

Rangoon; Mergui, mud-flats; Elphinstone Island Bay, sand-flats; Sullivan Island, highest tide-level, and tidal stream; Kisseraing Island.

The variety with blackish-coloured aperture (*N. cornu-copiæ*, Benson, *N. melanostoma*, Troschel) has been found intermingled with typical red-coloured specimens at three of these localities: Mergui, Elphinstone Island Bay, and Kisseraing Island. At

Mergui this species lives associated with *Nerita lineata* and *Columbella Duclosiana*. *Bengal, Tranquebar, Mergui, Singapore, Bangkok, Java, Borneo, Celebes, Philippines, Japan.*

57. Neritina (Dostia) Guerinii, *Récluz, Revue Zool.* 1841, p. 314; *Sowerby, Thesaur. Conch.* ii. pl. 111. fig. 272.

A pretty little shell, shining blackish with white spots.

Mergui, mud-flats, associated with *Assiminea brevicula*; King Island. *Sumatra.*

58. Neritina (Clithon) Sowerbyana, *Récluz, Proc. Zool. Soc.* 1842, p. 174; *Sowerby, Thes. Conch.* ii. pl. 109. figs. 5–8; *Reeve, Conch. Icon.* ix. pl. xx. fig. 89, *a–d*; *v. Martens, Monogr.* Neritina, p. 172, pl. 18. figs. 1–4.

King Island, littoral; and Elphinstone Island Bay.

This species was hitherto not known so far westward, its geographical distribution ranging from *Southern Japan* and *China* to the *Gulf of Siam* and the *Philippines*. At *Hongkong* I have found it also in sea-water, in company with *Littorina.*

59. Neritina (Clithon) Ualanensis, *Lesson, Voy. de la 'Coquille,' Zool.* p. 379; *Reeve, l. c.* ix. pl. xxxvi. fig. 168; *v. Martens, Monogr.* Neritina, p. 193, pl. 20. figs. 1–24.

Neritina Mertoniana, *Récluz, Proc. Zool. Soc.* 1843, p. 71; *Sowerby, Thes.* ii. figs. 242–246.

A handsome little species, resembling somewhat *N. virginea*, L., from the West Indies, but essentially distinct in the operculum; extremely variable in colours, usually ornamented with very fine dark lines on a shining greenish ground.

Elphinstone Island, immediately below high-water mark, on sand; King Island; Sullivan Island, highest water-mark.

Widely distributed, extending from *Madras* and *Ceylon* to *Southern Japan*, the *Carolines*, *Viti Islands*, and *Northern Australia*. Commonly found in brackish water.

c. BIVALVIA.

Ostreidæ.

60. Ostrea cucullata, *Born, Testacea Musei Cæs. Vindob.* 1780, pl. 6. figs. 11, 12; *Reeve, Conch. Icon.* xviii. pl. xvi. fig. 34.

Shape of the shell very variable, often wrinkled and angular; size ordinarily rather small; substance solid, white; edges blackish

blue. Fixed on shells, stones, &c.; encrusting the rocks below high- and low-water levels.

Elphinstone Island Bay, and on sand below mangrove-trees. Widely distributed in the Indian seas. *Red Sea, Mozambique, Ceylon, Siam, Sumatra, Timor, Moluccas, Philippines.*

61. Ostrea mytiloides, *Lam.*, *Rumph. Amboin. Rariteit-Kamer*, pl. 46. fig. O; *Reeve, Conch. Icon.* xviii. pl. ii. fig. 3.

Of oblong flat shape. Ordinarily fixed on wood.

Elphinstone Island Bay, on stems of mangrove-trees. *Ceylon, Moluccas.*

62. Ostrea nigromarginata, *Sowerby*, *Reeve, l. c.* xviii. pl. 33. fig. 85.

Very flat and thin, inside white in the centre, dark violet at the periphery.

Elphinstone Island Bay, on the trunks of mangrove-trees. *Arakan.*

63. Ostrea echinata, *Quoy and Gaimard, Voy. 'Astrolabe,' Zool.* iii. p. 155, pl. 76. figs. 13, 14.

Ostrea spinosa (by mistake from the French name "épineuse" in the volume cited above), *Reeve, Conch. Icon.* xviii. pl. xxx. fig. 79.

Small, rather flat, beset with blunt blackish spines.

Elphinstone Island Bay, with the preceding on mangrove-trunks. *Amboina.*

64. Ostrea (Alectryonia) folium, *L.*, *Rumph. Amboinsche Rariteit-Kamer*, pl. 47. fig. A; *Chemnitz, Conch.-Cab.* vol. viii. figs. 662–666; *Lamarck, Hist. Nat. Anim. s. Vert.* ed. 2, vii. p. 232; *Reeve, Conch. Icon.* xviii. pl. xviii. fig. 40.

Elongated, sharply plaited, yellowish brown or reddish; one valve fixed by peculiar brackets to mangrove-branches.

King Island Bay. *Moluccas.*

Lucinidæ.

65. Lucina (Anodontia) edentula, *L.* (Venus), *Philippi, Zeitschr. f. Malak.* 1845, p. 180; *Abbildungen*, vol. ii. Lucina, pl. 1. fig. 1.

? Lucina Philippiana, *Reeve, Conch. Icon.* vol. vi. pl. v. fig. 23 (not good).

Shell thin, convex, rounded before and behind, with unequal strong lines of growth; in fresh state covered with a distinct pale grey-brown periostracum; hinge-line rather thin. No distinct impression at the hinder area.

Elphinstone and Sullivan Islands. *Moluccas.*

The peculiar periostracum, not before noticed in this species as far as I know, proves it to be also an inhabitant of brackish water.

66. Lucina (Anodontia) Philippinarum, *Hanley, Catal. Rec. Bivalv.* p. 348; *Reeve, Conch. Icon.* vi. pl. iv. fig. 18.

Shell rather square, abruptly truncated before, somewhat solid, compressed, encircled with regular concentric ribs at about equal distances; also covered with a distinct brown periostracum. The impression of the hinder area often rather faint, but always existing. Hinge-line rather solid; ligament very thick. Largest specimen 72 millim. high, 70 millim. long.

Elphinstone Island, Sullivan Island in brackish water, in company with *Cyrena*. Kisseraing, on mud-flats. *Singapore, Philippines.*

Lucina induta, Stoliczka, from Port Canning, is, according to specimens received by the author, a dwarf variety of this species. *Cycladichama luciniformis*, Valenciennes, Voy. au Pôle Sud, Moll. p. 116, pl. 26. fig. 3, from the Philippines, resembles also these two species, but is provided with distinct teeth in the hinge, which are wanting in both; and differs also somewhat in its outlines.

Tellinidæ.

67. Tellina (Macoma) birmanica, *Philippi, Abbildungen*, Tell. pl. 5. fig. 1; *Reeve, Conch. Icon.* vol. xvii. pl. xxxii. fig. 177.

Mergui, mud-flats. *Mergui.*

Mactridæ.

68. Lutraria elongata, *Gray, Reeve, l. c.* viii. pl. i. fig. 2.

More elongated, thinner, and more convex than most other sepcies of this genus; periostracum pale yellowish grey; rather small, 40 millim. long, 16½ millim. high.

Minthautoung, near Mergui.

Burrows on the banks of tidal estuary of Tenasserim river.

Pholadidæ.

69. Teredo (Calobates) thoracites, *Gould, Proc. Boston Soc. Nat. Hist.* vi. p. 15; *Wright, Trans. Linn. Soc.* xxv. 1866, pl. 64. figs. 6–12.

Elphinstone Island, from trunks of old mangrove. *Tavoy.*

D. TRULY MARINE MOLLUSCA.

a. CEPHALOPODA.

70. Octopus rugosus, *Bosc, d'Orbigny, Céphalopod. acétab. viv. et foss.* pl. 6.

Mergui, common. *Mauritius, Java, Philippines, also in the tropical part of the Atlantic.*

71. Loligo sumatrensis, *d'Orbigny, loc. cit.* pl. 13. figs. 1–3.

Mergui, common. *Sumatra, Philippines.*

72. Sepia aculeata, *Hasselt, d'Orbigny, loc. cit.* pl. 5 *bis.*

Mergui, common. *Banka, Java, Macassar, Philippines, Japan.*

b. GASTROPODA PROSOBRANCHIA.

Conidæ.

73. Conus suratensis, *Hwass, Kiener, Spec. Coq.* pl. 37. fig. 4; *Reeve, Conch. Icon.* vol. i. pl. iv. fig. 18.

King Island Bay. *Philippines.*

74. Conus achatinus, *Hwass, Kiener,* pl. 40. fig. 1, *a–c*; *Reeve, Conch. Icon.* i. pl. xxxv. fig. 191.

Elphinstone Island and King Island Bay. *Tranquebar, Singapore, Java, New Caledonia.*

75. Conus miliaris, *Hwass, Kiener,* pl. 13. fig. 1; *Reeve, Conch. Icon.* i. pl. xxxvi. fig. 198.

Owen Island. *Mauritius, Java, Moluccas, China Sea, Paumotu Islands.*

76. Conus (Hermes) terebra, *Born, Kiener,* pl. 36. fig. 2; *Reeve, Conch. Icon.* i. pl. vii. fig. 38.

Elphinstone Island Bay. *Mauritius, Ceylon, Java, Timor, Philippines, New Caledonia.*

77. Conus (Cylinder) textile, *L., Kiener,* pl. 90; *Reeve, Conch. Icon.* i. pl. xxxviii. fig. 209.

Elphinstone Island. *Red Sea, Mauritius, Ceylon, Andamans, Nicobars, Salang, Java, Moluccas, Timor, Society Islands, New Guinea, Philippines.*

78. Conus (Cylinder) auratus, *Hwass, Kiener,* pl. 86. fig. 2; *Reeve, Conch. Icon.* i. pl. xxv. fig. 141.

Owen Island. *Mauritius, Ceylon, Chain Island (Pacific).*

Pleurotomidæ.

79. Pleurotoma (Turris) armillata, *Reeve, Conch. Icon.* i. Pleurotoma, pl. xxi. fig. 176.

Sullivan Island, 7 fathoms. *Philippines.*

80. Pleurotoma (Drillia) crenularis, *Lam., Reeve, Conch. Icon.* i. Pleurotoma, pl. vii. fig. 54.

Mergui, King Island and Sullivan Island, 4 and 7–10 fathoms. *Tranquebar, Singapore.*

81. Pleurotoma (Surcula) javana, *L., Reeve, Conch. Icon.* i. pl. iv. fig. 28.

Pleurotoma nodifera, *Lam., Kiener, Icon.* pl. 12. fig. 1.

Sullivan Island, 7–10 fathoms; young specimens. *Madras, Tranquebar, Singapore, Java.*

82. Clavatula nitens, *Hinds, Voy. of the 'Sulphur,' Zool.* pl. 6. fig. 17; *Reeve, l. c.* i. Pleurotoma, pl. xxii. fig. 189.

Mergui. *Malacca, Macassar, New Guinea.*

83. Mangelia (?) polita, *Hinds, P. Z. S.* 1843; *Reeve, Conch. Icon.* i. Pleurotoma, pl. xviii. fig. 150.

With only vertical stout ribs.

Sullivan Island, 7–10 fathoms. *Macassar.*

84. Mangelia (?) Fairbanki, *Nevill, Journ. As. Soc. Bengal,* vol. xliv. pt. 2, 1875, pl. 7. fig. 2.

Sharply cancellated, sexangular.

Sullivan Island, 7–10 fathoms. *Bombay, Ceylon* ?, *Andamans* ?

Terebridæ.

85. Terebra strigilata, *L., Kiener,* fig. 18; *Reeve, Conch. Icon.* xii. pl. xviii. fig. 85.

Owen Island, 7 fathoms. *Mauritius, Singapore, New Guinea, Hawaiian Islands.*

86. Terebra (Abretia) tricolor, *Sow.*

Terebra tæniolata, *Quoy & Gaimard, Voy. 'Astrolabe,' Moll.* pl. 36. figs. 25, 26; *Kiener,* fig. 33.

Owen Island, 7 fathoms. *Tongatabu.*

87. Terebra (Abretia) Swainsoni, *Deshayes, Reeve, Conch. Icon.* xii. pl. xxii. fig. 118.

King Island, mud-bank, exposed at low water (dead specimens). *Sandwich Islands.*

88. Terebra (Abretia) serotina, *Adams and Reeve, Zool. Voy. 'Samarang,'* pl. 10. fig. 20; *Reeve, l. c.* xii. pl. xv. fig. 66.
Mergui, mud-flats; Sullivan Island, 7 fathoms. *Japan.*

89. Myurella longiscata, *Deshayes, Reeve, Conch. Icon.* xii. Terebra, pl. xxi. fig. 103.
Sullivan Island, 7 fathoms. *Philippines.*

Cancellariidæ.

90. Cancellaria costifera, *Sow., Reeve, l. c.* x. pl. xii. fig. 57.
Mergui and King Island, littoral; small-sized specimens. *Mauritius, Philippines.*

Muricidæ (*including* Purpuridæ).

91. Murex ternispina, *Lam., Reeve, Conch. Icon.* iii. pl. xix. figs. 73 & 76.
King Island Bay, mud-banks exposed at spring-tides, and at a depth of 7 fathoms; Laloon Bay, Elphinstone Island; Owen Island; Sullivan Island; 6–7 fathoms. *Madras, Salang, Singapore, Celebes.*

92. Murex (Chicoreus) adustus, *Lam., Kiener*, pl. 33. fig. 1; *Reeve, Conch. Icon.* iii. pl. viii. fig. 29.
King Island and Sullivan Island. *Mauritius, Ceylon, Andamans, Salang, Singapore, Java, Celebes, Philippines.*

93. Murex (Chicoreus) rubiginosus, *Reeve, l. c.* iii. pl. viii. fig. 32.
Owen Island. *Philippines.*

94. Murex (Chicoreus) torrefactus, *Sow., Reeve, Conch. Icon.* iii. pl. x. fig. 41.
Elphinstone Island Bay; King Island. *Philippines.*

95. Murex (Chicoreus) microphyllus, *Lam., Reeve, Conch. Icon.* iii. pl. x. fig. 40.
Elphinstone Island. *Ceylon, Singapore.*

96. Murex (Ocinebra) capucinus, *Chemnitz, Kiener*, pl. 45. fig. 2; *Reeve, Conch. Icon.* iii. pl. ii. fig. 10.
Kisseraing and Owen Islands. Small specimens of *Ostrea cucullata* are fixed on several of them. *Coromandel, Ceylon, Salang, Celebes.*

97. Ricinula muricina, *Blainville, Monogr. Gen. Poupre, Nouv. Annales du Muséum d'Hist. Nat.* i. 1832, pl. 10. figs. 2–4; *Kiener*, Purpura, figs. 13 & 15.

King Island; Elphinstone Island; Sullivan and Owen Islands. Very common, and variable in size and form. *Red Sea, Mauritius, Nicobars, Singapore, Celebes, Philippines, Hawaiian Islands.*

98. Ricinula tritoniformis, *Blainville, loc. cit.* p. 33, pl. 10. fig. 10; *Kiener*, Purpura, fig. 18.

King and Elphinstone Islands, littoral.

99. Ricinula musiva, *Kiener*, Purpura, fig. 22; *Reeve, Conch. Icon.* vol. iii. Purpura, pl. xi. fig. 52.

Black and red tubercles in alternating spiral rows.

King Island Bay. *Celebes.*

100. Ricinula parva, *Reeve, Conch. Icon.* iii. pl. vi. fig. 43.

Allied to the preceding.

King Island. *Philippines.*

101. Ricinula (Morula) tuberculata, *Blainville, loc. cit.*; *Kiener*, Purp. fig. 10; *Reeve, l. c.* iii. Ricinula, pl. ii. fig. 11.

Purpura granulata, *Duclos, Ann. Sci. Nat.* t. xxvi. 1832, pl. 2. fig. 9.

Sullivan and Owen Islands. *Red Sea, Zanzibar, Natal, Mauritius, Vizagapatam, Nicobars, Celebes, Polynesian Islands.*

102. Ricinula (Morula) Anaxares, *Duclos, loc. cit.*; *Kiener*, Purp. fig. 17; *Reeve, Conch. Icon.* iii. Purpura, pl. xii. fig. 17.

Sullivan Island. *Red Sea, Zanzibar, Mauritius, Polynesian Islands.*

103. Enzina mendicaria, *L.*, *Kiener*, Columbella, pl. 6. fig. 1; *Reeve, Conch. Icon.* iii. Ricinula, pl. ii. fig. 8.

King and Owen Islands, littoral. *Red Sea, Zanzibar, Natal, Mauritius, Ceylon, Andamans, Java, Philippines, New Zealand.*

104. Enzina zonalis, *Lam. Hist. Nat. Anim. s. Vert.* ed. 2, viii. p. 274 (Columbella); *Chemnitz, Conch.-Cab.* vol. ii. fig. 459.

Ricinula lineata, *Reeve, Conch. Icon.* iii. pl. vi. fig. 51.

Owen Island. *Philippines.*

105. Enzina concinna, *Reeve, l. c.* iii. Ricinula, pl. v. fig. 35.

King and Owen Islands. *Philippines.*

106. Purpura persica, *Gmelin, Kiener*, fig. 67; *Reeve, Conch. Icon.* iii. pl. ii. fig. .

Sullivan Island, littoral. A specimen of 105 millim. in length and 72 millim. breadth; *Ostrea cucullata* fixed to it. *Mauritius, Marquesas.*

107. Purpura (Stramonita) mancinella, *L.*, *Kiener*, fig. 46; *Reeve, Conch. Icon.* iii. pl. i. fig. 2; *Quoy & Gaimard, Voy.* '*Astrolabe*,' *Zool.* pl. 38. figs. 14–16.

Elphinstone Island. *Madagascar, Ceylon, Amboina.*

108. Purpura (Thalessa) hippocastanum, *L.*

Var. P. intermedia, *Kiener*, fig. 34.—P. distinguenda, *Dunker, Moll. d. Novara Exped.* pl. 1. fig. 3.

Mergui, Elphinstone Island; Crow Islet, between King Island and Hayes Island; Sullivan and Owen Islands. *Mauritius, Zanzibar, Nicobars.*

Var. Purpura bitubercularis, *Kiener*, fig. 32.—P. Kieneri, *Deshayes.*

Elphinstone Island; King Island. *Mozambique, Zanzibar, Moluccas, Australia.*

109. Purpura (Cuma) imperialis (*Blainville*?), *Kiener*, fig. 39; *Reeve, Conch. Icon.* iii. pl. vii. fig. 30.

Mergui †.

The original figure of Blainville, *loc. cit.* pl. 11. fig. 6, is rather different.

110. Purpura (Cuma) tiarella, *Lam.*, *Kiener*, fig. 41; *Reeve, Conch. Icon.* iii. pl. ix. fig. 39.

Nearly allied to the preceding.

Mergui, mud-flats. *Port Canning.*

The shell from Vanikoro, figured by Quoy and Gaimard, Voy. 'Astrolabe,' seems also very different, and resembles rather *Ricinula turbinella.*

111. Purpura (Cuma) sacellum, *Chemnitz, Conch.-Ca inet*, vol. x. figs. 1561, 1562; *Kiener*, Purpura, pl. 14. fig. 39 *a*; *Reeve, Conch. Icon.* iii. pl. xi. fig. 58.

King Island. *Tranquebar, Nicobars.*

112. Purpura (Cuma?) costata, *Blainville, Nouv. Annales Mus. Hist. Nat.* i. 1832, pl. 11. fig. 8; *Kiener*, fig. 51.

Purpura gradata, *Jonas, Philippi, Abbildungen*, Purp. fig. 2.

Purpura trigona, *Reeve, Conch. Icon.* iii. pl. xi. fig. 53.

Recognizable by its biconical form.

Mergui, Kisseraing, and Owen Islands, common. *Port Canning, Malacca, Singapore, Banka, North Australia.*

BUCCINIDÆ.

113. HEMIFUSUS TERNATANUS, *Gmelin, Chemnitz, Conch.-Cab.* vol. iv. figs. 1304, 1305; *Kiener*, Fusus, fig. 27; *Reeve, Conch. Icon.* iv. Pyrula, pl. ii. fig. 6.

King Island. *Singapore, Moluccas, Philippines.*

114. HEMIFUSUS (PUGILINA) PUGILINUS, *Born, Reeve, Conch. Icon.* iv. Pyrula, pl. i. fig. 1.

Pyrula vespertilio, *Lam., Kiener*, Pyr. pl. 12. fig. 1; *Eydoux & Souleyet, Voy. 'Bonite,' Zool.* pl. 42. figs. 7–12.

Mergui, Elphinstone Island Bay, sand-flat; Kisseraing Island. *Negapatam, Ceylon, Singapore, Borneo, Cochin China.*

115. POLLIA TRANQUEBARICA, *Gmelin, Chemnitz, Conch.-Cab.* vol. iv. figs. 1146, 1147; *Kiener*, Buccinum, fig. 92; *Reeve, Conch. Icon.* iii. Buccinum, pl. iii. fig. 17.

Sullivan Island, 5 fathoms. *Tranquebar.*

116. PHOS ROSEATUS, *Hinds, Zool. Voy. 'Sulphur,'* pl. 10. figs. 9, 10; *Sowerby, Thesaur. Conch.* iii. pl. 221. figs. 1–3.

Owen Island, 7 fathoms. *Sumatra, Amboina, Philippines.*

117. EBURNA CANALICULATA, *Schumacher.*

Eburna spirata, *Lam.* (not *Linné*), *Kiener*, pl. 1. fig. 1; *Reeve, l. c.* v. pl. i. fig. 7.

Periostracum distinct, somewhat velvety, pale brown.

Sullivan Island, 4 fathoms. *Ceylon.*

118. NASSA TÆNIA, *Gmelin.*

Buccinum olivaceum, *Bruguière, Kiener*, Bucc. fig. 53; *Reeve, l. c.* viii. Nassa, pl. iii. fig. 19; *Eydoux & Souleyet, Voy. 'Bonite,' Zool.* pl. 41. figs. 14–16.

The largest species of this genus, very variable in size; upper whorls ribbed; the ribs disappear sooner or later towards the last whorl.

King and Kisseraing Islands. *Mauritius, Andamans, Ceylon, Singapore, Moluccas.*

119. NASSA STOLATA, *Gmelin, Chemnitz, Conch.-Cab.* iv. figs. 1167, 1168.

Buccinum ornatum, *Kiener*, Bucc. fig. 83; *Reeve, Conch. Icon.* viii. Nassa, pl. v. fig. 33.

Last whorl very inflated; nearly smooth, white, with large chestnut bands.

Mergui. *Ceylon, Singapore, Java, Borneo.*

120. Nassa marginulata, *Lam.*, *Kiener*, Bucc. fig. 117; *Reeve, Conch. Icon.* viii. pl. vii. fig. 43.

Buccinum arcularia papillosa, *Chemnitz, Conch.-Cab.* vol. x. fig. 1474.

Vertical ribs; whorls angulated above.

Mergui, mud-flats; King Island, littoral; Elphinstone Island Bay and Sullivan Island, 7–10 fathoms. *Celebes.*

Var. hepatica, *Pulteney, Montagu, Testacea Britannica*, pl. 8. fig. 1; *Reeve, Conch. Icon.* viii. pl. viii. figs. 50, 51.

More elongated.

King Island. *Moluccas.*

121. Nassa, sp. indetermined.

Mergui, mud-flats; King Island, littoral.

Only young specimens, resembling *N. planicostata*, Reeve, Conch. Icon. viii. pl. xii. fig. 76.

122. Nassa ravida, *Adams, Reeve, l. c.* viii. pl. xi. figs. 68 & 74.

Sullivan Island, 7 fathoms. *Malacca, Philippines, Hawaiian Islands.*

Also only young specimens.

123. Nassa albescens, *Dunker, Philippi, Abbildungen*, Buccinum, pl. 2. fig. 15; *Reeve, l. c.* viii. Nassa, pl. xv. fig. 100.

Nassa bicolor, *Hombr. & Jacq. Voy. au Pôle Sud, Moll.* pl. 21. figs. 41, 42.

White, regularly granulated, angulated near the suture.

Owen Island. *Red Sea, Mauritius, Timor, New Guinea, Samoa and Viti Islands, Carolines.*

124. Nassa muricata, *Quoy and Gaimard, Voy. 'Astrolabe,' Zool.* pl. 32. figs. 32, 33; *Reeve, l. c.* viii. pl. xi. fig. 73.

Distinctly cancellated; the interstices broad, square, about four rows on the last whorls.

King Island. *Mauritius, New Ireland.*

Var. horrida, *Dunker, Philippi, Abbildungen*, Bucc. pl. 2. fig. 8; *Reeve, Conch. Icon.* viii. pl. xi. fig. 69.

Vertical ribs prevailing, the spiral liræ more numerous.

King Island. *Mauritius.*

125. Nassa nodata, *Hinds, Zool. Voy. 'Sulphur,'* pl. 9. figs. 14, 15; *Reeve, Conch. Icon.* viii. pl. vii. fig. 41.

Strongly cancellated, somewhat similar to the European *N. incrassata*. Last whorl angulated above.

King and Elphinstone Islands. *Malacca*.

126. Nassa lirata, *Marrat, On the Varieties of* Nassa, *Liverpool*, 1880, pl. 1. figs. 18, 19.

Last whorl angulated above; dark brown, with a pale orange band.

King Island. *Philippines*.

127. Nassa foveolata, *Dunker, Zeitschr. f. Malak.* 1847, p. 63; *Reeve, Conch. Icon.* viii. pl. xiii. fig. 83.

King Island †.

128. Nassa punctata, *Adams, Reeve, l. c.* viii. pl. viii. fig. 54.

Smooth, variegated with grey, yellowish and blackish; spire elongated, pointed.

Mergui; King Island and Owen Island. *Mauritius, Philippines*.

129. Nassa Thersites, *Bruguière, Rumph. Amb. Rar.* pl. 27. fig. N; *Kiener*, Bucc. fig. 113; *Reeve, l. c.* viii. pl. x. fig. 65.

Buccinum pullus, *Linné*.

Recognizable by the oblique hump-like smooth gibbosity on the back of the last whorl opposite to the aperture.

Elphinstone Island, on sand, plentiful; King Island. *Salang, Singapore, Philippines, New Guinea*.

Var. acypha, n. (Pl. XVI. fig. 1, *a*, *b*, *c*.)

The whole of the last whorl regularly vertically ribbed, with only faint indication of the characteristic hump.

Mergui.

130. Nassa cancellata, *Adams, Reeve, l. c.* viii. [pl. xxiii. fig. 155.

Mergui, mud-flats. *Mauritius, Philippines*.

131. Nassa labecula, *Adams, Reeve, l. c.* viii. pl. xxv. fig. 166.

King Island and Pilai Bay, living a little below high-water mark. *Celebes, Timor, Philippines*.

132. Nassa delicata, *Adams, Reeve, l. c.* [viii. pl. xxviii. fig. 180?

Owen Island, 7 fathoms. *Philippines*.

133. Nassa globosa, *Quoy and Gaimard*, *Voy.* '*Astrolabe*,' *Zool.* pl. 32. figs. 25–27; *Reeve*, *Conch. Icon.* viii. pl. x. fig. 62.

Buccinum clathratum, *Kiener*, fig. 108.

Owen Island. *Celebes*, *Moluccas*, *Timor*, *New Zealand*.

Fusidæ.

134. Fasciolaria filamentosa, *Lam.*, *Kiener*, pl. 8. fig. 1; *Reeve*, *Conch. Icon.* iv. pl. ii. fig. 4.

Mergui; Sullivan Island. *Red Sea*, *Zanzibar*, *Seychelles*, *Ceylon*, *Andamans*, *Java*, *Vanikoro*, *New Hebrides*.

Columbellidæ.

135. Columbella versicolor, *Sow. Thesaur. Conch.* i. figs. 41 & 46; *Reeve*, *Conch. Icon.* xi. pl. xi. fig. 51.

Columbella scripta, *Lam.*, *Kiener*, pl. 6. fig. 3 (not *scripta* of Linné).

Pale yellow, finely spotted; upper part of the last whorl white, gibbous, with orange patches.

King and Owen Islands. *Ceylon*, *Philippines*, *Chain Island* (*Pacific*).

136. Columbella pardalina, *Lam.*, *Kiener*, pl. 4. fig. 3; *Sowerby*, *Thesaur.* i. figs. 90–92; *Reeve*, *l. c.* xi. pl. xv. fig. 75.

Smooth, white, with round black or dark-brown patches.

King Island and Owen Island, littoral. *Singapore*, *Timor*, *Philippines*.

137. Columbella (Anachis) Terpsichore, *Sow. Thesaur.* i. figs. 98, 99; *Reeve*, *Conch. Icon.* xi. pl. xii. fig. 58.

Columbella lineolata, *Kiener*, pl. 13. fig. 3.

Vertically ribbed.

Sullivan Island, 7–10 fathoms. *Ceylon*, *Sumatra*, *Java*, *Amboina*.

Columbella Duclosiana. See above, no. 41.

Mitridæ.

138. Mitra (Nebularia) adusta, *Lam.*, *Chemnitz*, *Conch.-Cab.* vol. iv. fig. 136*a*; *Kiener*, fig. 15; *Reeve*, *l. c.* ii. pl. iv. fig. 25.

Laloon Bay, Elphinstone Island. *Moluccas*, *Timor*, *Philippines*, *New Guinea*, *Polynesian Islands*.

139. Mitra (Cancilla) circulata, *Kiener*, fig. 13; *Reeve*, *l. c.* ii. pl. xi. fig. 77; *Chemnitz*, *Conch.-Cab.* vol. iv. fig. 1391.

King Island. *Mauritius*, *Singapore*, *Philippines*.

140. Mitra (Cancilla) interlirata, *Reeve*, *l. c.* ii. pl. x. fig. 70.

Sullivan Island, 6 fathoms. *Mauritius*, *Philippines*, *Samoa*, *Viti*, *Hawaiian Islands*.

141. Mitra (Chrysame) cucumerina, *Lam.*, *Kiener*, fig. 24; *Reeve*, *Conch. Icon.* ii. pl. xxv. fig. 201; *Chemnitz*, *Conch.-Cab.* iv. figs. 1398, 1399.

King Island Bay, littoral; Owen Island. *Mauritius*, *Ceylon*.

142. Strigatella columbellæformis, *Kiener*, Mitra, fig. 46; *Reeve*, *Conch. Icon.* ii. Mitra, pl. xviii. fig. 138.

King Island Bay. *Samoa and Paumotu Islands*.

143. Strigatella scutulata, *Chemnitz*, *Conch.-Cab.* vol. x. figs. 1428, 1429; *Kiener*, Mitra, fig. 57; *Reeve*, *Conch. Icon.* ii. Mitra, pl. xii. fig. 82.

Sullivan Island. *Timor*, *Philippines*.

144. Strigatella paupercula, *L.*, var. virgata, *Reeve*, *Conch. Icon.* ii. Mitra, pl. xxv. fig. 197.

Owen Island. *Zanzibar*, *Kingsmill Island*.

145. Strigatella amphorella, *Lam.*, *Kiener*, fig. 56; *Reeve*, *Conch. Icon.* ii. Mitra, pl. xii. fig. 85.

Elphinstone Island Bay. *Borneo*, *Philippines*.

Marginellidæ.

146. Marginella (Glabella) elegans, *Kiener*, fig. 35; *Reeve*, *Conch. Icon.* xv. pl. ii. fig. 4; *Martini-Chemnitz*, *Conch.-Cab.* ii. figs. 426, 427.

King Island Bay, littoral; Elphinstone Island Bay, mud-flat. *Nicobars*, *Salang*, *Malacca*.

147. Marginella (Cryptospira) quinqueplicata, *Lam.*, *Kiener*, pl. 2. fig. 3; *Reeve*, *l. c.* xv. pl. x. fig. 40.

Laloon Bay, Elphinstone Island, and Elphinstone Island, sand-flat. *Penang*, *Malacca*, *Singapore*.

Olividæ.

148. Oliva Maura, *Lam.*, *Martini-Chemnitz*, *Conch.-Cab.* ii. figs. 472, 473; *Reeve*, *Conch. Icon.* vi. pl. vii. fig. 10 *d*.

Elphinstone Island Bay. *Red Sea*, *Mauritius*, *Ceylon*, *Andamans*, *Java*, *Borneo*, *Moluccas*.

149. Oliva scripta, *Lam. Encycl. Méth.*, Vers, pl. 362. fig. 4; *Chenu, Illustrations Conch.* pl. 11. figs. 13, 14; *Reeve, Conch. Icon.* vi. pl. xiv. fig. 27.

Oliva mauritiana, var., *Sowerby, Thes.* fig. 140.

Elphinstone Island. *Mauritius, Seychelles.*

150. Oliva Macleayi, *Duclos, Chenu, Illustr. Conch.* pl. 23. fig. 13–16.

Oliva maura, var., *Reeve, Conch. Icon.* vi. pl. vii. fig. 10*g*.

Sullivan Island. *Seychelles, Ceylon.*

151. Olivancillaria gibbosa, *Born, Martini-Chemnitz, Conch.-Cab.* ii. figs. 539, 540, 565, 566.

Oliva utriculus, *Lam., Chenu, Illustr. Conch.* pl. 18. figs. 1–3; *Reeve,* Oliva, pl. viii. fig. 12.

Elphinstone Island Bay. *Madras, Ceylon.*

152. Ancillaria ampla, *Gmelin.*

Ancillaria candida, *Lam., Kiener,* pl. 5. fig. 4; *Sowerby, Thesaur.* fig. 29; *Reeve, Conch. Icon.* xv. pl. viii. fig. 27.

Owen Island; Sullivan Island, 4 fathoms. *Red Sea, Madras, Ceylon.*

Cassididæ.

153. Cassis (Semicassis) pila, *Reeve, l. c.* v. pl. ix. fig. 21.

King Island Bay. *Salang, China Sea.*

154. Dolium fasciatum, *Bruguière, Kiener,* pl. 5; *Reeve, Conch. Icon.* v. pl. vii. fig. 11.

King Island. *Madras, Ceylon, Philippines.*

155. Ranella albivaricosa, *Reeve, l. c.* ii. pl. i. fig. 2.

Murex rana, *L., Chemnitz, Conch.-Cab.* iv. figs. 1268, 1269.

King Island Bay, mud-banks exposed at spring-tides. *Ceylon.*

156. Ranella tuberculata, *Broderip, Kiener,* pl. 12. fig. 2; *Reeve, Conch. Icon.* ii. pl. vii. fig. 36; *Eydoux & Souleyet, Voy.* '*Bonite*,' *Zool.* pl. 44. figs. 24, 25.

Mergui, King Island, littoral. *Vizagapatam, Andamans, Salang, Malacca.*

Cypræidæ.

157. Cypræa tigris, *L., Kiener,* pl. 1, pl. 45, & pl. 46. fig. 1; *Reeve, Conch. Icon.* iii. pl. iv. fig. 12; *Quoy et Gaimard, Voy.* '*Astrolabe*,' *Zool.* pl. 47. fig. 1.

Locality not stated. *Zanzibar, Mauritius, Ceylon, Andamans, Singapore, Java, Tonga.*

158. Cypræa onyx, *L.*, *Kiener*, pl. 44. fig. 1; *Reeve*, *Conch. Icon.* iii. pl. x. fig. 39 *a*.

King Island Bay. *Seychelles*, *Andamans*.

159. Cypræa vitellus, *L.*, *Kiener*, pl. 19. fig. 1; *Reeve*, *l. c.* iii. pl. v. fig. 14; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' *Zool.* pl. 48. figs. 8, 9.

King Island Bay. *Red Sea*, *Natal*, *Seychelles*, *Ceylon*, *Andamans*, *Singapore*, *Java*, *Moluccas*, *Tonga*.

160. Cypræa turdus, *Lam.*, *Kiener*, pl. 11. fig. 2; *Reeve*, *Conch. Icon.* iii. pl. ix. fig. 31.

Forbes Island; Sullivan Island. *Red Sea*, *Persian Gulf*.

161. Cypræa Lamarcki, *Gray*, *Reeve*, *l. c.* iii. pl. x. fig. 37.

Cypræa miliaris (non *Gmelin*), *Kiener*, pl. 30. fig. 2.

King Island Bay, littoral; Laloon Bay, Elphinstone Island. *Zanzibar*, *Salang*.

162. Cypræa caurica, *L.*, *Kiener*, pl. 10. fig. 2; *Reeve*, *Conch. Icon.* iii. pl. xi. fig. 46; *A. Adams and Reeve*, *Zool. Voy.* '*Samarang*,' *Moll.* pl. 5. fig. 5.

King Island Bay. *Red Sea*, *Zanzibar*, *Natal*, *Mauritius*, *Andamans*, *Singapore*, *Java*, *Timor*, *Moluccas*.

163. Cypræa erronea, *L.*, *Sowerby*, *Conchol. Illustr.* fig. 124.

Cypræa spurca, *Born*, *Test. Mus. Cæs. Vindob.* pl. 8. fig. 14.

Cypræa olivacea, *Lam.*, *Quoy and Gaimard*, *Voy.* '*Astrolabe*,' *Zool.* pl. 48. fig. 13.

King Island; Elphinstone Island; Owen Island. *Red Sea*, *Mauritius*, *Ceylon*, *Andamans*, *Singapore*, *New Guinea*.

164. Cypræa erosa, *L.*, *Kiener*, pl. 9. fig. 2; *Reeve*, *l. c.* iii. pl. xi. fig. 43; *Quoy and Gaimard*, *Voy.* '*Astrolabe*,' *Zool.* pl. 47. figs. 12, 13.

Laloon Bay, Elphinstone Island. *Red Sea*, *Natal*, *Mauritius*, *Ceylon*, *Andamans*, *Singapore*, *Moluccas*, *Java*.

165. Cypræa xanthodon, *Gray*, *Sowerby*, *Conchol. Illustr.* fig. 18; *Kiener*, pl. 57. fig. 3; *Reeve*, *l. c.* iii. pl. xiii. fig. 55.

King Island.

166. Cypræa mauritiana, *L.*, *Kiener*, pls. 39, 40; *Reeve*, *l. c.* iii. pl. i. fig. 1; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' *Zool.* pl. 48. figs. 2–4.

Casuarina Bay, Sullivan Island, littoral. *Mauritius*, *Ceylon*, *Andamans*, *Moluccas*, *New Zealand*.

167. Cypræa arabica, *L.*, *Kiener*, pl. 17. fig. 1; *Reeve, Conch. Icon.* iii. pl. i. fig. 2; *Quoy & Gaimard, Voy.* '*Astrolabe*,' pl. 48. fig. 5.

King Island, on rocks at spring-tide; Elphinstone Island; Sullivan Island; Owen Island. Mergui (*W. Jameson*). *Red Sea, Zanzibar, Natal, Mauritius, Andamans, Penang, Java, New Guinea.*

168. Cypræa moneta, *L.*, *Kiener*, pl. 34. fig. 1; *Reeve, l. c.* iii. pl. xv. fig. 74; *Quoy & Gaimard, Voy.* '*Astrolabe*,' pl. 48. fig. 7.

Great Western Torres Island. *Red Sea, Mauritius, Seychelles, Madras, Salang, Singapore, Tonga.*

169. Cypræa hirundo, *L.*, *Kiener*, pl. 32. fig. 1; *Reeve, Conch. Icon.* iii. pl. xix. fig. 104.

Elphinstone Island. *Mauritius, Ceylon, Java.*

170. Cypræa neglecta, *Sow. Conch. Illustr.* fig. 12 *; *Reeve, Conch. Icon.* iii. pl. xix. fig. 100.

Sullivan Island, littoral. *Mauritius*?

171. Cypræa Saulæ, *Gaskoin, Reeve, l. c.* iii. pl. xiv. fig. 62.

Elphinstone Island. *Manila.*

172. Ovula ovum, *L.*

Ovula oviformis, *Lam., Kiener*, pl. 1; *Reeve, l. c.* xv. pl. i. fig. 3; *Quoy & Gaimard, Voy.* '*Astrolabe*,' pl. 47. fig. 7.

Little Torres Island. *Seychelles, Ceylon, Andamans, Java, Celebes, Timor, Moluccas, New Guinea, Friendly and Society Islands.*

173. Ovula birostra, *Lam., Kiener*, pl. 5. fig. 1; *Reeve, Conch. Icon.* xv. pl. x. fig. 45.

King Island Bay, littoral. *Java* (Lamarck).

174. Ovula dentata, *Adams & Reeve, Zool. Voy.* '*Samarang*,' pl. 6. fig. 4; *Reeve, Conch. Icon.* xv. pl. viii. fig. 36.

King Island. *Singapore, Borneo, Japan.*

175. Ovula Trailli, *Adams, Reeve, l. c.* xv. pl. viii. fig. 38.

King Island Bay, littoral. *Malacca.*

176. Ovula fruticum, *Adams, Reeve, l. c.* xv. pl. iv. fig. 16.

King Island Bay, mud-bank exposed at low water. *Malacca.*

VELUTINIDÆ.

177. NARICA LIGATA, *Récluz*, *Monogr.* Narica, *Mag. Zool.* 1845, pl. 121. fig. 2. (Not Reeve, Conch. Icon. xx. Vanikoro, pl. i. fig. 6, which is much stronger cancellated.)

Islet in King Island Bay, littoral. *Philippines.*

NATICIDÆ.

178. NATICA MACULOSA, *Lam.*

Natica pellis-tigrina, *Chemnitz*, *Reeve*, *Conch. Icon.* ix. pl. xiii. fig. 57; *Eydoux & Souleyet*, *Voy.* '*Bonite*,' pl. 35. fig. 18.

Mergui, mud-flats; Elphinstone Island, sand-flat. *Ceylon*, *Salang*, *Singapore*, *Java*, *Siam*, *Philippines*, *Swan River.*

179. NATICA PULICARIS, *Philippi*, *Küster*, *Monogr.* Natica, pl. 13. fig. 9.

Columellar lip reddish yellow. Allied to *N. tincturata*, Reeve, Conch. Icon. ix. pl. xv. fig. 63.

Sullivan Island, 7–10 fathoms †.

180. NATICA HELVACEA, *Lam.*

Natica pallens, *Philippi*, *Zeitschr. Mal.* 1848, p. 157.

Natica globosa, *Deshayes*, *Reeve*, *l. c.* ix. pl. xi. fig. 46.

King Island Bay. *Mergui*, *Singapore*, *Java.*

181. NATICA UNIFASCIATA, *Lam.*, *Delessert*, *Recueil Coq.* pl. 32. fig. 13; *Reeve*, *l. c.* ix. pl. xii. fig. 49.

Elphinstone Island and Owen Island. *Red Sea*, *Mauritius*, *Salang*, ? *west coast of Central America.*

182. NATICA COLLIEI, *Récluz*, *Reeve*, *l. c.* ix. pl. xxiv. fig. 112.

Owen Island. *West Australia.*

183. NATICA (NEVERITA) CHEMNITZII, *Récluz*, *Chenu*, *Illustr. Conch.* pl. 3. fig. 4; *Eydoux & Souleyet*, *Voy.* '*Bonite*,' *Zool.* pl. 35. figs. 4, 5; *Reeve*, *l. c.* ix. pl. ii. fig. 7.

Natica didyma, *Philippi*, *Monogr.* pl. 1. figs. 1–4.

Owen Island. *Persian Gulf*, *Tranquebar*, *Mergui*, *Penang* (Eyd. & Soul. p. 575), *Singapore.*

184. NATICA (NEVERITA) ALBUMEN, *Gmelin*, *Reeve*, *l. c.* ix. pl. viii. fig. 31.

Owen Island, 7 fathoms. *Moluccas*, *Philippines.*

185. NATICA (POLINICES) MAMMILLA, *L.*, *Eydoux & Souleyet*, *Voy.* '*Bonite*,' *Zool.* pl. 35. figs. 16, 17; *Reeve*, *l. c.* ix. pl. vii. fig. 27.

King Island Bay; Laloon Bay, Elphinstone Island. *Red Sea*, *Zanzibar*, *Mauritius*, *Ceylon*, *Singapore*, *Celebes*, *Timor*, *Philippines.*

STROMBIDÆ.

186. STROMBUS LUHUANUS, *L.*, *Kiener*, pl. 27. fig. 1; *Reeve*, *l. c.* vi. pl. ix. fig. 19; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 31. figs. 3, 4.

Owen Island. *Reunion*, *Singapore*, *Java*, *Celebes*, *Timor*, *Moluccas*, *New Guinea*.

187. STROMBUS MAURITIANUS, *Lam.*, *Kiener*, pl. 27. fig. 2; *Reeve*, *l. c.* vi. pl. ix. fig. 20.

Mergui; King Island; Elphinstone Island Bay; Owen Island, 7 fathoms. *Red Sea*, *Mauritius*, *Ceylon*.

188. STROMBUS URCEUS, *L.*, *Kiener*, pl. 30. figs. 2, 3; *Reeve*, *l. c.* vi. pl. xi. fig. 24.

Elphinstone Island and Owen Island. *Red Sea*, *Ceylon*, *Salang*, *Singapore*, *Celebes*.

Var. PLICATUS, *Lam.*, *Kiener*, pl. 31. fig. 1; *Reeve*, *l. c.* vi. pl. ix. fig. 17; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 51. figs. 6, 7.

Owen Island. *Mauritius*, *Salang*, *Singapore*, *Java*, *Timor*, *Moluccas*, *New Guinea*, *Philippines*.

189. STROMBUS FLORIDUS, *Lam.*, *Kiener*, pl. 32. fig. 1; *Reeve*, *l. c.* vi. pl. vii. fig. 11; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 11. figs. 12, 13.

Mergui. *Red Sea*, *Zanzibar*, *Mauritius*, *Samoa*, *Viti*, *and Society Islands*.

190. STROMBUS CANARIUM, *L.*, *Kiener*, pl. 29. fig. 1; *Reeve*, *l. c.* vi. pl. 18. fig. 46; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 51. figs. 10, 11.

King Island, below low-water mark, in mud; Elphinstone Island; Sullivan and Kisseraing Islands. *Ceylon*, *Java*, *Borneo*, *Celebes*, *Moluccas*, *New Guinea*.

191. STROMBUS MARGINATUS, *L.*, *Kiener*, pl. 16. fig. 2; *Reeve*, *Conch. Icon.* vi. pl. xviii. fig. 49.

King Island, littoral, in pools on mud-banks exposed at spring-tides; Sullivan Island, 4 fathoms. *Tranquebar*, *Ceylon*, *Philippines*.

192. STROMBUS SUCCINCTUS, *L.*, *Kiener*, pl. 10. fig. 2; *Reeve*, *Conch. Icon.* vi. pl. xvii. fig. 43.

Sullivan Island Bay. *Ceylon*, *Java*, *Moluccas*, *Philippines*.

193. Pterocera lambis, *L.*, *Kiener*, pls. 3 & 4; *Reeve*, *Conch. Icon.* vi. pl. v. fig. 8; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 49. figs. 18–20, pl. 50. figs. 6–13.

Elphinstone Island Bay. *Red Sea*, *Zanzibar*, *Madagascar*, *Ceylon*, *Nicobars*, *Singapore*, *Java*, *Celebes*, *Timor*, *Moluccas*.

194. Rimella Tyleri, *H. Adams*, *Proc. Zool. Soc.* 1863, p. 428.

Sullivan Island, 7 fathoms. *China Sea.*

195. Terebellum subulatum, *Lam.*, *Kiener*, fig. 1; *Adams and Reeve*, *Voy.* '*Samarang*,' *Moll.* pl. 9. fig. 6; *Reeve*, *Conch. Icon.* xiv. pl. i. fig. 1.

King Island; Sullivan Island, 4 and 7–10 fathoms. *Mauritius*, *Ceylon*, *Philippines*, *China Sea.*

Cerithiidæ.

196. Cerithium (Vertagus) asperum, *L.*, *Reeve*, *Conch. Icon.* xv. Vertagus, pl. v. fig. 21.

Cerithium lineatum, *Lam.*, *Kiener*, pl. 21. fig. 1; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 54. figs. 7, 8.

Locality not indicated. *Red Sea*, *Zanzibar*, *Mauritius*, *Tranquebar*, *Ceylon*, *Andamans*, *Singapore*, *Moluccas*, *New Caledonia*, *Tonga.*

197. Cerithium (Aluco) obeliscus, *Bruguière*, *Kiener*, pl. 5. fig. 1; *Reeve*, *l. c.* xv. Vertagus, pl. ii. fig. 7.

Murex sinensis, *Gmelin*, *Chemnitz*, *Conch.-Cab.* iv. fig. 1489.

Mergui and Owen Island. *Red Sea*, *Natal*, *Seychelles*, *Ceylon*, *Salang*, *Singapore*, *Sumatra*, *Java*, *Timor*, *Moluccas*, *Southern China*, *Western Australia.*

198. Cerithium corallium, *Défrance*; *Kiener*, pl. 8. fig. 3; *Reeve*, *loc. cit.* xv. pl. v. fig. 29.

King Island and Elphinstone Island. *Ceylon*, *Singapore*, *Celebes*, *Moluccas*, *Philippines*, *Solomon Islands.*

199. Cerithium rubus, *Reeve*, *Conch. Icon.* xv. pl. xi. fig. 75 (not *rubus*, Martyn, Univ. Conch. pl. 75).

King Island, littoral; Laloon Bay, Elphinstone Island. *Ceylon.*

200. Cerithium rugosum, *Wood, Index Test. Suppl.* pl. 4, Strombus, fig. 10; *Kiener*, pl. 15. fig. 3; (*Reeve, l. c.* xv. pl. vii. fig. 45 ?).

Regularly granulated. Variable in colour: blackish, reddish brown, grey, sometimes banded.

King Island Bay; Elphinstone Island Bay, sand-flats; Owen Island. Common. *Red Sea, Zanzibar, Seychelles, Java, Moluccas, Philippines, Islands of the Pacific.*

201. Cerithium variegatum, *Quoy & Gaimard, Voy. 'Astrolabe,' Zool.* pl. 55. fig. 17; *Kiener*, pl. 15. fig. 2; *Reeve, Conch. Icon.* xv. pl. vii. fig. 41.

White, chequered with black and white.

King Island, littoral; Laloon Bay, Elphinstone Island; Owen Island. *Timor, Philippines, Tonga and Kingsmill Islands.*

202. Cerithium lemniscatum, *Quoy & Gaimard, Voy. 'Astrolabe,' Zool.* pl. 54. figs. 16–18; *Kiener*, pl. 16. fig. 1; *Reeve, Conch. Icon.* xv. pl. v. fig. 27.

Rather finely granulated; whitish, with broad yellow or reddish bands.

Rangoon; sand-flats, Elphinstone Island; Owen Island. *Bintang, Moluccas, Philippines, Vanikoro.*

203. Cerithium morum, *Lam., Kiener*, pl. 15. fig. 1.

With rather large black tubercles.

King Island, littoral; Laloon Bay, Elphinstone Island; Owen Island. *Red Sea, Mauritius, Persian Gulf, Bengal, Singapore, Java, Philippines, Vanikoro, Hongkong.*

All comparatively very small specimens, but full grown.

204. Cerithium obesum, *Sow., Reeve, l. c.* xv. pl. ix. fig. 62.

Nearly smooth; in other respects near the former species.

King Island, mud-bank exposed at low tide; Owen Island. *Timor, Philippines.*

205. Cerithium fusiforme, *Sow., Reeve, l. c.* xv. pl. viii. fig. 47.

King Island. *Philippines.*

Cerithium patulum, *Sow.*
Potamides, several species.
Planaxis pyramidalis.

See above, pp. 168, 169, nos. 42–47.

TURRITELLIDÆ.

206. TURRITELLA COLUMNARIS, *Kiener*, pl. 7. fig. 1; *Reeve, Conch. Icon.* v. pl. iv. fig. 14.

Rangoon; Sullivan Island, littoral, young specimens from 7–10 fathoms. *Ceylon.*

207. TURRITELLA TRISULCATA, *Lam.*, *Kiener*, pl. 11. fig. 1; *Reeve, loc. cit.* v. pl. v. fig. 17.

Elphinstone Island Bay. *Red Sea, Ceylon.*

208. TURRITELLA FASTIGIATA, *Adams and Reeve, Zool. Voy. 'Samarang,'* pl. 12. fig. 9; *Reeve, l. c.* v. pl. x. fig. 48.

Very slender and elongated, each whorl narrowed above.

Sullivan Island, 4 fathoms; young specimens. *China Sea.*

209. TURRITELLA CINGULIFERA, *Sow. Cat. of Shells Collect. Tankerville*, 1825, *Append.* p. xiv; *Reeve, l. c.* v. pl. xi. fig. 64.

Turritella fragilis, *Kiener*, pl. 8. fig. 3.

Small-sized, white, with chestnut spiral bands.

Sullivan Island, 4–6 fathoms. *Port Essington.*

LITTORINIDÆ.

210. LITTORINA PYRAMIDALIS, *Quoy & Gaimard, Voy. 'Astrolabe,' Zool.* pl. 33. figs. 12–15; *Philippi, Abbildungen*, Lit. pl. 2. figs. 19, 20; *Reeve, l. c.* x. pl. ii. fig. 14.

With two rows of rather stout tubercles on the last whorl.

Elphinstone Island Bay, on rocks at highest water-level; Owen Island, 4 fathoms; Sullivan Island. *Hongkong, Australia, Marquesas, New Zealand.*

211. LITTORINA GRANULARIS, *Gray, Zoology of Beechey's Voyage*, p. 140; *Reeve, l. c.* x. pl. xiii. fig. 68.

Whitish, more finely granulated.

King Island; Laloon Bay, Elphinstone Island; Sullivan Island. *Flores, Hongkong.*

For other species of *Littorina* see above, pp. 169, 170, nos. 48–51.

RISSOIDÆ.

212. RISSOINA (PHOSINELLA) CLATHRATA, *A. Adams, Proc. Zool. Soc.* 1851, p. 265; *Schwartz von Mohrenstern, Monogr.*

Rissoina (*Denkschr. Akad. Wien*, 1860), p. 169, fig. 49; *Reeve, Conch. Icon.* xx. Rissoa, fig. 76; *Nevill, Hand-list*, ii. p. 86.

King Island. *Red Sea, Andamans, Singapore, Philippines, Australia.*

Calyptræidæ.

213. Calyptræa Neptuni, *Schumacher* (Mitrula); *Martini-Chemnitz, Conch.-Cab.* vol. i. figs. 119, 120.

Calyptræa dormitoria, *Reeve, Conch. Icon.* xi. pl. ii. fig. 5.

Elphinstone Island Bay. *Mauritius, Philippines.*

214. Trochita extinctorium, *Lam., Martini-Chemnitz, Conch.-Cab.* vol. i. figs. 123, 124; *Reeve, l. c.* xi. Crucibulum, pl. v. fig. 14.

Resembling the European *T. sinensis*, L., but more pointed and marked with obliquely radiating pale-brown bands.

Sullivan Island, 4–5 and 7–10 fathoms. *Malacca.*

215. Crepidula (Siphopatella) Walchi, *Hermannsen* (named in memory of Prof. J. E. Walch of Jena, died 1778).

Crepidula excisa, *Philippi, Zeitschr. Mal.* 1849, p. 24.

Crepidula Walshi (err. typ.), *Reeve, l. c.* xi. pl. iii. fig. 17.

Crepidula plana, *Adams and Reeve, Zool. Voy. 'Samarang,'* pl. 11. fig. 3.

Elphinstone Island Bay; Sullivan Island, 4–5 and 7–10 fathoms; Owen Island. *Mergui, Ceylon, Singapore, China Sea.*

Solariidæ.

216. Solarium perspectivum, *L., Kiener*, pl. 1; *Reeve, Conch. Icon.* xv. pl. ii. fig. 11.

Laloon Bay, Elphinstone Island; Sullivan Island, 4 fathoms. *Red Sea, Madagascar, Zanzibar, Moluccas, Salang, Singapore, Java.*

Eulimidæ.

217. Eulima Martinii, *Adams, Sowerby, Thes.* fig. 8; *Reeve, Conch. Icon.* xv. pl. i. fig. 6.

King Island Bay, littoral. *Ceylon.*

218. Eulima (Leiostraca) bivittata, *Reeve, l. c.* xv. Leiostraca, pl. i. fig. 6.

Eulima bilineata, *Adams and Reeve, Zool. Voy. 'Samarang,' Moll.* p. 52, pl. 11. fig. 24. (Not *bilineata*, Alder.)

Sullivan Island, 7–10 fathoms. *Sooloo Sea.*

219. Stilifer, sp. indet.

Elphinstone Island Bay, in the ambulacral groove of a Starfish (*Goniaster*).

Neritidæ.

220. Nerita costata, *Chemnitz, Conch.-Cab.* vol. v. figs. 1966, 1967; *Reeve, Conch. Icon.* ix. pl. ii. fig. 6; *Martens-Küster, Monogr.* Nerita, pl. 4. figs. 8–11.

Crow Islet west of King Island; Sullivan Island, littoral. *Nicobars, Singapore, Java, east and west coast of Australia, Philippines, Carolines.*

221. Nerita chamæleo, *L., Hanley, Ipsa Linn. Conch.* pl. iv. fig. 8; *Hombron & Jacquinot, Voy. Pôle Sud, Moll.* pl. 16. figs. 1–6; *Sowerby, Thes.* iii. figs. 93–99; *Martens-Küster,* Nerita, pl. 5. figs. 5–15.

Nerita stella, *Chemnitz, Reeve, l. c.* ix. pl. xiii. fig. 60.

Very variable in colour.

King Island Bay, littoral; Crow Islet, between King Island and Hayes Island, at high-water level; Elphinstone Island; Owen Island. *Vizagapatam, Nicobars, Singapore, Gulf of Siam, Java, Celebes, Moluccas, Philippines, Hongkong, Samoa Islands.*

222. Nerita albicilla, *L., Chemnitz, Conch.-Cab.* vol. v. fig. 2000 *a–h*; *Quoy & Gaimard, Voy.* '*Astrolabe*,' pl. 65. figs. 17, 18; *Reeve, l. c.* ix. pl. xv. fig. 64.

King Island, littoral; Crow Islet, between King Island and Hayes Island, at high water; Elphinstone, Sullivan, and Owen Islands. *Natal, Mozambique, Mauritius, Seychelles, Persian Gulf, Ceylon, Nicobars, Singapore, Java, Celebes, Philippines, China, Japan, New Guinea, Samoa, Tonga, Tahiti.*

223. Nerita polita, *L., Chemn. Conch.-Cab.* v. figs. 2002–2012; *Reeve, l. c.* ix. pl. i. fig. 2.

King Island Bay, littoral; Crow Islet, between King Island and Hayes Island, at high water; Elphinstone Island Bay; Malcolm Island, littoral; Sullivan Island, high water; Owen Island. *Mauritius, Natal, Ormuz Island, Ceylon, Nicobars, Java, Moluccas, Timor, Philippines, Aru and Solomon Islands, Hongkong.*

Nerita lineata and planospira. See above, nos. 54, 55.

TROCHIDÆ.

224. TURBO MARMORATUS, *L.*, *Kiener*, pls. 1, 2; *Quoy & Gaimard, Voy.* '*Astrolabe*,' pl. 59. figs. 10–16; *Reeve, l. c.* iv. pl. i. fig. 2.

North of Elphinstone Island. *Seychelles, Moulmein, Celebes, Moluccas, New Guinea.*

225. TURBO MARGARITACEUS, *L.*, *Chemnitz, Conch.-Cab.* v. fig. 1762.

Turbo crassus, *Gray, Reeve, l. c.* iv. pl. iii. fig. 10.

Rangoon; Crow Islet, between King Island and Hayes Island, at high water; Elphinstone Island Bay; Owen Island. *Mauritius, Seychelles, Moluccas.*

226. TURBO ARGYROSTOMUS, *L.*, *Kiener*, pls. 37, 38.

Turbo margaritaceus, *Reeve, l. c.* iv. pl. vii. fig. 29.

Owen Island. *Ceylon.*

227. TURBO CONCINNUS, *Philippi-Küster, Monogr.* Turbo, pl. 11. fig. 6.

Turbo articulatus, *Reeve, l. c.* iv. pl. ix. fig. 39.

Elphinstone Island; Sullivan and Owen Islands. *Siam, Zanzibar, Ceylon.*

228. TURBO (LUNELLA) PORPHYRITES, *Martyn, Universal Conchologist*, pl. 72; *Reeve, l. c.* iv. pl. xi. fig. 53.

Turbo versicolor, *Chemnitz, Kiener*, pl. 7. fig. 2.

Mergui; King Island; Crow Islet, between King Island and Hayes Island; Elphinstone Island Bay; Sullivan Island, littoral; Owen Island. *Ceylon, Nicobars, Java, Timor, Moluccas, Philippines, New Ireland.*

229. DELPHINULA LACINIATA, *Lam.*, *Kiener*, pl. 1. fig. 1; *Reeve, Conch. Icon.* i. pl. ii. fig. 9.

Forbes Island. *Ceylon, Java, Celebes, New Ireland, Philippines, Moluccas.*

230. DELPHINULA ATRATA, *Chemnitz, Kiener*, pl. 2. fig. 1 *a*; *Reeve, l. c.* i. pl. i. fig. 4.

Mergui; Elphinstone Island Bay. *Ceylon, Salang, Singapore, Bintang, Philippines, Moluccas.*

231. CYCLOSTREMA REEVEANUM, *Hinds, Voy.* '*Sulphur*,' pl. 16. fig. 17; *Reeve, l. c.* i. Delphinula, pl. iv. fig. 87, and xix. pl. ii. fig. 13.

King Island Bay, littoral. *Malacca.*

232. Trochus niloticus, *L.*, *Chemnitz*, *Conch.-Cab.* v. figs. 1605 & 1614; *Kiener*, pl. 10; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 62. fig. 12. (Not Reeve, *l. c.* xiii. pl. i. fig. 3 *a*, which represents *T. maximus*, Koch. See Ann. & Mag. Nat. Hist. (3) xx. 1867, p. 97.

Largest specimen 110 millim. high, 126 millim. broad at the base.

Elphinstone Island Bay and Sullivan Island. *Ceylon*, *Nicobars*, *Singapore*, *Celebes*, *New Ireland*.

233. Trochus (Obeliscus) pyramis, *Born*.

Trochus obeliscus, *Gmelin*, *Chemnitz*, *Conch.-Cab.* v. fig. 1510; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 61. figs. 19, 20; *Kiener*, pl. 19. fig. 1; *Reeve*, *l. c.* xiii. pl. ii. fig. 8.

Mergui; Elphinstone Island Bay and Sullivan Island. *Ceylon*, *Singapore*, *Celebes*, *Philippines*, *New Ireland*, *Tonga*.

234. Trochus (Polydonta) maculatus, *L.*, *Chemnitz*, *Conch.-Cab.* v. figs. 1615–1624; *Kiener*, pl. 29. fig. 1; *Reeve*, *l. c.* xiii. pl. i. fig. 4.

Mergui, Sullivan Island, and Owen Island. *Singapore*, *Ceylon*, *Moluccas*, *Mozambique*, *Philippines*, *Timor*, *Port Essington*.

235. Trochus (Polydonta) costatus, *Gmelin*, *Chemnitz*, *Conch.-Cab.* v. figs. 1643, 1644.

Trochus maculatus, var., *Kiener*, pl. 29. fig. 1 *a*.

Trochus tentorium, *Reeve*, *loc. cit.* xiii. pl. iii. fig. 14.

Granules confluent in vertical rows.

Elphinstone Island. *Ceylon*, *Nicobars*.

236. Trochus (Polydonta) concinnus, *Philippi*, *Zeitschr. Mal.* 1846, p. 105; *Küster*, *Monogr.* Trochus, pl. 16. fig. 1; *Reeve*, *l. c.* xiii. pl. iii. fig. 15.

Trochus tubiferus, *Kiener*, pl. 37. fig. 3 (1852).

The granules of the lowest row above the suture increasing to large tubercles.

Owen Island. *Mauritius*.

237. Trochus (Polydonta) radiatus, *Gmelin*, *Chemnitz*, *Conch.-Cab.* v. fig. 1642; *Reeve*, *l. c.* xiii. pl. xiv. fig. 80; *Kiener*, *Fischer*, pl. 97. fig. 1.

Owen Island. *Madagascar*, *Ceylon*, *Java*, *Philippines*.

238. Clanculus atropurpureus, *Gould*, *U. S. Exploring Exped.*, *Moll.* fig. 224, p. 189.

King Island; Owen Island; Sullivan Island. *Samoa Islands*.

239. Monodonta labio, *L.*, *Chemnitz*, *Conch.-Cab.* v. figs. 1579, 1580; *Philippi-Küster*, Trochus, pl. 27. figs. 1–3; *Woodward*, *Man. Moll.* pl. 10. fig. 11.

King Island, littoral; Crow Islet, between King and Hayes Islands, at high water; Elphinstone Island; Sullivan Island. *Singapore*, *Madagascar*, *Seychelles*, *Ceylon*, *Nicobars*, *Celebes*, *Moluccas*, *Philippines*, *Hongkong*, *North Australia*.

240. Monodonta canalifera, *Lam. Encycl. Méth.*, *Vers*, pl. 447. fig. 5; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 64. figs. 26–29.

Mergui; Owen Island. *Philippines*, *Moluccas*, *Timor*, *New Ireland*.

241. Monodonta (Euchelus) scabra, *Philippi-Küster*, *Monogr.* Trochus, p. 262, pl. 39. fig. 2.

King Island, 7 fathoms †.

242. Monodonta (Euchelus) quadricarinata, *Chemnitz*, *Conch.-Cab.* vol. xi. figs. 1892, 1893.

King Island, littoral. *Hongkong*.

243. Monodonta (Euchelus) tricarinata, *Lam.*, *Delessert*, *Recueil Coq.* pl. 36. fig. 8; *Philippi*, pl. 27. fig. 8.

Monodonta multicarinata, *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' pl. 63. figs. 25–27.

Sullivan Island. *Australia*.

244. Gibbula (Minolia) biangulosa, *Adams*, *Proc. Zool. Soc.* 1856, p. 49.

Margarita triangulosa, *Reeve*, *Conch. Icon.* vol. xx. pl. iii. fig. 26.

Sullivan Island, 7–10 fathoms. *Siam*.

245. Chrysostoma nicobaricum, *Gmelin*, *Chemnitz*, *Conch.-Cab.* v. figs. 1822–1825; *Reeve*, *l. c.* iv. Turbo, pl. xi. fig. 48.

Owen Island. *Singapore*, *Banka*, *Celebes*, *Moluccas*, *Philippines*.

246. Rotella vestiaria, *L.*, *Reeve*, *l. c.* xx. pl. iii. fig. 12.

Rotella lineolata, *Lam.*, *Kiener*.

Rocky islet, King Island Bay. *Madras*, *Ceylon*, *Singapore*, *Java*, *Philippines*, *New Ireland*.

247. Isanda pulchella, *A. Adams*, *P. Z. S.* 1853, p. 190. (Pl. XVI. fig. 3, *a–e*.) Testa sublenticularis, obtuse angulata, umbilicata, lævis, nitida, griseo-straminea, supra lineolis pallide

viridi-fuscis angulosis, sæpius in strigas latiores confluentibus, infra maculis albis picta; spira prominula, apice acutiuscula, albida; basi prope umbilicum latiusculum perspectivum radiatim corrugata et angulata; apertura subrhombea, valde obliqua, fauce margaritacea; peristomate recto, obtuso, albido, margine basali arcuato, margine columellari in callum linguiformem roseum umbilici partem obtegentem expanso. Diam. maj. 7 millim., min. 5½, alt. 4; apert. diam. 3 millim., alt. 2.

Owen Island, 7 fathoms. *Mindoro.*

A pretty little shell which, so far as I know, has not been figured hitherto. At first sight it appears to be a young *Rotella vestiaria*, L. (*lineolata*, Lam.); but even in the smallest specimens of *Rotella* which I have at my disposal, which are of the same size as this *Isanda*, the umbilicus is completely filled up by the callosity, whereas in the largest specimens of the present species the umbilicus is only covered halfway, and in smaller ones gradually less, or even not at all. The general aspect of the shell, however, is much more that of *Rotella* than that of the species of *Isanda* hitherto figured (Adams, Gen. Moll. pl. 46. fig. 2; Chenu, Manuel de Conchyliologie, i. p. 354, *I. coronata*; Reeve, Conch. Icon. vol. xix. Cyclostrema, pl. iii. fig. 23, *C. crenulifera*).

Fissurellidæ.

248. Fissurella Rueppelli, *Sowerby, Conch. Illustr.* fig. 75; *Reeve, Conch. Icon.* vi. fig. 54.

King Island, littoral. *Red Sea, Mauritius.*

249. Scutum unguis, *L., Hanley, Ipsa Linn. Conch.* p. 425, pl. iii. fig. 4.

Scutus corrugatus, *Reeve, Conch. Icon.* xvii. pl. ii. fig. 3.

King Island, sublittoral. *Mauritius, Singapore, Australia.*

Patellidæ.

250. Patella variegata, *Reeve, Conchologia Systematica*, pl. 136. fig. 1; *Conch. Icon.* viii. pl. xvi. fig. 36.

Sullivan Island. *Red Sea, Mauritius, Nicobars, Java, Moluccas, Australia.*

251. Patella stellæformis, *Reeve, Conch. Syst.* pl. 136. fig. 3.

Patella pentagona (*non Born*), *Reeve, Conch. Icon.* viii. pl. xx. fig. 48 *a–c*.

Chalky white, with very unequal ribs and scattered black spots between them.

Sullivan Island, littoral. *Philippines, Polynesian Islands.*

Polyplacophora.

252. Chiton (Acanthopleura) spiniger, *Sowerby, Conch. Illustr.* fig. 68; *Reeve, Conch. Icon.* iv. pl. xiv. fig. 75.

King Island and Crow Islet between King Island and Hayes Island; Sullivan Island; Owen Island. *Red Sea, Zanzibar, Nicobars, Java, Timor, Philippines, New Guinea, Northern Australia.*

253. Chitonellus fasciatus, *Lam., Quoy & Gaimard, Voy. 'Astrolabe,'* pl. 73. figs. 21–29; *Reeve, l. c.* iv. pl. i. fig. 2.

Sullivan Island. *Celebes, Moluccas, Timor, Australia, Tonga, New Ireland.*

c. GASTEROPODA OPISTHOBRANCHIA.

Siphonariidæ.

254. Siphonaria stellata, *Helbling in Abhandl. böhm. Priv. Gesellsch.* iv. 1779, pl. 1. fig. 11; *Martini-Chemnitz, Conch.-Cab.* i. figs. 88, 89 (Lepas exigua aurantia &c.).

Siphonaria exigua, *Sow. Gen. of Shells,* fig. 4.

Siphonaria luzonica, *Reeve, l. c.* ix. pl. vi. fig. 29.

King Island, littoral; Owen Island; Sullivan Island. *Nicobars, Singapore, Java, Celebes, Moluccas, Philippines, Vanikoro.*

Tornatellidæ.

255. Tornatella solidula, *L., Kiener,* fig. 2; *Reeve, Conch. Icon.* xv. pl. i. fig. 3.

Laloon Bay, Elphinstone Island; Owen Island, 7 fathoms. *Mauritius, Seychelles, Ceylon, Singapore.*

Bullidæ.

256. Bulla ampulla, *Reeve, Conch. Icon.* xvi. pl. i. fig. 3.

Laloon Bay, Elphinstone Island; Owen Island. *Mauritius, Seychelles, Ceylon, Salang, Singapore, Java, Timor, Philippines.*

257. Philine aperta, *L.*, *Reeve*, *Conch. Icon.* xviii. pl. i. fig. 2.
Sullivan Island, 4 to 7 fathoms. *Cape of Good Hope.*

Dorididæ.

258. Platydoris scabra, *Cuvier*, *Mém. Doris* (*Ann. Mus. Hist. Nat.* iv. 1804), p. 20; *Quoy & Gaimard*, *Voy.* '*Astrolabe*,' *Zool.* ii. p. 258, pl. 18. figs. 1, 2.
King Island. *Celebes*, *New Guinea.*

259. Doridopsis atromaculata, *Alder and Hancock*, *Trans. Zool. Soc.* v. p. 129, pl. 31. figs. 20–24.
King Island, sublittoral. *Madras.*

260. Doridopsis nigra, *Stimpson*, *Alder and Hancock*, *loc. cit.* p. 128, pl. 31. figs. 13–16.
King Island. *Madras*, *Ceylon*, *Loochoo Islands.*

261. Casella atromarginata, *Cuvier*, *loc. cit.* pl. 2. fig. 6.
Casella philippinensis, *Bergh in Semper Reis. Archip. Philipp.* vol. ii. pl. 33. fig. 1; *Abraham*, *Proc. Zool. Soc.* 1877, p. 229.
Elphinstone Island. *Philippines*, *Timor* (v. Martens, 1863), *New Guinea*, *Friendly Islands.*

Tritoniidæ.

262. Tritonia, sp. indet.
Elphinstone Island.

d. SCAPHOPODA.

263. Dentalium eburneum, *L.*
Dentalium politum (*L.*), *Deshayes*, *Monogr. in Mém. Soc. Hist. Nat. de Paris*, ii. 1825, p. 361, pl. 16. fig. 17; *Reeve*, *l. c.* xviii. pl. iii. fig. 16.
Dentalium annulatum, *Sow.*
Smooth, pale yellow, very elongated.
Sullivan Island, 7 fathoms. *Siam*, *Philippines.*

264. Dentalium variabile, *Deshayes*, *loc. cit.* p. 352, pl. 16. fig. 30; *Reeve*, *Conch. Icon.* xviii. pl. iv. fig. 26.
White, solid, 5–9-angulated.
Mergui, mud-flats; Sullivan Island, 7–10 fathoms. *Philippines.*

e. BIVALVIA.

Anomiidæ.

265. Anomia plenilunium, *Reeve, Conch. Icon.* xi. pl. i. fig. 2.
King Island. *Borneo.*

266. Placuna sella, *L.*, *Rumph. Amb. Rar.* pl. 47. fig. B; *Chemnitz, Conch.-Cab.* viii. fig. 714; *Reeve, l. c.* xviii. pl. i. fig. 1.
Dark purple, twisted.
King Island, in mud at low water at spring-tide. *Singapore.*

267. Placuna papyracea, *Lam.*, *Chemnitz*, viii. fig. 715; *Reeve, Conch. Icon.* xviii. pl. ii. figs. 2 *b*, *c*.
Placenta quadrangularis, *Retz.*
Purple-rayed, flat.
King Island. *Philippines, Australia.*

268. Placuna placenta, *L.*, *Chemnitz*, viii. fig. 716; *Reeve, Conch. Icon.* xviii. pl. iii. fig. 3 *d*.
Placenta orbicularis, *Retz.*
Orbicular, flat, white.
King Island; Elphinstone Island; Sullivan Island. *Ceylon, Singapore, Philippines, China, North Australia.*

Ostreidæ.

269. Ostrea sinensis, *Gmelin, Chemnitz, Conch.-Cab.* viii. fig. 668; *Reeve, Conch. Icon.* xviii. pl. iii. fig. 5.
A large dark-coloured specimen, 200 millim. long, 150 millim. broad.
Elphinstone Island; King Island. *China Sea.*

270. Ostrea permollis, *Sow.*, *Reeve, l. c.* xviii. pl. x. fig. 18?
King Island Bay; specimen fixed on *Pinna vexillum.*

271. Ostrea (Alectryonia) turbinata, *Lam.*, *Reeve, l. c.* xviii. pl. xiv. fig. 29.
King Island; Sullivan Island. *Red Sea, Mozambique.*

272. Ostrea crenulifera, *Sow.*, *Reeve, l. c.* xviii. pl. xxvii. fig. 67.
Mergui. *Red Sea.*

The species nos. 60–64, pp. 172–173, may be referred to here; and also *Ostrea cucullata*, Born, may be mentioned, as it occurs in the collection from truly marine localities, attached to the shells of a number of different species.

SPONDYLIDÆ.

273. SPONDYLUS PLURISPINOSUS, *Reeve, l. c.* ix. pl. v. fig. 18.
Elphinstone Island. *Philippines.*

274. PLICATULA DEPRESSA, *Lam.*, *Chemnitz*, *Conch.-Cab.* viii. fig. 482; *Sowerby*, *Thesaur.* i. pl. 90. fig. 7; *Reeve, l. c.* xix. pl. ii. fig. 7.
King Island. *Singapore.*

PECTINIDÆ.

275. PECTEN PORPHYREUS, *Chemnitz*, *Conch.-Cab.* viii. fig. 632.
Pecten senatorius, *Reeve, l. c.* viii. pl. xxi. fig. 81.
The ribs are tripartite; whereas they are simple in the true *P. senatorius*, Chemn.
King Island. *Red Sea*, *Mauritius*, *Salang*, *Moluccas.*

276. PECTEN HISTRIONICUS, *L.*, *Chemnitz*, viii. fig. 614; *Sowerby*, *Thes.* fig. 240; *Reeve, l. c.* viii. pl. xxix. fig. 130.
King Island. *Ceylon.*

277. PECTEN (VOLA) PYXIDATUS, *Born*, *Test. Mus. Cæs. Vindob.* pl. 6. figs. 5, 6; *Philippi*, *Abbild.* Pecten, pl. 1. fig. 2; *Sowerby*, *Thes.* figs. 34, 35; *Reeve, l. c.* viii. pl. xxiv. fig. 96.
Upper valve brown, spotted with white.
King Island, mud-banks exposed at spring-tide; Sullivan Island, 6 fathoms. *Tranquebar*, *Philippines*, *China*, *Australia.*

278. LIMA SQUAMOSA, *Lam.*, *Chemnitz*, viii. fig. 650; *Sowerby*, *Thes.* figs. 1 & 18; *Reeve, l. c.* xviii. pl. ii. fig. 10.
Number of ribs somewhat variable.
Mergui; King Island; Elphinstone Island. *Tranquebar*, *Ceylon*, *Singapore.*

279. LIMA (MANTELLUM) FRAGILIS, *Gmel.*, *Chemnitz*, viii. fig. 650; *Sow. Thes.* figs. 34–36; *Reeve, l. c.* xviii. pl. iv. fig. 18.
Lima linguatula, *Lam.*
King Island; Elphinstone Island; Owen Island, littoral. *Nicobars*, *Singapore*, *Timor*, *New Guinea*, *Kingsmill Islands.*

AVICULIDÆ.

280. AVICULA (MELEAGRINA) MARGARITIFERA, *L.* (*Pearl Oyster*); *Chemnitz*, viii. fig. 718; *Reeve, l. c.* x. pl. viii. fig. 21.

Large specimens 25 centim. broad, 19 millim. high. Edges yellowish, not blackish as in Australian specimens (*Reeve*, *l. c.* x. pl. i. fig. 1).

Elphinstone Island; Owen Island. *Red Sea*, *Mauritius*, *Madras*, *Ceylon*, *Andamans*.

281. Avicula atropurpurea, *Dunker*, *Monogr.* Avicula *in Küster's Conch.-Cab.* pl. 3. fig. 3.

Shell rather square, dark-coloured.

Elphinstone Island †.

282. Avicula Chemnitzii, *Philippi*, *Zeitschr. f. Malak. Zool.* 1849, p. 20; *Chemnitz*, *Conch.-Cab.* viii. fig. 720; *Dunker*, *Monogr.* pl. 3. fig. 5.

Avicula prætexta, *Reeve*, *Conch. Icon.* x. pl. vii. fig. 15.

Shell orbicular, hinder wing very prominent.

Elphinstone Island. *China Sea*.

283. Avicula scabriuscula, *Reeve*, *l. c.* x. pl. xiv. fig. 54.

Obliquely elongated, covered with a net-like fibrous pale-brown periostracum, the scale-like prominences of which are comparatively much longer in young than in full-grown specimens.

King Island; Elphinstone Island. *Australia*.

284. Perna ephippium, *L.*, *Chemnitz*, vii. fig. 576. (Not *Reeve*, *l. c.* xi. pl. ii. fig. 8, which is a species from the West Indies.)

Mergui; King Island, on rocks; Crow Islet between King and Hayes Islands, beneath stones; Kisseraing Island. *Mozambique*, *Mauritius*, *Nicobars*, *Singapore*, *Celebes*, *Philippines*, *West Australia*.

285. Perna isognomon, *L.*, *Chemnitz*, vii. figs. 582–584; *Reeve*, *Conch. Icon.* xi. pl. v. fig. 24.

The relative length of the arm-like prolongation of the shell is very variable.

King Island; Elphinstone Island; Owen Island; Sullivan Island, coral bottom; Lampee. *Mozambique*, *Singapore*, *Philippines*.

286. Perna spatulata, *Reeve*, *Conch. Icon.* xi. pl. vi. fig. 28.

Oblong-oval.

King Island; Elphinstone Island. *Philippines*.

287. Perna legumen, *Gmelin*, *Chemnitz*, vii. fig. 578; *Reeve*, *Conch. Icon.* xi. pl. v. fig. 22.
Shell narrow, elongate, whitish.
Owen Island, coral-burrows. *Nicobars*, *Polynesia.*

288. Perna costellata, *Conrad*, *Reeve*, *l. c.* xi. pl. iv. fig. 16.
With the preceding.
Owen Island. *Society Islands.*

289. Malleus dæmoniacus, *Reeve*, *l. c.* xi. pl. ii. fig. 6.
With the two preceding.
Owen Island. *Singapore.*

290. Vulsella lingua-felis, *Reeve*, *l. c.* xi. pl. ii. fig. 13.
King Island; Elphinstone Island †.

Pinnidæ.

291. Pinna fumata, *Hanley*, *Reeve*, *l. c.* xi. pl. xv. fig. 27.
Locality not stated. *Philippines.*

292. Pinna atropurpurea, *Sow.*, *Reeve*, *l. c.* xi. pl. xxii. fig. 41.
King Island. *Moluccas.*

293. Pinna (Atrina) nigrina, *Lam.*, *Chemnitz*, viii. fig. 714; *Reeve*, *l. c.* xi. pl. iii. fig. 4.
King Island and Owen Island. *Mozambique*, *Philippines*, *New Guinea*, *New Caledonia.*

294. Pinna (Atrina) vexillum, *Born*, *Test. Mus. Cæs. Vindob.* pl. 7. fig. 3; *Chemnitz*, viii. fig. 783; *Reeve*, *l. c.* xi. pl. xix. fig. 36.
The limits between this and the preceding species are not quite definite.
King Island and Elphinstone Island. *Singapore*, *Philippines.*

295. Pinna (Pennaria) Hanleyi, *Reeve*, *l. c.* xi. pl. viii. fig. 15.
Pinna pectinata (*L.*), *Chemnitz*, viii. fig. 770.
Elphinstone Island. *Moluccas.*

296. Pinna (Cyrtopinna) incurvata, *Chemnitz*, viii. fig. 778; *Reeve*, *l. c.* xi. pl. v. fig. 8.
King Island; Elphinstone Island. *Nicobars*, *Banka*, *Moluccas.*

297. Pinna (Cyrtopinna) bicolor, *Chemnitz*, viii. fig. 780; *Reeve*, *l. c.* xi. pl. ix. fig. 17.
Pinna dolabrata, *Lam.*
King Island. *Red Sea*, *Malacca*, *Moluccas.*

298. Pinna (Cyrtopinna) madida, *Reeve, l. c.* xi. pl. xvii. fig. 31.
Elphinstone Island. *Port Essington.*
The last three species are very near to one another.

Mytilidæ.

299. Mytilus viridis, *L.*
Mytilus smaragdinus, *Chemnitz*, viii. figs. 745, 746; *Reeve, l. c.* x. fig. 28.
Mergui; King Island; Sullivan Island. *Tranquebar, Ceylon, Singapore, Siam, Borneo.*

300. Mytilus (Aulacomya) curvatus, *Dunker, Reeve, l. c.* x. pl. xi. fig. 53. (Pl. XVI. fig. 4, *a–d.*)
Varies considerably in outline in the same locality, some specimens being rather straight, others distinctly curved in different degrees. The curvature is probably caused by the position of the individual shell between its neighbours or other objects.
Crow Islet between King Island and Hayes Island, beneath stones at highest water-level; Elphinstone Island. *Philippines.*

301. Mytilus (Septifer) bilocularis, *L.*, *Chemnitz*, viii. figs. 736, 737.
Mytilus nicobaricus, *Reeve, l. c.* x. pl. ix. fig. 42.
Bluish green inside.
King Island; Elphinstone Island; Owen Island, coral-burrows. *Red Sea, Mauritius, Ceylon, Nicobars, Salang, Singapore, Australia, Japan.*

302. Mytilus (Septifer) excisus, *Wiegmann, Archiv f. Naturgeschichte*, 1837, p. 49 (Tichogonia); *Reeve, l. c.* x. pl. iv. fig. 13.
Septifer fuscus, *Récluz, Revue Zool.* 1848.
Inside dark purple and white.
Owen Island. *Mauritius, Mozambique.*

303. Mytilus (?Septifer) Andersoni, sp. n. (Pl. XVI. fig. 5.)
Testa rhombeo-trigona, præter strias incrementi lævis, nitida, olivacea; intus olivacea; marginis dorsalis pars tertia anterior valde ascendens, fere rectilinea, reliquum rotundatum, sensim descendens; margo ventralis fere horizontalis rectilineus; facies ventralis paulum concava, angulo tumido sat distincto circumscripta; septum simplex, margine libero leviter concavo, appendice nulla. Long. 16, alt. 9, crass. 8 millim.
The locality of this apparently new species is distinctly stated

as marine by the label "Lampee, 7 fathoms, 14. 1. 82." Nevertheless the whole appearance of the shell is that of the genus *Dreissena*, which lives in fresh and brackish water. The marine subgenus *Septifer*, which agrees with *Dreissena* in the presence of a septum on the inside of the umbones, is further distinguished by radial furrows at the outside, which are wanting in our species. But the essential difference between both genera is in the soft parts, the edges of the mantle being united for some extent on the basal part in *Dreissena*, whereas in *Septifer* they are quite free in that region. In one of Dr. Anderson's specimens portions of the mantle in the dry state are present and show no trace of coalescence at the lower side. For this reason, and also from its habitat, this species is to be referred to *Septifer* until further evidence is forthcoming.

D. carinata, Dunker, Dissert. de *Septiferis* et *Dreissenis*, 1885, p. 15, seems, according to the description, rather near to this species; but on comparing the type in Dunker's collection it is found to be a much smaller shell, of much narrower shape, and different coloration.

304. Modiola glaberrima, *Dunker*, *P. Z. S.* 1856, p. 363; *Reeve*, *Conch. Icon.* x. pl. viii. fig. 48.

Elphinstone Island. *Canton*, *Australia*.

305. Modiolaria arcuatula, *Hanley*, *Reeve*, *l. c.* x. Modiola, pl. vi. figs. 27 & 28.

Elphinstone Island. *Singapore*.

306. Modiolaria nana, *Dunker*, *Reeve*, *l. c.* x. Modiola, pl. x. fig. 69.

Sullivan Island, 6 fathoms. *Port Lincoln* (*Australia*).

307. Lithodomus gracilis, *Philippi*, *Abbild.* Modiola, pl. 2. fig. 1; *Reeve*, *l. c.* x. pl. i. fig. 4.

Elphinstone Island. *Malacca*, *China Sea*.

308. Lithodomus teres, *Philippi*, *loc. cit.* pl. 1. fig. 3.

Elphinstone Island; Sullivan Island; Owen Island, in coral. *Mauritius*, *Seychelles*, *Pacific*.

309. Lithodomus nasuta, *Philippi*, *loc. cit.* pl. 1. fig. 2; *Reeve*, *l. c.* x. pl. ii. fig. 10.

Owen Island, coral-burrows. *Zanzibar*, *Japan*; *also in the Atlantic*.

310. Lithodomus malaccana, *Hanley*, *Reeve*, *l. c.* x. pl. iv. fig. 20.

Sullivan Island and Owen Island, in coral. *Malacca*.

311. Lithodomus (Botula) cinnamomea, *Lam.*, *Chemnitz*, viii. fig. 731; *Reeve*, *l. c.* x. pl. i. fig. 5.

Owen Island, coral-burrows. *Red Sea*, *Mauritius*, *Nicobars*, *Philippines*.

Arcidæ.

312. Arca Kraussi, *Philippi*, *Abbild.* pl. 5. figs. 8–10; *Krauss*, *Südafr. Moll.* pl. 1. fig. 13.

Allied to *A. maculata*, Sow., Reeve, Conch. Icon. ii. pl. xi. fig. 71.

King Island. *Natal*.

313. Arca symmetrica, *Reeve*, *l. c.* ii. pl. xvii. fig. 117.

King Island, beneath stones at highest water-mark; Elphin stone Island; Kisseraing. *Singapore*, *Philippines*.

314. Arca (Barbatia) fusca, *Bruguière*, *Chemnitz*, vii. fig. 535; *Reeve*, *l. c.* ii. pl. xii. fig. 82.

Elphinstone Island; Owen Island, among old corals. *Red Sea*, *Seychelles*, *Singapore*, *Celebes*, *North Australia*.

315. Arca (Barbatia) setigera, *Reeve*, *l. c.* ii. pl. xiv. fig. 94

Sullivan Island, 6 fathoms. *Zanzibar*.

316. Arca (Barbatia) velata, *Sow.*, *Reeve*, *l. c.* ii. pl. xii. fig. 79; *Dunker*, *Novitates*, pl. 41.

King Island, littoral; Laloon Bay, Elphinstone Island. *Madras*.

317. Arca (Barbatia) decussata, *Sow.*, *Reeve*, *l. c.* ii. fig. 81.

Very variable in outline, according to the individual position.

Elphinstone Island; Sullivan Island; Owen Island, burrows in old corals; Allen Island. *Red Sea*, *Mauritius*, *Ceylon*, *Salang*, *Singapore*, *Celebes*, *Philippines*, *New Zealand*, *Viti and Paumotu Islands*.

318. Arca (Barbatia) signata, *Dunker*, *Novitates*, pl. 38 figs. 3–5.

King Island †.

319. Arca (Anadara) granosa, *L.*, *Rumph. Amb. Rar.* pl. 44. fig. K; *Chemnitz*, vii. fig. 557; *Reeve*, *l. c.* ii. pl. iii. fig. 15.

Mergui, mud-flats; Crow Islet, between King Island and Hayes Island, at high-water level; Kisseraing. *Tranquebar*, *Nicobars*, *Singapore*, *Java*, *Celebes*.

320. Arca (Anadara) rhombea, *Born*, *Chemnitz*, *Conch.-Cab.* vii. fig. 553*a*; *Reeve*, *l. c.* ii. pl. ii. fig. 12.

Elphinstone Island. *Madras*, *Ceylon*, *Salang*, *China Sea*.

321. Arca (Anadara) pilula, *Reeve*, *l. c.* ii. pl. ii. fig. 8.

The height almost exceeds the length of the shell.

Sullivan Island, 7–10 fathoms. *Java*, *Philippines*.

322. Arca (Scapharca) inæquivalvis, *Bruguière*, *Chemnitz*, vii. fig. 552; *Reeve*, *l. c.* ii. pl. viii. fig. 54.

Arca hispida, *Philippi*, *Abbild.* pl. 5. fig. 2.

The number of ribs varies from 28 to 32; where the periostracum (younger state) is preserved, the interstices between the ribs seem narrower than the ribs; if the former is removed, ribs and interstices are about equally broad.

King Island, Elphinstone Island, and Sullivan Island. *Salang*, *Timor*, *Philippines*.

323. Cucullæa concamerata, *Chemnitz*, vii. figs. 526–528; *Reeve*, *l. c.* xvii. pl. i. fig. 1.

King Island, mud-banks exposed at spring-tide. *Tranquebar*, *Ceylon*, *Nicobars*, *China*.

324. Pectunculus pectiniformis, *Lam.*, *Reeve*, *l. c.* i. pl. iii. fig. 11.

Arca pectunculus, *Linné*, *Chemnitz*, vii. figs. 568–569.

King Island. *Zanzibar*, *Ceylon*, *Philippines*.

Nuculidæ.

325. Leda mauritiana, *Sow.*, *Reeve*, *l. c.* xviii. pl. vi. fig. 33.

Sullivan Island, 7–10 fathoms. *Mauritius*, *Ceylon*, *China Sea*.

Astartidæ.

326. Cardita variegata, *Bruguière*, *Chemnitz*, *Conch.-Cab.* xi. figs. 1999–2002; *Reeve*, *l. c.* i. pl. i. fig. 3.

Cardita calyculata, *Lam.*, not *L.*

Owen Island, coral-burrows. *Red Sea*, *Seychelles*, *Zanzibar*, *Ceylon*, *Nicobars*, *Singapore*.

327. Crassatella radiata, *Sow.*, *Reeve*, *l. c.* i. pl. iii. fig. 12.

King Island; Elphinstone Island, sand-flats; Sullivan Island, 4 and 7–10 fathoms. *Singapore*.

The rays are very faint or scarcely discernible in these specimens

LUCINIDÆ.

328. LUCINA (LENTILLARIA) DIVERGENS, *Philippi*, *Abbild.* vol. iii. Luc. pl. 2. fig. 4, April 1850.

Lucina fibula, *Reeve*, *l. c.* vol. vi. pl. vii. figs. 33, 37, & 38, June 1850.

Owen Island, sand. *Red Sea*, *Persian Gulf*, *Philippines*, *Samoa and Viti Islands*, *Japan*.

329. LUCINA (subg. s. str.) PISUM, *Reeve*, *l. c.* vi. pl. xi. fig. 66.

Small, subglobular, densely cancellated, white.

Sullivan Island, 7–10 fathoms. *Singapore*, *Port Essington*.

330. LUCINA (subg. s. str.) GEMMA, *Reeve*, *l. c.* vi. pl. xi. fig. 64.

Small, compressed, concentrically laminated, white.

Associated with the preceding. Sullivan Island. *Philippines*.

LUCINA (ANODONTIA) EDENTULA and L. PHILIPPINARUM. See before, pp. 173, 174, nos. 65, 66.

CHAMIDÆ.

331. CHAMA LAZARUS, *L.*, *Chemnitz*, vii. figs. 507, 509; *Reeve*, *Conch. Icon.* iv. pl. ii. fig. 4.

Chama damæcornis, *Lam.*

Elphinstone Island; Owen Island. *Mauritius*, *Bintang*, *Philippines*.

332. CHAMA BRASSICA, *Reeve*, *l. c.* iv. pl. vi. fig. 31; *Chemnitz*, vii. figs. 510, 514.

King Island; Elphinstone Island; Owen Island; Pilai Bay. *Nicobars*, *Moluccas*, *Philippines*.

333. CHAMA CRISTELLA, *Lam.*, *Reeve*, *l. c.* iv. pl. viii. fig. 42.

Broadly affixed by about half the surface of one valve.

Owen Island, burrows in old corals. *Java*, *Celebes*.

TRIDACNIDÆ.

334. TRIDACNA SQUAMOSA, *Lam.*, *Reeve*, *l. c.* xiv. pl. iii. fig. 3.

King Island, on rocks. *Red Sea*, *Nicobars*, *Singapore*, *Timor*, *Vanikoro*.

335. TRIDACNA CROCEA, *Lam.*, var. CUMINGII, *Reeve*, *l. c.* xiv. pl. vii. fig. 7.

Owen Island. *Singapore*, *Philippines*, *Moluccas*, *New Ireland*.

Cardiidæ.

336. Cardium (Trachycardium) rugosum, *Lam.*, *Chemnitz*, v. fig. 191.

Cardium flavum (*L.*?), *Reeve, Conch. Icon.* ii. pl. xiv. fig. 68.

King Island; Elphinstone Island; Owen Island. *Red Sea, Mozambique, Ceylon, Nicobars, Salang, Singapore, Moluccas, Philippines.*

337. Cardium (Hemicardium) unedo, *L.*, *Chemnitz*, vi. figs. 168, 169; *Reeve, l. c.* ii. pl. ii. fig. 13.

Elphinstone Island. *Mauritius, Madras, Ceylon, Nicobars, Singapore, Bintang, Java, Moluccas, Philippines.*

338. Cardium (Hemicardium) subretusum, *Sow.*

Cardium retusum (*L.*?), *Reeve, l. c.* ii. pl. xix. fig. 103.

Elphinstone Island, mud-flats. *Seychelles, Tranquebar, Singapore, China Sea.*

339. Cardium (subgen. nov.?) latum (*Born*?), *Chemnitz*, vi. figs. 192, 193; *Reeve, l. c.* ii. pl. iv. fig. 21.

King Island. *Tranquebar, Nicobars, Ceylon, Java, Philippines.*

340. Cardium (Bucardium) coronatum, *Spengler*, 1786; *Schroeter, Einleitung Conch.* iii. pl. 7. fig. 13.

Cardium fimbriatum, *Wood, Reeve, l. c.* ii. pl. xviii. fig. 91.

Elphinstone Island; Sullivan Island, 2–7 fathoms. *China Sea.*

341. Cardium (Papyridea) rugatum, *Gronov.*, *Reeve, Conch. Icon.* ii. pl. xii. fig. 63.

Cardium apertum, *Chemnitz*, vi. figs. 181–183.

Elphinstone Island. *Singapore, Philippines, New Britain.*

342. Cardium (Papyridea) pulchrum, *Sow.*, *Reeve, l. c.* ii. pl. xix. fig. 98.

Sullivan Island. *Seychelles, Mauritius, Salang, China Sea, Zanzibar.*

Veneridæ.

343. Circe scripta, *L.*, *Chemnitz, Conch.-Cab.* vii. fig. 316; *Sowerby, Thes.* vol. ii. Veneridæ, pl. 139. figs. 41, 43; *Reeve, l. c.* xiv. pl. i. fig. 1; *Roemer, Monogr.* Cytherea, pl. 52. figs. 1*a*–1*i*.

Sullivan Island. *Red Sea, Seychelles, Coromandel, Ceylon, Nicobars, Singapore, Moluccas.*

344. Circe sulcata, *Gray*, *Reeve*, *Conch. Icon.* xiv. pl. iv. fig. 16*b*; *Roemer*, Cyth. pl. 57. fig. 2.

Circe plebeia, *Hanley*, *Sow. Thes.* Ven. figs. 33–37; *Reeve*, *loc. cit.* fig. 17.

Sullivan Island, 4 fathoms. *Java*, *Philippines*.

345. Circe (Crista) divaricata, *Chemnitz*, *Conch.-Cab.* vii. fig. 316; *Sowerby*, *Thes.* fig. 12; *Reeve*, *l. c.* xiv. pl. vi. fig. 23; *Roemer*, *loc. cit.* pl. 49. fig. 1, pl. 51. fig. 5.

King Island, in pools on mud-banks exposed at spring-tides; Elphinstone Island. *Red Sea*, *Zanzibar*, *Bombay*, *Salang*, *Singapore*.

346. Circe (Crista) gibba, *Lam.*, *Chemnitz*, *Conch.-Cab.* vii. figs. 415, 416; *Sow. Thes.* pl. 137. figs. 4–7; *Reeve*, *l. c.* xiv. pl. v. fig. 21, *c*, *d*; *Roemer*, *loc. cit.* pl. 47. fig. 2.

Elphinstone Island. *Seychelles*, *Ceylon*, *Nicobars*, *Singapore*, *Philippines*, *New Caledonia*.

347. Cytherea (Calliste) festiva, *Sow. Thes.* fig. 72; *Reeve*, *l. c.* xiv. Dione, pl. i. fig. 2; *Roemer*, *loc. cit.* pl. 17. fig. 3.

Mergui, only very young specimens. *Moluccas*.

348. Cytherea (Caryatis) rufescens, *Gray*, *Reeve*, *l. c.* xiv. Dione, pl. vii. fig. 26; *Roemer*, *loc. cit.* pl. 31. fig. 1.

Mergui, mud-flats. *Philippines*.

349. Cytherea (Caryatis) alabastrum, *Reeve*, *l. c.* xiv. Dione, pl. x. fig. 42; *Roemer*, *loc. cit.* pl. 25. fig. 2.

King Island †.

350. Cytherea (Caryatis) indecora, *Philippi*, *Abbild.* Cyth. pl. 9. fig. 7; *Roemer*, *loc. cit.* pl. 24. fig. 1.

Sullivan Island, 2–7 fathoms. *Mergui* (Philippi).

351. Cytherea (Caryatis) minuta, *Koch*, *Philippi*, *Abbild.* Cyth. pl. 3. fig. 8; *Roemer*, *loc. cit.* pl. 33. fig. 1.

Sullivan Island, 2–7 and 7–10 fathoms; Kisseraing †.

352. Artemis excisa, *Chemnitz*, *Conch.-Cab.* vii. figs. 400, 401; *Sow. Thes.* Ven. fig. 69; *Reeve*, *l. c.* vi. pl. vii. fig. 43; *Roemer*, *Monogr.* Dosinia, pl. 4. figs. 2–4.

Sullivan Island, 7 fathoms. *Nicobars*.

353. Venus (Anaitis) calophylla, *Jonas*, *Archiv f. Naturgeschichte*, 1836, pl. 8. fig. 2; *Sowerby*, *Thes.* Ven. fig. 176; *Reeve*, *l. c.* xiv. pl. xxiii. fig. 114.

Laloon Bay, Elphinstone Island. *China Sea.*

354. Venus (Antigona) reticulata, *L.*, *Lister*, *Hist. Conch.* pl. 335. fig. 172, "cardine croceo;" *Chemnitz*, vi. figs. 382, 383; *Sow. Thes.* figs. 11–13; *Reeve*, *l. c.* xiv. pl. x. fig. 34.

Venus corbis, *Lam.*

Recognizable by the orange-coloured hinge-teeth.

Mergui; Owen Island. *Red Sea, Moluccas, Philippines, Viti Islands.*

355. Venus (Antigona) crispata, *Desh.*, *Reeve*, *l. c.* xiv. pl. ix. fig. 31.

Venus cancellata, *Chemnitz*, vi. figs. 304, 305.

Venus Listeri, var., *Sowerby*, *Thes.* fig. 7.

King Island. *Mauritius, Zanzibar.*

356. Venus (Timoclea) arakanensis, *Nevill*, *Journ. As. Soc. Bengal*, 1871, vol. xl. p. 10, pl. 1. fig. 16.

Sullivan Island, 6 fathoms. *Arakan.*

357. Venus (Timoclea) imbricata, *Sow. Thes.* pl. 156. figs. 81, 82; *Reeve*, *l. c.* xiv. pl. xxiv. fig. 118.

King Island; Elphinstone Island. *China Sea.*

358. Venus (Timoclea) scabra, *Hanley*, *Catal. Rec. Bivalv.* pl. 16. fig. 24; *Sow. Thes.* figs. 101, 102; *Reeve*, *l. c.* xiv. fig. 97.

Elphinstone Island, sand-flat; Sullivan Island, 7–10 fathoms. *Philippines*, *Australia* (Reeve).

These three species are all nearly allied to one another, and are of small size, and with knotty ribs: in *V. imbricata* the radial ribs are rather few and of a rusty yellow colour, with large smooth interstices; in *V. scabra* the ribs are more crowded, unequal, and crossed by narrow, thin, rather distant concentric laminæ; in *V. arakanensis* densely granulated concentric ribs prevail in the midst of the shell, and only on both extremities are radial ribs distinctly expressed.

Also *V. cochinchinensis*, Sow. Thes. figs. 79, 80, is very nearly allied to this species.

359. Venus (Cryptogramma) squamosa, *L.*, *Rumph. Amboinsche Rariteit-Kamer*, pl. xliv. fig. M.

Elphinstone Island. *Singapore.*

360. Tapes textrix, *Chemnitz, Conch.-Cab.* vii. fig. 442.

Venus textile, *Gmelin, Sow. Thes.* Ven. fig. 26; *Reeve, Conch. Icon.* xiv. Tapes, pl. ii. fig. 3.

Nearly smooth, shining.

Sullivan Island, 4 fathoms, large specimen. *Malabar, Ceylon, Malacca, Moluccas.*

361. Tapes undulatus, *Born, Reeve, l. c.* xiv. pl. iii. fig. 8; *Roemer, loc. cit.* pl. 5. fig. 2.

Venus rimosa, *Philippi, Abbild.* pl. 7. fig. 7.

Surface of the shell marked with narrow deep lines somewhat oblique to the lines of growth. General outlines like *T. textrix.*

Sullivan Island, 7 fathoms. *Philippines, Hongkong, Japan.*

362. Tapes amabilis, *Philippi, Abbild.* Venus, pl. 7. fig. 2; *Reeve, l. c.* xiv. pl. v. fig. 21; *Roemer, Monogr.* Venus, pl. 7. fig. 1.

Deep concentric furrows.

Sullivan Island, 2–7 fathoms. *China Sea.*

363. Tapes exaratus, *Philippi, Abbild.* pl. 5. fig. 6; *Roemer, loc. cit.* pl. 8. fig. 2.

Very near the preceding; the furrows more crowded.

Sullivan Island, 4 fathoms. *Red Sea?, Canton.*

364. Tapes literatus, *L.*, var. nocturnus, *Chemnitz, Conch.-Cab.* vii. figs. 434, 435; *Sow. Thes.* fig. 45; *Reeve, l. c.* xiv. pl. i. fig. 2*c*; *Roemer, loc. cit.* pl. 12. figs. 1*b*, 1*d*, 1*e*.

Elphinstone Island. *Moluccas.*

365. Tapes quadriradiatus, *Desh., Reeve, loc. cit.* pl. ii. fig. 6; *Roemer, loc. cit.* pl. 18. fig. 2.

King Island; Laloon Bay, Elphinstone Island. *Salang, Singapore, Moluccas.*

366. Tapes variegatus, *Sow. Thes.* figs. 133, 136, 137, 138; *Reeve, l. c.* xiv. pl. xii. fig. 64; *Roemer, loc. cit.* pl. 26. fig. 2.

Very near to the European *T. decussatus*, L.; but generally smaller, of a more reddish hue, and inside bright red.

Owen Island. *Salang.*

367. Tapes malabaricus, *Chemnitz*, vi. figs. 324, 325; *Sow. Thes.* figs. 6–8; *Reeve, l. c.* xiv. pl. vi. fig. 27; *Roemer, loc. cit.* pl. 10. fig. 3.

Venus gallus, *Spengler, Gmelin.*

Mergui; King Island; Sullivan Island, 6 fathoms. *Malabar, Ceylon, Bintang, Hongkong.*

Var. SINUOSUS, *Lam.* (Venus), *Sow.* fig. 10; *Reeve, l. c.* xiv. Tapes, pl. v. fig. 18; *Roemer*, pl. 11. fig. 1.

The hinder part of the shell abbreviated and somewhat distorted. Rather large, 77 millim. in length, 53 high, 43 in diameter.

King Island Bay. *Salang.*

368. TAPES (HEMITAPES) STRIATUS, *Chemnitz*, vi. figs. 365, 366; *Sow. Thes.* Ven. figs. 207 & 213; *Reeve, l. c.* xiv. Tapes, pl. ix. fig. 45.

Elphinstone Island. *Nicobars, Singapore, Philippines, China Sea.*

369. TAPES (HEMITAPES) LATERISULCUS, *Lam. Nat. Hist. Anim. s. Vert.* ed. 2, vi. p. 361; *Sow. Thes.* figs. 67–76.

Tapes marmoratus (*Lam.*?), *Reeve, l. c.* xiv. pl. vi. fig. 26.

Venus intuspunctata, *Anton Philippi, Abbild.* pl. 5. fig. 7.

In younger specimens both the anterior and the posterior extremities of the shell are marked with deeply-cut lines; the middle part, on the contrary, is nearly smooth; in larger shells, of a length of about $13\frac{1}{2}$ centim. and upwards, the hinder extremity is smooth and the deep lines are limited to the anterior end.

King Island and Elphinstone Island. *Bombay, Ceylon, Mergui, Salang, Philippines.*

370. TAPES (HEMITAPES) CEYLONENSIS, *Sow. Thes.* figs. 24, 25; *Reeve, Conch. Icon.* xiv. pl. vii. fig. 30.

Smooth, shining, very convex.

King Island; Elphinstone Island. *Red Sea, Ceylon, Salang.*

371. CYPRICARDIA VELICATA, *Reeve, l. c.* i. pl. ii. fig. 7.

King Island, littoral; Crow Islet, between Padaw and Hayes Islands; Elphinstone Island Bay; Sullivan Island. *Philippines.*

372. LITHOPHAGELLA CORALLIOPHAGA, *Chemnitz*, x. figs. 1673, 1674; *Reeve, l. c.* i. Cypricardia, pl. ii. fig. 12.

King Island. *Red Sea, Mauritius, Polynesia.*

TELLINIDÆ.

373. SEMELE (AMPHIDESMA) SINENSIS, *Gray, Reeve, l. c.* viii. Amphidesma, pl. v. fig. 28.

King Island, mud-banks exposed at spring-tide; Laloon Bay, Elphinstone Island. *China.*

374. Semele (Amphidesma) vestalis, *Adams*, *Reeve*, *Conch. Icon.* viii. Amphidesma, pl. vi. fig. 38.

King Island. *China Sea.*

375. Mesodesma (Paphia) glabratum, *Lam. Encycl. Méth.* pl. 257. fig. 3; *Reeve*, *l. c.* viii. pl. iii. fig. 20.

King Island and Owen Island, sand. *Red Sea*, *Mauritius*, *Mozambique*, *Seychelles*, *Salang*, *Singapore*, *Philippines*, *Australia.*

376. Mesodesma æquilaterum, *E. Roemer*, *Malakozoologische Blätter*, 1862, p. 136. (Pl. XVI. fig. 6 *a*, *b*.) Testa transverse oblonga, subæquilatera, concentrice striatula, periostraco fulvo tecta, extremitate utraque rotundata, margine ventrali recto, antico paulum magis ascendente, verticibus in $\frac{3}{7}$–$\frac{1}{2}$ longitudinis sitis, sinu palliari usque in mediam fere testam elongato. Long. 38, alt. $20\frac{1}{2}$, crass. 12 millim.

King Island, beneath stones at highest water-mark; Elphinstone Island; Allen Island. *Salang.*

377. Mesodesma (Davila) planum, *Hanley*, *Reeve*, *l. c.* fig. 16.

Elphinstone Island; Owen Island, sand. *Philippines.*

378. Mesodesma (Davila) crassulum, *Desh.*, *Reeve*, *l. c.* fig. 26.

Very near the preceding, of about the same triangular outline, but not so very flat, and marked with a pale reddish median ray in white; whereas *M. planum* is uniformly horn-coloured.

Elphinstone Island †.

379. Tellina perplexa, *Hanley*, *Proc. Zool. Soc.* 1844, p. 149; *Roemer*, *Monogr.* Tellina *in Küster's Conch.-Cab.* pl. 14. figs. 4–6.

T. ostracea (Lam.?), Hanley, Reeve, Conch. Icon. xvii. fig. 124, is scarcely different, but comparatively a little shorter behind. Also *T. siamensis*, Martens, Proc. Zool. Soc. 1860, p. 20, is nearly allied, but larger, with more horizontal dorsal margins.

King Island; Sullivan Island, 4 fathoms. *Seychelles*, *Ceylon*, (*Siam*), *Philippines*, *Moluccas.*

380. Tellina (Arcopagia?) casta, *Hanley*, *Reeve*, *loc. cit.* xvii. pl. xlvi. fig. 269.

Allied to the European *T. balaustina*, L., but purely white.

Sullivan Island, 7 fathoms. *Singapore.*

381. Tellina (Macalia) Bruguierei, *Hanley, Sowerby, Thesaur.* fig. 193; *Reeve, l. c.* xvii. pl. xxx. fig. 165; *Roemer*, pl. 50. figs. 6–9.
King Island. *Singapore.*

382. Tellina (Angulus) lanceolata, *Chemnitz*, vi. fig. 103; *Sow. Thes.* figs. 86, 87; *Reeve, l. c.* xvii. pl. iv. fig. 13.
Psammobia pellucida, *Lam., Delessert, Recueil*, pl. 5. fig. 10.
Kisseraing Island. *Moluccas.*

383. Tellina (Tellinides) emarginata, *Sow. Thes.* fig. 70; *Reeve, l. c.* pl. xx. fig. 99; *Roemer*, pl. 36. fig. 1.
Sullivan Island, 7–10 fathoms. *Singapore.*

Tellina (Macoma) birmanica. See above, p. 174, no. 67.

384. Psammobia bipartita, *Philippi, Zeitschr. f. Malakoz.* 1848, p. 166; *Chemnitz, Conch.-Cab.* vi. fig. 92 (Tellina truncata, *Linné*?).
Psammobia cærulescens, *Reeve, l. c.* x. pl. viii. fig. 60 (not *P. cærulescens* of Lamarck, which is identical with *P. tripartita*, Desh., Reeve, *l. c.* pl. iii. fig. 20).
Sullivan Island, 4 fathoms. *Ceylon, Moluccas, Philippines.*

385. Asaphis deflorata, *L., Chemnitz, Conch.-Cab.* vi. fig. 83.
Capsa rugosa, *Lam., Reeve, l. c.* x. pl. i. fig. 1.
A very large specimen from Elphinstone Island measures 54 millim. in length, 42 millim. in height, and 29 millim. in diameter.
King Island; Elphinstone and Owen Islands. *Red Sea, Zanzibar, Mauritius, Seychelles, Salang, Singapore, Java, Timor, Moluccas, Tahiti.*

386. Soletellina acuminata, *Desh., Reeve, l. c.* x. pl. iii. fig. 12.
Hinder part of the shell long, produced.
King Island. *Philippines.*

387. Soletellina tumens, *Desh., Reeve, l. c.* x. pl. iv. fig. 20.
Outlines oval, hinder part rounded.
King Island, sand; Elphinstone Island; Allen Island. *Philippines.*

Mactridæ.

388. Mactra decora, *Desh., Reeve, l. c.* viii. pl. xvi. fig. 80.
With purple-violet rays.
Sullivan Island †.

389. Mactra attenuata, *Desh.*, *Reeve*, *l. c.* viii. pl. xviii. fig. 97.

Very inequilateral; outline like that of some species of *Venus*.

Elphinstone Island. *Madras.*

390. Mactra (Mactrinula) angulifera, *Desh.*, *Reeve*, *l. c.* viii. pl. xvi. fig. 83.

Sullivan Island, 2–7 fathoms; Owen Island, sand. *Philippines.*

391. Lutraria (Merope) nicobarica, *Gmelin.* (Pl. XVI. fig. 7 *a*, *b*.)

Mactra rugosa Indiæ orientalis, *Chemnitz, Conch.-Cab.* vol. vi. p. 238, pl. 24. fig. 237.

Mya nicobarica, *Gmelin, Linné, Syst. Nat.* ed. 13, p. 3221.

Mactra reticulata, *Spengler, Skrivter af Naturhist. Selskab. Copenhagen,* vol. v. pt. 2, 1802, p. 119.

Lutraria Chemnitzii, *Philippi, Zeitschrift für Malakozoologie,* v. 1849, p. 26.

Testa ovato-oblonga, tenui, stramineo-albida, costulis radiantibus numerosis, interstitia non æquantibus excavata, extremitate utraque rotundata, antica altiore, costulis obsolescentibus, postica striis capillaribus obliquis sculpta; verticibus ad $\frac{2}{5}$ longitudinis sitis. Long. 27 millim., alt. 18, crass. 10.

Very near *L. ægyptiaca* (Chemnitz?), Hanley, Reeve, Conch. Icon. viii. Mactra, fig. 112, and *L. capillacea*, Desh., Reeve, *l. c.* Mactra, fig. 117; but distinctly less inequilateral. This species attains a larger size than above indicated, a specimen in the Berlin Museum, locality unknown, being 44 millim. long and 29 high.

King Island, mud-bank exposed at spring-tide. *Nicobars.*

Lutraria elongata, *Gray*. See before, p. 174, no. 68.

Corbulidæ.

392. Corbula tunicata, *Hinds*, *Voy. of the 'Sulphur,' Zool.* pl. 20. fig. 45; *Reeve*, *l. c.* ii. pl. i. fig. 5.

Hinder part produced into a narrow beak.

Sullivan Island, 7–10 fathoms. *Agulhas Bank*, *Macassar*, *Philippines.*

393. Corbula crassa, *Hinds, loc. cit.* pl. 20. figs. 1–3; *Reeve, Conch. Icon.* ii. pl. i. fig. 8.

Very near the preceding, but the hinder extremity more rounded.

Owen Island. *Malacca, Philippines.*

Solenidæ.

394. Aulus Winterianus, *Dunker*, *Zeitschr. f. Malakozool.* 1852, p. 57, *Novitates*, pl. 39. figs. 8, 9; *Reeve*, *l. c.* xix. Cultellus, pl. 5. fig. 10*b*.

Leguminaria alba, *Valenc. in Hombron & Jacquinot, Voy. au Pôle Sud, Moll.* pl. 26. fig. 6. (This name may be older, but the date of the publication of the plate is not ascertained; the letterpress is later, 1854.)

Sullivan Island, 7–10 fathoms; and King Island. *Java, Borneo.*

395. Cultellus subellipticus, *Dunker*, *Proc. Zool. Soc.* 1861, p. 421; *Reeve*, *l. c.* xix. pl. ii. fig. 9.

King Island. *Salang, Malacca, Java, Singapore.*

Pholadidæ.

396. Pholas (Martesia) striata, *L.*, *Chemnitz*, viii. figs. 867–871; *Sowerby*, *Thes.* figs. 40–42; *Reeve*, *l. c.* xviii. pl. viii. fig. 32.

King Island, on drift-timber. *Singapore, China Sea, also in the Atlantic.*

397. Pholas (Parapholas) quadrizonata, *Spengler*, *Skrivter af Naturhist. Selskab. Copenhagen*, vol. ii. 1792, pl. 1. figs. 1–4; *Reeve*, *l. c.* xviii. pl. ix. fig. 38.

Sullivan Island, a single valve. *Torres Strait.*

Teredo thoracites. See above, p. 174, no. 69.

The Tenasserim coast having been explored for shells by the naturalists Philippi and Gould, no striking novelties in this department could be expected. Nevertheless, the present collection is one of considerable interest. The occurrence of several species known hitherto only from the Philippines, from Java, or from Ceylon, tends to prove that very few marine species are confined to only one locality; and that the large number of such species in our systematic catalogues is due only to the want of careful researches in other places. Some species, for which no exact locality was hitherto known, are here for the first time found to be inhabitants of the Indian Ocean. Generally, most of the sea-shells are widely distributed throughout the Indian Ocean, many species extending from the east coast of Africa to the

Moluccas, and even to Polynesia, many of which were well known to the early conchologists of the ante-Linnean period; and of these we find a large number also on the Tenasserim coast. Others appear to be confined to that part of the Indian Ocean which includes the Andamans, Nicobars, and the Tenasserim coast; some of them were known to the older Danish conchologists (Chemnitz, Spengler; the Nicobars being a Danish possession at the close of the last century), but are still rare in collections, e. g. *Pholas quadrizonalis*.

The statements concerning the occurrence at low-water, on mud-flats, on mangrove-trunks, &c., yield many hints concerning the relations of the shapes and colours of the shells to their peculiar habitats, which will be very acceptable to most conchologists. It is also very remarkable that some species, unanimously considered as marine, e. g. *Nerita lineata* and *Columbella Duclosiana*, have been found associated in brackish water with others generally regarded as freshwater shells, e. g. *Neritina crepidularia*; and that some species of *Neritina*, such as *N. ualanensis*, have been found alike in fresh and in brackish waters. This proves that the distinction between freshwater and marine species is in some families not so well defined as has been generally surmised.

DESCRIPTION OF THE PLATES.

Plate XIV.

Figs. 1–6. *Cyclophorus aurantiacus*. 1, 2, var. *a, typicus*; 3, 4, var. *b, pernobilis*; 5, 6, subvar. *bb* (paulo minor).

Plate XV.

Figs. 1–6. *Cyclophorus aurantiacus*. 1, 2, var. *c, Nevilli*; 3, 4, var. *d, Reevei*; 5, 6, var. *e, Andersoni*.
Figs. 7, 8. *Cyclophorus expansus*.
Fig. 9. *Cyclophorus zebrinus*, var. *c, ambiguus*.

Plate XVI.

Fig. 1, *a, b, c. Nassa Thersites*, var. *acypha*.
Fig. 2. *a–f. Littorina rubropicta*, n. sp.
Fig. 3, *a–e. Isanda pulchella*.
Fig. 4, *a–d. Mytilus* (*Aulacoma*) *curvatus*.
Fig. 5, *a, b, c. Mytilus* (*? Septifer*) *Andersoni*, n. sp.
Fig. 6, *a, b. Mesodesma æquilaterum*.
Fig. 7, *a, b. Lutraria* (*Merope*) *nicobarica*.

On the Gephyreans of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum. By Professor Emil Selenka, Erlangen. (Communicated by Dr. John Anderson, F.R.S., F.L.S.)

[Read 21st April, 1887.]

Genus Phascolosoma (sensu stricto),

Selenka, De Man, and Bülow.

Longitudinal musculature continuous. Numerous finger-shaped tentacles, surrounding the mouth in rings or clusters. A pair of ciliated tubercles over the cerebral ganglion. Intestinal canal consisting of many spiral convolutions, not attached at the hinder extremity. Hooklets present or absent. Two free nephridia. Eggs round. Retractors four, two, or one.

In all seas.

1. Phascolosoma pellucidum, *Kef.*

Phascolosoma pellucidum, *Keferstein, Beiträge zur anatom. und systematischen Kenntniss der Sipunculiden, Zeitschr. f. wiss. Zoologie*, Bd. xv. 1865, p. 433, Taf. xxxii. figs. 26, 27.

Phascolosoma pellucidum, *Selenka, De Man, and Bülow, Die Sipunculiden, eine systematische Monographie, in Semper's Reisen im Archipel der Philippinen*, ii. 4ter Bd. Erste Abtheilung, 1883, pp. 32–34, Taf. iv. figs. 44–49.

Three large specimens, measuring 8–11 centim.

Genus Phymosoma,

Selenka, De Man, and Bülow.

Longitudinal musculature separated into bands. Tentacles numerous, not arranged round the mouth but placed beyond it on the dorsal side in a single series forming three quarters of a circle. Body covered with papillæ. Hooklets generally present on the introvert. Eggs elliptical, flattened. Four retractors. Two eye-spots.

Mostly tropical forms.

2. Phymosoma japonicum, *Grube.*

Phascolosoma japonicum, *Grube*, 54. *Jahresb. der schlesischen Gesellschaft für vaterländische Cultur*, Breslau 1877, p. 73.

Phymosoma japonicum, *Selenka, De Man, and Bülow, Die Sipunculiden, eine systematische Monographie, in Semper's Reisen im Archipel der Philippinen*, ii. 4ter Bd. Erste Abth. 1883, pp. 76–78, Taf. ii. figs. 18–19, Taf. x. figs. 145–146.

Seven specimens, from $4\frac{1}{2}$ to $7\frac{1}{2}$ centim. in length.

Genus Sipunculus.

Longitudinal musculature divided into 17 to 42 bands. Four retractors. Body without papillæ. Tentacles finger-shaped, or a lobed membrane surrounding the mouth. One or several cæca on the rectum. Hooklets wanting. One or two contractile sacs accompany the œsophagus.

Species large. In all seas.

3. Sipunculus robustus, *Keferstein.*

Sipunculus robustus, *Keferstein, Beiträge zur anatom. und system. Kenntniss der Sipunculiden, Zeitschr. f. wiss. Zoologie,* Bd. xv. 1865, p. 421.

Sipunculus robustus, *Selenka, De Man, and Bülow, Die Sipunculiden, eine systematische Monographie, in Semper's Reisen im Archipel der Philippinen,* ii. 4ter Bd. Erste Abth. 1883, pp. 97–99, Taf. xii. fig. 170.

Two specimens, of 17 and 30 centim. in length, and nearly $1\frac{1}{2}$ centim. broad.

4. Sipunculus porrectus, sp. n.

Two yellowish-brown specimens of 28 and 32 centim. in length and $1\frac{1}{2}$ centim. broad.

The internal organs were partially macerated.

On examining the exterior the most obvious peculiarities were the *distinct transverse rings*, whereas the longitudinal furrows are only faintly indicated. Sclerorhynchus about 1 centim. broad and thick; thickly set with papillæ as far as a narrow smooth ring in front. Tentacles very numerous (about 120), about 3–4 millim. long and $\frac{1}{2}$ millim. broad, flattened or fluted. These tentacles are arranged in 2 half-circles on the right and left of the border of the mouth, so that there is a small free space on the dorsal and ventral median lines.

Body musculature strong. The number of longitudinal muscles running from before to behind is 32; anastomoses rarely and feebly occur.

Four retractors of the introvert are of the usual length; the two ventral retractors a few millimetres shorter than the dorsal. Each retractor rises from 3, 4, or 5 longitudinal muscles. The retractors are free for their whole length, and coalesce just before their insertion into the introvert. From 20–25 longitudinal muscles are found in the greater portion of the anterior half of the body, and freely traverse its cavity. Their thickness corresponds to that of the longitudinal muscles of the body, or perhaps less; some are as slender as threads. These free "accessory muscles" apparently originate from the longitudinal

muscles of the body by subdivision, for each is inserted in front to the same body-muscle as that from which it originates further back. There is no regularity of arrangement in these accessory muscles; in some their hinder insertion extends back to the hinder third of the body; in others, only just beyond the insertion of the retractors of the introvert; but the majority originate just before, or beyond, the middle of the body. Their insertion is equally variable, as 3 or 4 are inserted at the base of the retractors, and perhaps a single one about the middle of the retractor, while others extend to the body-wall from 5–8 centim. beyond the sclerorhynchus; but one or two extend as far forward as the sclerorhynchus. In general the dorsal accessory muscles have a greater length, and extend further back than the ventral muscles. Sometimes two adjacent longitudinal muscles each throw off one accessory muscle; then follow several undivided longitudinal muscles in succession. The tendency to such subdivision of the longitudinal body-muscles, however, exhibits itself at several other points, as, for instance, when an accessory muscle rises from the longitudinal muscle only to reunite with it one or a few centims. further on.

Only a portion of the intestinal canal was in good preservation—the œsophagus, the spiral at the end of the body, and the rectum. Two contractile sacs were visible on the œsophagus, without constrictions; the intestinal coil was *not fixed* at the hinder end of the body, but free, and consisted here of a double spiral, the convolutions of which were fixed further forward by many delicate fibres to the body-wall. The rectum was attached to the inner body-wall by a mesentery for a length of 5 centim.; the anus is placed unusually far forward, being only 5 millim. beyond the sclerorhynchus. Where the rectum separates from the body-wall and the intestinal coil passes into it, the slightly developed spindle-muscle also arises.

I can give no positive information respecting the nephridia, as they were macerated. In one of the two specimens I thought I recognized two fragments of nephridia; their external openings appeared to lie a little in front of the four retractors of the introvert; but I am not positive on this point.

Among the other Gephyrea sent to me for examination I found a specimen of a *Bonellia*; but unfortunately so imperfect that I was not in a position to determine the species.

Report on the Alcyoniid and Gorgoniid Alcyonaria of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S.

By Stuart O. Ridley, M.A., F.L.S., late Assistant in the Zoological Department, British Museum.

[Read 5th May, 1887.]

(Plates XVII. & XVIII.)

The collection of the above groups of Alcyonaria put into my hands for description by Dr. Anderson did not at first sight exhibit indications of any great importance. On the contrary, the dry specimens, which formed the great bulk of the collection, seemed, as regards their specific characters, as well as their condition of preservation, of a very ordinary character; and the impression left on my mind was that of a small series of typical and common Indian Ocean species, with possibly a few exceptions in the shape of new species. Among the spirit-specimens I observed one form apparently of considerable interest. In the latter case I was not altogether misled (see below, *Lobophytum madreporoides*), it being a representative of a group which has been distinguished generically from its allies since the time when I last had a collection of Alcyonaria in my hands for description. But in my judgment on the collection as a whole I was entirely in the wrong; for not only is the number of new species greater than I had estimated, and this to the extent of nearly 50 per cent. beyond my original opinion, but the *quality* of the new forms, if the term is admissible, is remarkably high. Among the Gorgoniidæ one form occurs which may perhaps ultimately prove an addition to the comparatively small number of genera in that family so rich in species, besides two other novelties (see *Psammogorgia*? *plexauroides*, infrà). We have a new addition to the small family Melithæidæ in the form of a *Mopsella*, characterized by a fine spiculation and by external beauty. Finally the *Spongodes* seem to be all new and of a type hitherto but little known. Of the whole collection, more than 50 per cent. of the species are described here for the first time. This large percentage of novelties is no doubt greatly due to the comparatively slight amount of work which has been done among the Alcyonaria of the Indian Ocean area, those of the Red Sea,

the Mascarene and Seychelles Islands having alone, so far as my knowledge goes, been at all adequately described. Possibly a species or two here set down as new may have been referred to by one or other of the older writers, but, if so, my researches have at any rate failed to detect them.

Looking at the Alcyonarian Fauna of the Burmese coast generally, we see that it is in no way behind that of any other part of the Indian Ocean, so far as known to us, and in some ways it is decidedly superior to that of other districts. Thus it produces a considerable contingent of the soft and fleshy Alcyoniid section of the Order, *Spongodes* and *Lobophytum* being well represented; I myself described a novel type of an allied genus, *Nephthya*, from this coast (Ann. & Mag. Nat. Hist. 5th ser. vol. ix. p. 184); and thus all the members of this group known to us from this coast seem to be peculiar to it. In its richness in species of the family, however, it only agrees with what we know of the other northern parts of the Indian Ocean area, the Red Sea, and Ceylon; hereby, however, differing somewhat, so far as our information extends, from the more southern parts of that ocean (Australia and the Cape) in the proportion of species of this family to the total number of species collected. Thus the Red Sea is rich in *Alcyonium*, *Sarcophytum*, and *Lobophytum* (see Klunzinger, Korall. Roth. Meeres), and exhibits a very fair muster of the more elegant *Spongodes* and *Nephthya*. Ceylon, again, as shown by collections (as yet undescribed) deposited in the British Museum by Dr. Ondaatje, and made by himself and elucidated by drawings, is rich in *Alcyonium*, *Sarcophytum*, or allied forms. *Spongodes*, on the other hand, seems scarce. Gorgoniids, well represented here and in Ceylon, are comparatively scarce in the Red Sea, even typical Indian Ocean forms being absent there but present here. The Burmese fauna, then, may be shortly characterized as distinctly of Indian Ocean *facies*, but with a large proportion of species peculiar to it, so far as is known at present *.

* I should perhaps except Kurrachee from those northern districts of the Indian Ocean with a good Alcyonarian fauna. Among the numerous Cœlenterata received at the British Museum from that locality through the energetic Curator of the Kurrachee Museum, Mr. A. Murray, but as yet, from lack of time and opportunity, unworked out, there are, so far as my memory serves me, hardly any Alcyonaria of these groups. There are, however, some Gorgoniids among them.

Dr. Anderson tells me that these Alcyonaria grow just below low-water mark, appearing at the surface at low tide. With regard to the condition of the collection, most of the species are represented by specimens in spirit, but the condition of some of the dry specimens was decidedly unfavourable for study.

List of Species.

Family Alcyoniidæ.

1. Lobophytum madreporoides, n. sp.
2. Spongodes aurora, n. sp.
3. —— boletiformis, n. sp.
4. —— nigrotincta, n. sp.

Family Gorgoniidæ.

5. Plexaura indica, n. sp.
6. Psammogorgia? plexauroides, n. sp.
7. Gorgonia oppositipinna, n. sp.
8. Gorgonella umbella, *Esper*.
9. Juncella gemmacea, *Milne-Edwards & Haime*, var.
10. —— fragilis, *Ridley*?, var.
11. Ctenocella pectinata, *Pallas*.
12. Suberogorgia suberosa, *Pallas*.

Family Melithæidæ.

13. Mopsella planiloca, n. sp.

Family Alcyoniidæ.

Lobophytum, *Von Marenzeller*.

Guided by Von Marenzeller's recent important paper on this and allied forms (Zool. Jahrbücher, i. p. 341, pl. ix.), I distinguish the following species as new to science.

Lobophytum madreporoides, n. sp. (Plate XVII. figs. 7–11.)

Corallum stipitate, with distinct pileus; height of stalk in young specimens about the same as its diameter immediately under the pileus, irregularly shaped (angular), marked with numerous shallow longitudinal grooves. Pileus extending beyond stalk to the extent of more than half the diameter of the latter, incised at margin almost to stalk, margin much contorted; the centre occupied by erect digitate or palmate lobes. Upper surface of pileus of shagreen-like appearance to the naked eye,

besprinkled with the autozooids at intervals of about ·5 to 3 millim. on the edges, of about 2 to 7 millim. (usually about 4 millim.) on the faces of the lobes and folds of the pileus. Siphonozooids depressed, about two in number to a millimetre; the autozooids on margins of folds of pileus, and on parts of their faces, having their margins flush with the surface; those on the upright lobes and to some extent on the faces of the folds (and more so in older than younger colonies) prominent, rising gradually, like truncate hillocks, up to about 1·5 millim. high, a bare 1 millim. in width at opening. Texture in spirit stiff but very brittle.

Colour in spirit cream-colour, or dirty white, or with a very slight reddish or brownish tint.

Spicules (measurements including tubercles) :—

A. *Zooid-bearing portion*.—I. In walls of siphonozooid tubes, fusiform; those near outside of colony more cylindrical. (1) Broader; both ends tapering to sharp points or blunted; tubercles in 6–8 distinct whorls, size about ·25 to ·29 by ·088 to ·09 millim.; tubercles generally low, broad, flattened, with numerous but slight secondary tubercles. (2) Similar to (1), but rather slenderer, and with only a few median tubercular whorls well pronounced, the tubercles narrower, more punctiform, size about ·29 to ·35 by ·05 millim.—II. (3) On surface of corallum, subclavate, similar to (2), but with one end blunted, the other fairly sharp; beset with small simple tubercles, and with about four rather irregular whorls of medium-sized, not very broad or rough tubercles, size about ·21–·25 by ·053 millim.

B. *Stem* (special spicules).—1. *Deep*:—Subcylindrical, *i. e.* tapering to more or less rudely blunted, much tubercled ends, often showing a more or less distinct subterminal whorl of tubercles; shaft with broad bare, median space, and two very pronounced whorls of broad flattened tubercles covered by minute secondary ones, with distinct spaces between these whorls themselves and between the whorls and the ends; size about ·21 to ·25 by ·09 to 1 millim. Also large whorled fusiform spicules (? belonging to siphonozooid tubes). 2. *Superficial*:—Chessman-like, *i. e.* clavate, with blunt outer end, covered with rather prominent simple, or almost simple, rounded or nearly pointed tubercles; the shaft rather slender, bearing two median, very definite wheel-like whorls of rather prominent roughened or filigreed tubercles, with a distinct intermediate bare space; the inner end more or less pointed, with tubercles resembling those

of the outer end scattered up and down it without regular order. Set vertically to the surface, about one layer deep; size up to about ·14 by ·052 to ·06 millim. Spicules all colourless and transparent.

Hab. Sullivan Island, sublittoral.

Two specimens of this species came under my notice for description. The largest, when perfect, must have been about 3 inches in height and greatest diameter respectively, stem just below pileus about 2 by $\frac{3}{4}$ inch in diameter and $1\frac{3}{4}$ in height, erect lobes up to about 1 inch high, marginal folds about 3 to 6 mm. thick. A younger and less perfect specimen differs in the inferior prominence of the autozooids and in the dirty white colour. A slight colour ring indicated on the lower part of the stem in both specimens is perhaps due to staining by immersion of this part in mud. The species, from its prominent autozooids, has a considerable resemblance to a low-calicled *Madrepora*. I see no hint of such a character in either of the two described forms obviously not distantly related to it—*L.* (*Sarcophytum*, Klunzinger) *pauciflorum*, Ehrb. (Red Sea), and its var. *validum*, Von Marenzeller (Andaman Islands, Tonga Islands). It differs from the typical form of this species, but agrees with the variety, in its projecting superior lobes and in the general form of the colony. From var. *valida* it differs in the greater definiteness of the form of the spicules, *i. e.* in the arrangement of their tubercles in whorls; the deep-lying spicule of the stem is particularly characteristic, with its wide median space, well-defined ends, and heavy compact tubercular whorls; the proportions, generally speaking, of the spicules closely resemble those of var. *valida*.

Spongodes, *Milne-Edwards & Haime.*

Distinct as species of *Spongodes* commonly look at first sight, it is not so easy to feel positive about specific distinctions. Colour, however, appears to furnish fairly constant characters. Of spicular characters, those of the characteristic "projecting" spicules (as I have below designated those peculiar to the genus), and of the spicules of the stem, seem to give the best promise, especially the condition of the outer end of the former and the shape and the tubercles of the latter. Dr. Gray's character of the arrangement of the zooids on the lobules separates the genus very conveniently into groups. With regard to distribution,

we have not many data. The genus does not appear to have been recorded from the Atlantic and its outlying waters; it seems to be exclusively, or almost exclusively, tropical.

All the species here to be described belong practically to that cymosely-pinnate section of the genus in which the zooids are closely aggregated near the ends of the branches, the first of the groups or subgenera (distinguished as *Spoggodes*) into which Dr. Gray, in his useful paper in Proc. Zool. Soc. 1862, p. 27, divided those species which were in the National Collection at the time at which he wrote. The two species placed by him in that group are *S. florida* (Esper), and *S. spinosa*, described for the first time. Of these two species the latter is the most closely related to the three species to be described below, from the cymose arrangement of the terminal lobules. It is, however, readily distinguished from all of them by the very large terminal spicules and their grouping into very evident spine-like processes. A specimen in the Museum identified (but probably wrongly) by Dr. Gray himself with his species, wants these processes, and has the terminal lobules much more closely aggregated than in the type of the species. It is probably closely related to one of the species here described.

S. Studeri, mihi (Report Zool. Coll. H.M.S. 'Alert,' p. 333), belongs to the same circle of species, uniting the smaller spicules of our species with that more scattered condition of the terminal lobules which characterizes *S. spinosa*. Of other authors' species, *S. capitata*, Verrill, evidently belongs to the same group. It is, however, very difficult to identify species with authors' descriptions, as they mostly show a great want of minute detail.

Judging by the condition of their rooting-filaments, the Mergui species prefer a sandy or gravelly bottom. The specimens in this collection are commonly inhabited by Crustaceans, apparently shrimps of one or more species, which are found wedged in between the branches of the head.

Spongodes aurora *, n. sp. (Plate XVII. figs. 20–24.)

Capitate, with very short stalk; rather compressed from back to front. Stem expanding immediately below head into a large fleshy mass, which gives off towards the surface short broad-surfaced lobes which rapidly divide and subdivide, forming outwardly-flattened (sometimes slightly convex) lobules of angular

* "Rosy fingered morn," from the delicate rosy tint which characterizes it.

outline as seen from outside, and of very various size, up to half an inch in diameter, which may either form a continuous surface to the head, or may be set at wide intervals (especially in young specimens). Zooids crowded at about the same level on surface of lobules; diameter in closed state ·35 to ·5 millim. "Projecting spicules" just visible, viz. rising about ·6 millim. beyond level of exterior zooids, but scarcely beyond general surface of the head; single, any accompanying ones not rising above general surface of the lobule. Fleshy axis under lobules smooth; stem longitudinally wrinkled (? from action of the spirit). Colour of stalk and axis of head in spirit usually white, of surface of head rosy pink, the zooids being white and their supporting spicules crimson.

Spicules (the measurements include tubercles):—(1) "*Projecting spicule*" of external zooids of lobule fusiform, slightly flexuous, normally sharply pointed exteriorly, but often blunted, more or less blunted at inner extremity, thickly covered with low sharp or almost sharp tubercles, erect or almost erect, size about 1·4 to 1·8 by ·12 millim. Median portion deep crimson, inner end usually colourless, tip of outer end often very pale. 1*a*. Shorter spicule of exterior zooids accompanying the projecting spicules; similar, but generally rather blunted at both ends, tubercles fewer than in (1), and those at inner end abundant, prominent, and directed towards that end; very variable in size; colour much as (1); about five or six to each projecting spicule. (2) Cortical spicules of axis below zooids, except in colour much as 1*a*, which apparently represent the uppermost members of the cortical spicules; flexuous, rather blunted fusiform, with slender, smooth, blunted tubercles, not crowded in middle, but crowded and prominent at both ends of spicules; size about 2·1 to 2·5 by ·1 to ·14 and (occasionally) ·21 millim; colourless (occasionally with faint pink tinge near end of lobule); mainly longitudinally directed on lobule or the chief and subjacent divisions of axis. (3) *Spicules of stem.* Arenaceous-looking in the mass, sufficiently far apart to show their form. Typically globular stellate to slightly elongated, limaciform (slug-like), thickly covered with prominent conical, almost sharp tubercles; shorter diameter about ·12 millim.; colourless.

Hab. King Island Bay.

Ten specimens in spirit, of various ages, ranging from about $1\frac{1}{4}$ inch in height upwards. The rootlets are narrow and very

numerous. Judging by mountings made from a representative of each of the two apparent varieties in external form, viz. (*a*) that with closely aggregated lobules, and (*b*) that with wide spaces visible on the surface, there are small corresponding differences in the spiculation, *e. g.* the cortical spicules (no. 2) in (*b*) are rather shorter and stouter than in (*a*).

S. spinosa, Gray, is the nearest described species, judging by the external characters, with which I am acquainted; but the probable type (pink var.) is brown with white projecting spicules. The latter are very much larger than in our form, constituting conspicuous objects to the naked eye; whereas, were it not for their strong coloration, they would scarcely be noticed in *S. aurora*. In *S. Studeri*, mihi, the zooids are decidedly scattered, and do not conceal the cortex, as here. Its coloration and short stalk readily distinguish it from the other two forms described below. The difference between those specimens (var. *a*, above) in which the lobules form a close, continuous covering to the head and those (var. *b*) in which they are separated by wide gaps, in which the bulky white axis is well seen (producing a resemblance to *S. florida*), is instructive, but leaves the arrangement of the zooids on the lobule unaffected as a specific character; it appears, though commonly obtaining in young specimens, to be independent of age, as two or three large specimens exhibit it.

Spongodes boletiformis, sp. n. (Plate XVII. figs. 17–19.)

Erect, distinctly capitate. Stem long (that of the single example about 2 diameters high). Head distinct, sublobate, much compressed, of rounded even outlines. From the stem arise rapidly short broad fungiform lobes which break up, without much intermediate division, into the very variously shaped, exteriorly flattened, and closely appressed terminal lobules, which cover evenly the entire surface in a tessellated manner; diameter of lobules at surface about 2–3 millim.

Zooids arising by short distinct stalks (apparently about ·18–·3 millim. long) from the lobule; crowded at surface, almost all attaining the same level, about ·7 millim. in horizontal diameter in closed state. Lobule surrounded by the "projecting spicules" of the peripheral zooids, which accompany the latter to the number of 1 to 3 each; they rise but slightly (about ·3 millim.) above the surface of the lobule.

Colour in spirit: surface, head pale orange to yellowish white; stem pink, upper part opaque white; axis of head (below lobules) whitish, subtransparent.

Spicules (the measurements including tubercles):—(1) *Projecting spicule* of external zooids: long, slender, fusiform, slightly flexuous, tapering to fairly sharp points; tubercles of median portion small, rounded, rather crowded, erect; those of interior end similar, but outwardly directed (towards apex of spicules), up to about ·02 millim. long; exterior end of spicule bare, or with slight indications of tubercles, and with a scraped (? substriated) appearance; largest about 2·5 by ·14 to ·16 millim. (smaller projecting spicules measure about 1·5 by ·1 millim.). (2) Large *spicules of cortex* of axis below lobules as (1), but larger and with both ends armed with tubercles projecting towards their own end of the spicule; size about 3·0 by ·14 millim.; chiefly longitudinally arranged on the axis and its divisions. (3) *Spicules of stem*: arenaceous-looking in the mass (up to about ·1 millim. in the shorter diameter), too crowded to show their forms well, but apparently short thick forms, with abundant smooth rounded tubercles. Colours of spicules the same as those of the parts of the colony at which they are found.

Hab. King Island Bay.

The single specimen is preserved in spirit; it bears three lobes, more or less distinct, one median and superior, two lateral and inferior. Total height $3\frac{3}{4}$ inches. The head measures about $2\frac{3}{4}$ inches in greatest (lateral) diameter, 2 inches in vertical diameter, mean thickness about $\frac{3}{4}$ inch; stem about 2 inches high (by 1 inch in lateral, and $\frac{3}{4}$ inch in antero-posterior diameter), but proportions perhaps affected by distortion (shown by its very wrinkled condition). A number of thin ribbon-like flat roots, 1·5–3·0 millim. wide, proceed from the lower surface of the stem, and have much shelly sand attached.

This species resembles, in outward form, the species described by Dr. Gray as *Morchellana*, which seems, however, to be only a damaged *Spongodes*; but in that species the zooids are scattered and not closely grouped.

Spongodes nigrotincta, n. sp. (Plate XVII. figs. 13–16.)

Erect, distinctly capitate. Stem long (its length in the single example about 3 times the maximum diameter), rather compressed from front to back (the lateral diameter being twice the antero-

posterior), strongly wrinkled longitudinally in spirit, except just below head, where it is wrinkled horizontally, as also are most of the divisions of the axis. Head of rounded, even outlines, slightly antero-posteriorly compressed, incipiently lobate. Stem giving rise above to a small number of short broad lobes, which break up almost directly and with very few intermediate divisions into the exteriorly more or less convex terminal lobules, which are almost in contact laterally, and give a racemose appearance to the head; lobules at surface about 2–3 millim. in diameter. Zooids crowded at one level all over the rounded end of the lobule, about ·6 millim. across when closed. "Projecting spicules" sometimes just visible above lateral border of lobule, but not rising to general level of the head; the cortical spicules of the axis are chiefly horizontally arranged in the larger divisions of the axis, tending to become longitudinal towards the zooids.

Colour in spirit dirty white, with the exception of the upper part of stem, which is opaque white, and of the zooids, which appear normally to be black, but to be commonly bleached by spirit.

Spicules (measurements including tubercles):—(1) *Projecting spicule* of external zooids, fusiform, slightly flexous, with sharp inner extremity, thickly covered throughout with rather prominent but slender, bluntly pointed, smooth tubercles; those of inner end backwardly directed (towards apex of spicule); size about 1·0 by ·09 millim.; colourless. (2) Spicules of cortex of axis below lobules fusiform, rather flexuous, fairly sharp at both ends, closely covered by slender, prominent, but blunted and often roughened tubercles, those of ends relatively larger and commonly more or less directed towards their respective ends; size of largest about 2·1 by ·14 millim. (3) Scantily scattered in the cortex, very stout and blunted forms, similar to (2), but measuring about 2·6 by ·18 millim.; colourless. (4) Spicules of lower part of stem fantastically and variously branched forms, apparently modifications of a cylindrical or fusiform type; short diameter of axis commonly about ·07 millim.; with broad black axial band or almost entirely black.

Hab. King Island Bay.

Total height of single specimen (in spirit) 3 inches, lateral diameter of head and diameter from stalk to top, both about 3 inches; head, back to front about 2 inches. The stem ends below in thin ribbon-like rootlets about 1–2 millim. wide. The

colour of the zooids appears to reside wholly in the soft parts (the tentacles?), which appear dark brown to black under the microscope.

This form appears markedly distinct from all species of which satisfactory information can be obtained; but in its colour *S. capitata* of Verrill possibly resembles it; this is described (Bull. Mus. Comp. Zoöl. Harvard, i. p. 40) as yellowish grey, and the spicules as white, not very conspicuous, the large ones not very numerous. From its neighbours, *S. aurora* and *boletiformis*, it is well separated by its colour, by the transverse wrinkling of the axis and upper part of the stem, and (connected with this last point) the horizontal position of some large spicules in the cortex of the axis; the much branched condition of the proper spicules of the stem is another point distinguishing it from these two species.

Family Gorgoniidæ.

Plexaura indica, n. sp. (Plate XVIII. figs. 1–5.)

*Ramose, flabellate, with decided tendency to unilateral pinnation; after the first one or two divisions the branches assume a suberect position †; origins of lower branches about $\frac{3}{4}$ to 1 inch apart, those of upper ones very distant; terminal pinnæ very long (may attain a length of 6 inches), bluntly rounded or slightly clavate. Lower branches subcylindrical or flattened, flattening especially marked just below origin of branches; terminal pinnæ cylindrical, commonly somewhat clavate. Base spreading widely. Cortex in dry state about ·3 to ·5 millim. thick near base, about ·6 millim. thick near periphery of colony; colour strong scarlet. Verrucæ small, depressed below the general level of the cortex, oval in outline, with the long diameter parallel to that of the branches, and about ·5 millim. in this dimension; thickly distributed over every part of the branches, viz. about ·5 to 1·0 millim. apart.

Axis of stem subcylindrical, with distinct though irregular (in the single dry specimen) longitudinal grooves, black; that of

* Description taken, except where otherwise stated, from the large dry specimen.

† In both the specimens, one or more of the lower branches are given off almost horizontally, and their pinnæ originate almost at right angles from their upper sides.

the base strongly ridged in a radiating manner, dull brown; that of main branches near their origins cylindrical or subcylindrical; of rest elk-horn-like, viz. strongly flattened *, and near points of division much expanded and hollowed out in the middle, and reduced to a thin sheet, hard, subelastic; the ends of terminal branches very flexible, commonly shading off from black to yellow-ochre, with very large central cavity, occupying about $\frac{3}{4}$ of the thickness of the twig in the dry state, about $\frac{3}{5}$ the thickness in spirit. Shape, in spirit, cylindrical; in dry state flat.

Spicules (measurements excluding tubercles):—I. *Cortical.* (1) Foliate ("Blattkeule," Kölliker), very variable in form, blade very thick, either single, subcircular, margin slightly undulating to strongly toothed, and either smooth or with one or more strong ridges or elongate tubercles on the face, or with several tooth-like processes in the place of the blade; handle of two to four or more prongs or more or less amorphous, with good-sized tubercles. Adult spicule about ·23 to ·27 long by ·16 to ·18 millim. broad; those with toothed blade about ·21 by ·12 millim. Colour ochreous yellow. (2) Fusiform, commonly sharply bent at middle, tapering from centre to fairly sharp points, strongly tuberculate; median tubercles up to ·03 millim. long, rounded, the rest shorter, tending to become pointed; size about ·21 by ·035 millim.; colour pink.

Also (?) radiate forms of similar character; also some perhaps subcortical, small, very variable in shape, bacillar to scale-like or subglobular (?), thickly covered with large tubercles; size about ·1 to ·18 by ·028 to ·035 millim.; colour pale brown.

II. *Spicules of Verrucæ.*—(1) Triradiate &c., two of the arms supporting the body-walls of the zooid, about ·25 millim. across, greatest thickness about ·035 to ·048 millim. (2) Stout linear forms, shaft subcylindrical, tending to fork at one end, pointed at the other, arranged radiately around (?) verrucæ; tubercles rather blunt and minutely roughened; size up to about ·35 by ·062 millim.; colour pale pink. (These are the leading types; the range of variation is, however, very great.)

Hab. King Island Bay.

Distribution. Ceylon? (*fide* drawing in coll. Dr. Ondaatje).

This is a fine showy species. It is represented in the series before me by two specimens. Of these one is dry; it measures

* In spirit-specimen nearly cylindrical, being filled with a soft material. *Cf.* Kölliker, Icon. Histiol.

about 12 inches in height, by about the same in its probable original lateral extent; it has about 80 or 90 terminal branches; the stem is about $1\frac{1}{2}$ inches high, and it gives off its next branches in rapid succession. The second specimen is in spirit, and from its size and slightly branched condition is pretty obviously young; it is $4\frac{1}{2}$ inches high by about $2\frac{1}{4}$ in greatest width, the stem is $1\frac{1}{3}$ inches long; it gives off four branches alternately, and ends in the middle of its branches in a cluster of Cirrhipede galls; the most branched of the axes to which it gives rise sends off one horizontal shoot, from which arise at almost right angles three secondary twigs, so that this rectangular mode of branching is probably specific; the stem and branches are approximately cylindrical, the places of bifurcation being slightly flattened; the tips of the pinnæ are slightly clavate; colour in spirit dark vermilion.

This species is mainly characterized by its colour.

Lamouroux, the first to distinguish the genus, says, in 1816 ('Hist. Polypiers Coralligènes flexibles,' p. 428), that the Plexauras show none of the light tints of the Gorgonias, so he could not have known of this form. No similar species seems to have been since described.

There is some superficial resemblance between *Plexaura indica* and *Echinomuricea indomalaccensis*, Ridley (Rep. Zool. Coll. H.M.S. 'Alert,' p. 336, see pl. xxxvi. figs. B, B'), and *Echinogorgia pseudosappo*, Kölliker (Icon. Histiol. p. 136), also from the East Indies; *E. sasappo*, Esper, is another scarlet species from the East Indies. We very possibly have here some mimicry; the *Echinomuricea*, being well protected by its projecting verruca-spicules, may perhaps be imitated by its smoother companion.

Judging from some well-executed drawings of spicules in the collection of Dr. Ondaatje, and lent by him to the Museum, this species appears to occur on the Ceylon coast.

Psammogorgia? plexauroides, n. sp. (Plate XVII. figs. 1–6.)

Corallum erect, ramose, typically flabelliform, of straggling growth. Stem (in the single example) short, apparently typically alternately pinnate, varied by unilateral pinnation in crowded parts; branches given off at intervals of about $\frac{1}{2}$ to 1 inch, at about right angles, the angle tending to become acute towards periphery of corallum; terminal pinnæ commonly about 6 inches

long, slightly clavate at ends. Anastomosis exceptional. Base spreading (about ¾ inch across in the single specimen). Stem and branches cylindrical. Stem about 4 millim. thick, terminal pinnæ about 1·75 to 2·25 millim. thick below their terminal enlargement. Cortex firm, pale umber-brown, sprinkled with the black verrucæ; minutely granular, of thickness of tissue-paper on stem, about ·5 millim. thick on terminal pinnæ. Verrucæ strongly elongate in the direction of the axis of the branch, opening flush with the surface on the terminal pinnæ, on main branches often forming slightly elevated rings, about 1 diameter apart in the terminal pinnæ, increasingly scattered towards the stem (about 2–4 diameters apart); long diameter about ·5 to ·75 millim.; equally distributed all round the axes.

Horny axis very dark brown, hard and wiry, imperfectly flexible; near the ends of the pinnæ provided with wide central cavity.

Spicules (the measurements here include the tubercles).—Exact distribution in corallum not certainly made out*; the following chief types occur:—(1) Short, thick, cylindrical, with rounded ends, densely covered with rather small, low, blunt, broad tubercles, much roughened minutely; size about ·14 to ·18 by ·07 to ·1 millim. (2) Cylindrical, with two more or less distinctly marked whorls of tubercles, each whorl made up of about 5 tubercles; it terminates in one or two tubercles, or an expansion resembling a large tubercle, at each end; shaft cylindrical, about ·026 millim. thick, with slight median bare space; tubercles about ·026 millim. high and broad, fungiform, proliferating into a number of secondary rounded tubercles, giving a beautifully filigreed appearance to the spicule; total size of spicule about ·12 by ·007 millim. (3) Cylindrical, with two whorls of rough-hewn, broad, simple, and angular or knobbed tubercles, more or less definitely arranged in two whorls of about 4 each, and terminal ones; no distinct median bare space, and often no distinct terminal tubercles, or these, if present, low and crowded up against those of the whorls; proportions of spicule and its parts about same as those of (2). (4) Cylindrical, almost truncate at the ends, hence with suboblong or irregular, slightly constricted outline, either bare, with an irregular roughly-hewn look, or beset

* The coloration of the interstitial soft matter, combined with the absence of colour in the spicules, rendered it impossible in the time at my disposal to ascertain this point as usual from rough sections and teased specimens.

with low angular facets, about ·026 millim. in greatest width, rather than tubercles; the spicule in any case looks as if it had been shaped with a blunt knife; there is no indication of whorls except the median constriction; size about ·12 by ·052 to ·07 millim.; abundant.

Quadruple forms of stellate appearance, with surface presenting the character, now of (3), now of (4), and measuring about ·09 to ·12 millim. across, are common. All the spicules are colourless and transparent.

Hab. King Island Bay.

I have given the specific name on account of the great superficial resemblance to a *Plexaura* which is exhibited. This fine and interesting species is represented by a single dry specimen rooted to a rock; when spread out in life it may have stood about 12 inches high by 16 in greatest width. The agreement in proportions between the different kinds of spicules, though not a novel phenomenon in the Alcyonaria, is yet remarkable from its closeness, and perhaps indicates a common origin of, at any rate, spicules Nos. 2 and 3; perhaps the strange form No. 4 may be regarded as of independent origin. Nos. 1 and 2 differ markedly both from the latter and from each other (1) by the size, (2) by the character of their tubercles. No. 2 resembles in character the fusiform spicules of *Leptogorgia*; No. 1, some (?) in *Muricea umbraticodes*, Studer; No. 4 is peculiar, so far as I am aware, to this species, it being only distantly approached by the fusiform spicules of *Suberogorgia* (*Sclerogorgia*) *verriculata*, as figured by Kölliker (Icon. Histiol.). The angular character of the tubercles is found also in the (however, much more constant and regularly formed) spicules of *Isis* and *Corallium*. It should be noted, as bearing upon the question of affinity, that all the spicules are symmetrically equal-ended and symmetrically tuberculate, which points rather to Leptogorgian than Plexaurid or Primnoid affinities, if such should be suggested for it. It is not unlikely that the species ought to form the type of a new genus, but I am not sufficiently confident of being able rightly to lay down the characters of the genera in this section of the Alcyonaria, and, in my ignorance of the distribution in the corallum of the different forms of spicules, I have thought it best to place it with *Psammogorgia* (Verrill, Trans. Conn. Acad. i. p. 414) for the present, as it has many points of resemblance to that genus, as defined by its author (*loc. cit.*), although no "clubs"

are present here, and spicule No. 4 is not represented in *Psammogorgia*. On the other hand, it resembles *Leptogorgia* in the form and tubercles of the elegant spicule No. 2.

GORGONIA*, sens. strict.

(Gorgonia, sens. mod., *Verrill*, *Amer. Journ. Science*, (2) xlviii. p. 424.)

The "Klammer" type of spicule ("bracket- or crescent-shaped," Verrill, *l. c.*; "scaphoid," Kent, Monthly Microsc. Journ. iii. 1870, p. 90), by which this section of Gorgonaceans is characterized by Kölliker and Verrill, is developed in various degrees of definiteness, and besides being pretty obviously only a modification of the regular fusiform type prevailing in this and the allied genera, differs but slightly from it in some species, as in the one now to be described; hence the difference between *Gorgonia* and *Leptogorgia* (Verrill) becomes but a slight one. Still the genera should perhaps be maintained distinct, if only to preserve order among the numerous species composing the group. *Gorgonia*, however, unites types characterized by very diverse external forms (e. g. *Hymenogorgia*, *Xiphigorgia*, *Pterogorgia*, *Rhipidigorgia*); but there is at any rate one probably natural group among them, viz. the pinnately branched form (*Pterogorgia*).

GORGONIA OPPOSITIPINNA, n. sp. (Plate XVIII. figs. 7–11.)

Corallum erect, ramose, typically flabelliform. Base very narrow. Stem (in single specimen) very short. Mode of branching after the first division almost wholly oppositely pinnate, tending to become alternately pinnate towards the periphery; pinnæ in lower part of colony about $\frac{1}{2}$ inch apart, towards periphery up to about 2 inches; terminal pinnæ up to 3 inches in length. Pinnæ given off at angles of about 65° in

* *Note.*—I take this opportunity of correcting an error into which I fell in the description of the Alcyonaria brought home by H.M.S. 'Alert' (Report Zool. Coll. H.M.S. 'Alert,' London, 1884). *Leptogorgia australiensis*, mihi (*loc. cit.* p. 342, pl. xxxvi. figs. c, c', *c*, *c'*), should stand as *Gorgonia australiensis*, for the following reason. It occurred to me, on considering the pinnate arrangement of the branches, to re-examine the spicules to see whether I had possibly overlooked, from its resemblance to the fusiform, the occurrence of a scaphoid spicule here; I found it to be so. The scaphoids of *G. australiensis* are closely similar to those here figured for *G. oppositipinna*, indeed the long ones are practically identical with those of that species.

lower part, to about 50° near outside of colony. Stem and branches very slender; the stem and the branches immediately succeeding subcylindrical, the rest gradually clavate, strongly flattened, of undulating outline owing to the slight uniserial marginal projections which carry the verrucæ; terminal pinnæ sharply pointed; greatest diameter ranging from 1·5 millim. in the stem and chief branches to about 1 millim. in the terminal pinnæ. Cortex firm, harsh to touch, minutely rough, dull crimson in spirit, of about tissue-paper thickness in stem and base, but rapidly acquiring a thickness (on the margins of the branches) of about ·3 to ·5 millim. Verrucæ apparently very minute, uniserially arranged along margins of branches, flush with surface. Axis very tough and wiry, flexible, near base almost black, but throughout most of the colony brown to amber-yellow.

Spicules (measurements including tubercles) :—Fusiform, of two sizes, tapering gracefully from the centre to fairly sharp points, and with the ends commonly gently bent to opposite sides, and, as usual with the "bracket" spicule, moderately curved from front to back, with two very distinct median whorls of tubercles, and generally one whorl besides at each end beyond these, indicated by aggregation of low tubercles, the terminations of the spicule being clothed with similar tubercles not distinctly grouped. The median tubercles exfoliating elaborately into bushes of secondary tubercles, which are, however, absent at the "back" of the spicule; the remaining tubercles low, broken up into bead-like secondary tubercles. Spicules respectively about ·18 by ·052 to ·06 and ·14 by ·048 to ·052 millim. Colour bright crimson-scarlet.

Hab. King Island Bay, sublittoral.

Represented by a single spirit-specimen about 7 inches high by about 6 inches in greatest lateral extent. Owing to luxuriant branching at short intervals, it appears to consist of several parallel fronds; but these are really only the several branches with their offshoots, lying in front of one another, probably from want of lateral space and owing to the angles at which they are given off.

There are several known species closely allied to this form, especially the species above referred to (footnote, p. 238). *Gorgonia* (*Leptogorgia*) *australiensis*, Ridley, from Torres Straits, is chiefly distinguished from this species by its stout stem and its more acute angle of branching—the pinnæ are, however,

subopposite, as here, and should have been so described (the figure of the corallum brings out this point)—perhaps by the double series of verrucæ at the margins of the older axes, by the colour (yellow, orange, or dull red); but especially by the very different and less graceful form of the smaller spicule, which is commonly only about ·12 millim. long, and, having a large subterminal whorl of tubercles, looks almost blunt (fig. *c'*, *loc. cit.*).

Gorgonella umbella, *Esper*.

Gorgonia umbella, *Esper*, *Pflanzenth. Fortsetz.* ii. p. 30, pl. liii. —Gorgonia umbella (probably), *Dana*, *U.S. Expl. Exped.*, *Zooph.* p. 657.—Rhipidigorgia umbella, *Milne-Edwards & Haime*, *Hist. Nat. Coralliaires*, i. p. 175.—? Gorgonia umbella, *Kölliker*, *Icon. Histiol.*

From Esper's description and figure I refer to his species a form which has stood under the above name for some time in the Collection at the Museum. It presents both "double-head" and fusiform spicules. Kölliker, however, places Esper's species in that section of the genus *Gorgonia* which is characterized by spindles only, and not in his genus *Gorgonella*, into which our species (by virtue of its spiculation at any rate) naturally falls. Unfortunately neither Kölliker, Verrill, Studer, nor Klunzinger appear to have described the spicules of Esper's species, although Verrill (Amer. Journ. Sci. xlviii. p. 422), probably following Kölliker's initiative, thinks it may probably belong to his genus *Leptogorgia* as remodelled, *loc. cit.* However, the spicules of this species coincide well with those described and figured by Kölliker for *Gorgonella* (see especially *Gorgonella granulata*, *l. c.* p. 140, pl. xviii. fig. 43).

Hab. King Island Bay.

Distribution. Probably Bengal Seas (*Esper*).

A small dry specimen, and one in spirit probably belonging to the same species, were the material to be examined.

Juncella, *Valenciennes*.

This is a most difficult genus. Looking at the variations in the external form and in the spicules of the specimens here referred to this genus, and comparing them with facts previously known about it, one is struck by the extremely slight nature of the points separating some of the species. Had not *J. juncea* and *J. fragilis* been simple, while the present specimens of *J. gem-*

macea are branched, it would have been difficult to distinguish the three species, as in spiculation every fresh specimen appears to present some slight difference, while the total differences of spiculation in these species are slight, and thus admit of little specific distinction. Then, again, *J. gemmacea*, though commonly branched, may be simple. Colour, too, appears to afford equally little help in the determination of species. The form, size, and distribution of the zooid-verrucæ and the proportions of the corallum as a whole, seem to be the best points to rely upon. *J. elongata*, however, seems to be distinct in spiculation.

JUNCELLA GEMMACEA, var.

Verrucella gemmacea, *Milne-Edwards & Haime, Hist. Nat. Coralliaires*, i. p. 185, pl. B. 2. fig. 7.—Ellisella gemmacea, *Gray, Catalogue Lithophytes or Stony Corals, &c.* p. 26.—Juncella gemmacea, *Kölliker, Icon. Histiologicæ*, p. 140, fig. 191.—Juncella gemmacea, *Studer, Monatsbericht k. Akad. Wiss Berlin*, 1878, p. 659.—Juncella gemmacea, *Klunzinger, Korall. Roth. Meeres*, pt. i. p. 55.—Juncella gemmacea, *Ridley, Report Zool. Coll. H.M.S.* '*Alert*,' *Brit. Mus.* pp. 346, 580.—Juncella elongata, var., *op. cit.* p. 346.

In the 'Alert' Report I applied the above name to some very slender unbranched specimens with very prominent calicles, and varying in colour from orange to scarlet. The present collection contains two specimens which probably should also be referred here. Of these one is dirty white or cream-colour, branched very frequently, forming quite a dense head of short branches (about $\frac{1}{2}$ to 2 inches between bifurcations); the other is a fragment of a deep red colour, with very few and long branches (probable original length fully 6 inches); the maximum diameter of the axes (without the verrucæ) is about $3\frac{1}{2}$ millim. in both cases; a slight bare line is constantly present on one face of the red specimen, and on both faces, in parts at any rate, of the white specimen; verrucæ small, crowded; branching dichotomous. The club-spicules are elongate, and the double stars are equally or almost equally ended, and have few and prominent blunt tubercles.

The specimen described in the 'Alert' Report from the N.E. coast of Australia, and probably also that possibly from Formosa, referred to (p. 347) as *Juncella elongata*, Pallas, var., appear to be nothing more than the present species, it having been apparently overlooked that Pallas's species has no club-spicules (Kölliker,

Icon. Histiol. p. 140)—perhaps owing to my being misled by two wrongly identified specimens in the Museum Collection. A specimen from Malacca, recently received at the Museum, seems to be identical with this species; it agrees essentially with the red specimen from Mergui. The original specimen figured by Milne-Edwards and Haime is cream-coloured, the branches have their longer diameter (exclusive of verrucæ) 5 millim.; the stem apparently attains a thickness of 7 millim.; it is distantly branched.

From these facts it will be seen that we probably have a very variable species before us, colour, form, and size being alike not to be depended on by themselves; the spiculation is fairly constant, but differs so little from that of allied forms (*J. juncea* and *J. fragilis*) as to be scarcely a sufficient guide *per se* to the recognition of the species.

Hab. King Island Bay.

Distribution of Species.—Red Sea (*Milne-Edwards & Haime, Klunzinger*); Mascarene Islands (*'Alert' Coll.*); N.W. Australia (*Studer*); N.E. Australia (*'Alert' Coll.*); Malacca (*Coll. Brit. Mus.*); Burmah coast (*Coll. Mus. Calcutta*); Singapore (*Klunzinger*).

It may be of interest to note that in the pale specimen occur two cases of anastomosis between branches, but this is pretty obviously due to the crowded condition of the branches having caused mutual apposition; at any rate, in the case of the two shorter branches thus united the horny axes themselves are thoroughly fused together.

Juncella fragilis ?, var.

Juncella juncea (*Esper*), *Kölliker, Icon. Histiol.* p. 140, pl. xviii. figs. 45, 46.—? Juncella fragilis, *Ridley, Report Zool. Coll. H.M.S. 'Alert,' Brit. Mus.* p. 347, pl. xxxvi. fig. D.

Under the above species I place with doubt two forms which occur in this collection, viz.:—(1) White or cream-coloured. The only specimen of this which was placed before me has the apex gone. It is 14 inches long, and probably when perfect was quite four if not six inches longer; maximum diameter about 4 millim. A group of four specimens, probably all referable to this variety, occurs among the Sponges, overgrown by the sponge *Esperia plumosa* (Carter, *suprà*, p. 72). One of these has a greatest thickness of 5·5 millim. near its broken distal extremity. (2) A much decorticated pale brick-red specimen, now about 15 inches

(originally perhaps 16 to 18 inches) long, maximum present diameter 5 millim.

The spicules differ slightly from those of the type as represented by the original mounting, viz. in the greater prominence of the tubercles of the double stars; they are, as a rule, decidedly unequally ended in the white, and about as often as not in the red, specimen; but this point is much more strongly marked in the original specimen than in that from Mergui. In fact, both in this particular and in the larger growth of the corallum the latter makes a considerable approach to *J. juncea*, that species being now mainly distinguished from *J. fragilis* by its greater size, its red colour, its equal-ended double stars, and its larger and more distant polype-verrucæ, and the space bare of verrucæ just above the base.

As regards colour, pale varieties of red species are already known in the genus, also in the case of *J. gemmacea* (see above).

Thus these specimens seem to stand midway between *J. juncea* and *J. fragilis*, and may prove to be merely young forms of the former species. The original specimen of the species has a very flexible axis, while these specimens are comparatively stiff.

Hab. King Island Bay.

Distribution. N.E. coast of Australia (' *Alert* ' *Coll.*).

Ctenocella pectinata, *Pallas.*

Gorgonia pectinata, *Pallas*, *Elench. Zoophytorum*, p. 179.—Gorgonella pectinata, *Kölliker*, *Icon. Histiol.* p. 140, pl. xviii. fig. 41.

A fine specimen, 30 inches or upwards in height (now broken); branching luxuriant; spiculation normal.

Hab. Elphinstone Island.

Distribution. Indian Ocean (*Pallas*); seas of Moluccas (*Lamarck*); Torres Straits (' *Alert* ' *Coll.*); North-west coast of Australia (*Studer*); Cuba (*Brit. Mus.*); " India, China " (*Gray*).

By the absence of this familiar species, as by that of *Suberogorgia suberosa*, the Red Sea fauna shows its distinctness from that of the Indian Ocean.

Suberogorgia suberosa, *Pallas.*

Gorgonia suberosa, *Pallas*, *Elench. Zooph.* p. 191.—Suberogorgia suberosa, *Gray*, *Proc. Zool. Soc.* 1857, p. 159.—Sclerogorgia suberosa, *Kölliker*, *Icon. Histiol.* p. 142, pl. xix. fig. 13 (2).—Sclerogorgia suberosa, *Studer*, *Monatsber. k. Akad. Wiss. Berlin*, 1878, p. 666.

A dry specimen about 14 inches in height (if it ever stood upright), firmly rooted to a piece of quartz, over which the base spreads as a thin lamina nearly 5 inches by 3 inches in breadth.

The longer spicule of this species appears to be confined to the deeper parts of the cortex, hence is liable to be overlooked.

Hab. King Island Bay.

Distribution. "Sea which washes South Africa, and Indian Ocean" (*Pallas*); N.W. coast of Australia (*Studer*); Port Denison, Queensland, and Torres Straits ('*Alert*' *Coll.*); Mauritius (*Coll. Brit. Mus.*).

This species, so abundant in the Indian Ocean, is, like the preceding one, apparently not found in the Red Sea (*cf. Klunzinger, Korall. Roth. Meeres*, pt. i. p. 57).

Family Melithæidæ.

Mopsella planiloca *, n. sp. (Plate XVIII. fig. 6.)

Corallum strong, flabellate, reticulate. Basal portion massive, unjointed, dividing into several short, imperfectly joined axes, which proceed to break up, by branching at very acute angles, into fronds composed of very narrow elongate meshes, in which comparatively little distinction between the stoutness or length of the internodes (hard joints) and little difference in the thickness of the branches can be made out from top to bottom of the frond; nodes (soft joints) diminishing in stoutness from below upwards; meshes 3 millim. in average short diameter; long (vertical) diameter very variable (3 to 45 millim. observed), owing to the great variation in the completeness to which the anastomosis of the branches is carried, and the difference in length between the short lower and the longer distal internodes (the latter forming the greater number of the whole); distal internodes slightly tortuous, round to oval in transverse section, but generally somewhat antero-posteriorly compressed, fairly constant in length, viz. 9 millim.; thickness (in median to subterminal branches) about $2\frac{1}{2}$ by 2 millim. *Nodes* rugged, subglobular, rather compressed laterally, commonly with an angular margin below, ranging in diameter from about 7 millim. in the proximal to 2 millim. in the distal or subterminal nodes. Colour of the *axis* of the nodes and of the spongy proximal internodes pale brick-red, that of distal internodes rather deep pink. *Cortex* thin (equal to rather thick

* From the level character of the cœnenchyma.

paper), even and smooth, ground-colour pale vermilion. Polype-verrucæ, whether closed or open, flush with surface, lemon-yellow in colour, very small (about $\frac{1}{3}$ of a millim. when closed), closely aggregated on the cortex (a very narrow bare posterior line being sometimes left).

Spicules exhibiting a great range of form. The following are the chief types distinguishable :—I. *Cortical.* 1. Foliate spicule ("Blattkeule," Kölliker), of subquadrangular outline, with several sharp, slender tooth-like leaves, often jagged, but with margins otherwise usually entire, and a low mass of small tubercles representing the "handle" of the usual form of this spicule, which may therefore be described in this case as "very high-shouldered"; size about ·07 to ·088 long by ·052 to ·07 millim. broad. Colour crimson, ends of the leaves colourless, or almost so. 2. Fusiform, subclavate or irregular spicules of very various proportions, but usually with a slender body and long, rugged, rather distant tubercles; size up to about ·18 by ·018 to ·03 millim., excluding tubercles. Colour pale crimson. Perhaps confined to the neighbourhood of the verrucæ.

II. *Verruca-spicules.*—1. Long-handled foliate spicules (Blattkeulen), with short, usually few, rather wide, jagged leaves, and thick, strongly tuberculate handles; size up to about ·14 by ·055 millim. (Placed with the leaves fringing the opening of the verrucæ.) Colour yellow. 2. Long, graceful fusiform, with moderately-sized rounded tubercles on the convex side; size up to about ·2 by ·012 millim. Colour yellow. Forming a ring, overlapping slightly at their ends, round the zooid cavity. 3. Cylindrical or flattened, of various shapes, fusiform to irregular, may be curved; tubercles variable in size, mostly rather simple and rounded; size up to about ·14 to ·16 by ·018 to ·035 millim. Arranged so as to form triangular segments, forming valves over the zooids. Colourless or (?) faint lemon-yellow.

Hab. Elphinstone Island.

The specimen, which has suffered damage at its margins and extremities, measures about 7 inches high and 8 inches wide and $\frac{3}{4}$ inch in thickness at base. The originally flat frond has proliferated somewhat, forming two subparallel series of secondary fronds.

In coloration the species resembles that form of *M. aurantia* which is figured by Esper (Pflanzenth.) as *Isis coccinea*, and may be termed var. *coccinea*; but the distal internodes in that species

are generally stouter, shorter, and curved, and the verrucæ prominent, even in the closed condition. By its long, straight, and slender distal internodes and the distribution of its colours, it has more the appearance of *Melitodes virgata*, Verrill, or of purple varieties of *M. ochracea*; but a specimen of the latter in the Museum differs in its very wide posterior bare area in both ultimate and middle branches and its very squarely-cut nodes (perhaps the colour and resemblance is largely due to fading, &c., of both specimens). The ground-colour of *M. virgata* is (as implied by Gray's synonymic appellation, *atrorubens*) a very dark red.

An undescribed species in the British Museum has rather stouter terminal twigs and more or less prominent verrucæ, is non-reticulate and non-flabellate, and is further at once distinguished from *M. planiloca* by the evenly-rounded foliar lobes of the "Blattkeule" spicule, and by the apparent absence of the graceful fusiform spicule, and its replacement (?) by an irregular nodular form. Perhaps, however, this is the most closely allied known species. As positive characters of the new species may be indicated the "high-shouldered" form of the foliate spicule, the very slender cortical fusiform spicule, the very thin, smooth cortex, and very small unprojecting verrucæ. The spiculation strikes me as being more varied than that of any Melithæid known to me, but this may be due to defective observation as regards the remaining species.

DESCRIPTION OF THE PLATES.

Plate XVII.

Fig. 1. *Psammogorgia*? *plexauroides*, n. sp. Portion of colony (dry). Nat. size.
2. The same. Tip of pinna. ×2 diam.
3. The same. Spicule No. 2 of description. ×250 diam.
4. The same. Spicule No. 3 of description. ×250 diam.
5 & 6. The same. Spicule No. 4 of description, varieties. ×250 diam.
7. *Lobophytum madreporoides*, n. sp. Portion of colony, showing stem &c. (spirit). Nat. size.
8. The same. Small portion from surface of pileus to show an autozooid and siphonozooids. ×6 diam.
9. The same. Deep spicule of stem, No. 1 of description. ×250 diam.
10 & 11. The same. Spicules of zooid-bearing portion. ×250 diam.
12. The same. Superficial spicule of zooid-bearing portion. ×250 diam.
13. *Spongodes nigrotincta*, n. sp. Portion of head (spirit). Nat. size.
14. The same. A lobule. ×6 diam.
15. The same. Projecting spicule. ×55 diam.
16. The same. Spicule of general cortex. ×55 diam.

Fig. 17. *Spongodes boletiformis*, n. sp. Portion of head (spirit). Nat. size.
18. The same. Lobule. ×6 diam.
19. The same. Projecting spicule. ×55 diam.
20. *Spongodes aurora*, n. sp. Portion of head (spirit). Nat. size.
21. The same. Small portion of head. ×6 diam.
22. The same. Large spicule of cortex of head. ×85 diam.
23. The same. Projecting spicule. ×85 diam.
24. The same. Spicules of stem. ×250 diam.

PLATE XVIII.

Fig. 1. *Plexaura indica*, n. sp. Small specimen in spirit. Nat. size.
2. The same. Portion of larger (dry) specimen. ×2 diam.
3. The same. Foliate spicules of cortex. ×250 diam.
4. The same. Radiate spicule of verrucæ. ×250 diam.
5. The same. Fusiform cortical spicule (No. 2 of description). ×250 diam.
6. *Mopsella planiloca*, n. sp. Foliate spicule. ×300 diam.
7. *Gorgonia oppositipinna*, n. sp. Portion of type specimen (spirit). Nat. size.
8. The same. Portion of branch. ×4 diam.
9 & 10. The same. Larger scaphoid spicule. ×250 diam.
11. The same. Smaller scaphoid spicule. ×250 diam.

On two Species of Actiniæ from the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By Professor ALFRED C. HADDON, M.A., M.R.I.A. (Communicated by Dr. JOHN ANDERSON, F.R.S., F.L.S.)

[Read 16th June, 1887.]

(PLATES XIX. & XX.)

Two species of Actiniæ from the Mergui Archipelago were submitted to me by Dr. John Anderson, both of which have proved to be undescribed.

The more interesting form, which is the type of a new genus, was unfortunately in such a bad state of preservation that most of the epithelial tissues had entirely disappeared. Although this specimen was partially dissected and a portion removed for microscopic examination, care was taken not to destroy its value as a Museum specimen.

The other species was represented by three specimens, one

of which was devoted to the microtome, the other two are uninjured.

Except where otherwise stated, the following descriptions apply to the specimens as they appear after preservation in alcohol, and in a very contracted condition. In my definitions I have largely followed the method of procedure advocated by Professor R. Hertwig.

Myriactis*, n. gen.

Hexactiniæ [as defined by R. Hertwig] with slightly developed endodermal muscles in the upper portion of the body-wall, and strong mesenteric retractor muscles; a large number of moderately long, slightly contractile, subequal, polycyclic tentacles, the marginal row being papilliform; numerous complete mesenteries ["septa" of Hertwig]; reproductive organs present on all the mesenteries; wall, smooth below, provided with suckers above.

Myriactis tubicola†, n. sp. (Plate XIX.)

Form. Cylindrical; base not expanded, thrown into a number of radiating ridges, with concentric rugosities, thus giving it a reticulate appearance; scapus thin-walled, with the mesenteries shining through in the less contracted portions, transversely wrinkled; the closeness of the folds in the most contracted portion of the body it gives a satin-like lustre; capitulum non-retractile, transversely folded, but not nearly to the same extent as the scapus, provided with numerous suckers; the latter are most developed above, and become less prominent below; at the region where the capitulum imperceptibly passes into the scapus the suckers are very irregular in size and disposition, and give a perforated appearance to the body-wall. Margin of disk thrown into folds. Tentacles moderately long, conical, fairly uniform in size in eight or nine rows, over four hundred in number, not counting the marginal row. Gonidial furrows prominent.

Colour. "Disk and tentacles pale green. My impression is that they were barred or spotted." [J. A., *MS.*] Uniform grey, in spirit. The green colour in the living animal is almost certainly due to the presence of zooxanthellæ, which occur in enor-

* Μυρίος innumerable, ακτὶς a ray. † So named from its habit.

mous numbers in the endoderm of the upper portion of the body, and but sparsely in the rest of the column.

Dimensions. Contracted specimen in spirit—height 40 millim.; diameter of column 22 millim. below, 25 millim. above. Length of tube (in spirit) about 260 millim.

Habitat. Deeply burrowing in mud-flats, low spring-tide, French Bay, King Island, Mergui Archipelago (February 1882). The animal inhabits a thick slimy tube formed by the threads of cast-off cnidæ and foreign matter.

I have received the following memorandum from Dr. Anderson:—

"The large Actinia I found burrowing in the extensive mud-flats exposed at spring-tides in French Bay, King Island. There was a small depression in the mud around the disk and tentacles, and as they were filled with water, the tentacles were more or less expanded, of considerable size, and prominent. The disk was large, but whether it expanded much beyond the column, or at all, I cannot say. The upper stratum of mud was so soft that I sank halfway up to my knees in it; but the burrow of the Actinia extended deep below this; and I consequently experienced considerable difficulty in digging it out. When removed from its burrow, it was very flaccid, but had contracted to about 9 inches in length."

From the foregoing account we may conclude that the fully extended animal measures some 18 inches (460 millim.) in length. It is probable that when fully distended the disk extends beyond the diameter of the column, making it somewhat salver-shaped. As in *Cerianthus*, the tube is composed of innumerable cnidæ felted together; entangled amongst these are large numbers of unexploded nematocysts and foreign bodies, such as grains of sand, spicules of sponges and alcyonaria, diatoms, and the hyphæ of a fungus. The possession of symbiotic algæ must be very advantageous to this tubicolous actinian; and it is not surprising that they are mainly massed in the only portion of the animal which is exposed to the light.

The figures on Plate XIX. sufficiently explain themselves. It must be remembered that the greater portion of the epithelial tissues are lost by maceration. The ectoderm is entirely lost, most of the endoderm has separated from the lower portion of the body and from the mesenteries; enough, however, is present

in patches to prove that the zooxanthellæ occurred sparsely. The endoderm coating the generative region of the mesenteries (Pl. XIX. fig. 6) appears to be of a slightly different character from that of the more distal portion; in the latter granular gland-cells are very abundant; the mesenterial filaments (craspeda), as usual, contain a large number of granular unicellular glands, but I cannot discover any nematocysts.

In the capitular region of the body the endoderm is much better preserved, as will be seen from fig. 7; it is crowded with symbiotic algæ. At this region of the body the muscular folds of the endoderm, which usually remain simple, are very slightly branched (Pl. XIX. fig. 7). The mesoglœa or "mesoderm" appears to be entirely fibrous, the wavy appearance being due to contraction (figs. 6 and 7).

The mesenteries are ninety-six in number, the formula being 12+12+24+48; all of them are perfect, that is reach the œsophagus; lower down the mesenteries of different orders can be recognized by their length and relative size of the longitudinal muscles, the latter being very well developed (Pl. XIX. fig. 5). All the mesenteries bear reproductive organs. The specimen under examination possessed only ova (fig. 6).

The gonidial grooves are very well developed (Pl. XIX. fig. 4); above they have thick swollen margins, but lower down the latter are flattened bands. The œsophageal wall is thin, and can be divided into an upper folded portion and into a lower more diaphanous moiety.

The nematocysts (figs. 8 and 9) vary in size from about ·00225 to ·0035 of an inch, and in breadth from about ·00075 to ·0013 of an inch. No barbs are to be seen on the proximal portion of the thread.

There is a certain amount of external resemblance between this species and *Cereus pedunculatus* (Penn.) (*Sagartia bellis*, E. & S.), at least in such characters as the warty capitulum, smooth scapus, numerous somewhat short tentacles in several rows, of which the outermost is papilliform; but the latter is a typical member of the Sagartidæ in having acontia and in the six pairs of primary mesenteries being sterile although others reach the œsophagus. It is possible that the *Actinia paumotensis* of Couthouy is allied to our species; but H. Milne-Edwards and Andres both agree in placing that species close to the above-

mentioned Sagartid. It is now recognized that determinations of Actiniæ made from purely superficial characters are apt to be erroneous; so that a minute anatomical investigation of many of the previously described forms is now necessary before they can be confidently relegated to any group of the Actiniæ.

Dr. R. Hertwig divides the Actiniaria or Malacodermata, in his 'Challenger' Report, into six tribes. From the arrangement of its mesenteries, *Myriactis tubicola* belongs to the first tribe, the Hexactiniæ. Nine families are enumerated as belonging to this tribe. The first (Corallimorphidæ) has accessory tentacles, the last (Ilyanthidæ) has a vesicular physa. The Tealidæ have a very strong endodermal circular muscle; while the Paractidæ, Liponemidæ, Sagartidæ, and Amphianthidæ have a mesodermal circular muscle. The Antheomorphidæ are characterized by possessing a "slightly developed muscular system, long, slightly contractile tentacles, without any circular muscles (tentacles consequently non-retractile); reproductive organs present on all the septa [mesenteries]; accessory tentacles wanting." Lastly, the Antheadæ are defined as "Hexactiniæ with long marginal tentacles and slightly developed endodermal circular muscle (so that the oral disk cannot be covered at all, or only incompletely); numerous septa, reaching for the most part up to the œsophagus, distinguished only by their size, and all (?) furnished with reproductive organs."

On comparing the above descriptions with the definition of the genus *Myriactis*, it will be seen that the latter cannot be placed in any of these families unless one or more of their characters are amended. Its exact systematic position must be left until we have a more accurate knowledge of the tropical Sea-Anemones.

Hormathia Andersoni, n. sp. (Plate XX.)

Form. Base expanded; scapus leathery, with transverse furrows, terminating above in twelve fairly regular bosses, which are prolonged along the inverted capitulum as twelve prominent ridges. Tentacles moderately long, pointed, arranged in four (?) cycles, about 100 in number.

Colour. Cuticle burnt sienna, speckled with grains of sand; where the cuticle is rubbed off, the supporting tissue (mesoglœa or "mesoderm") of the scapus is yellowish; terminal prominences

of scapus white. Tentacles with a row of small madder-brown spots on their oral aspect. Disk with madder pigment.

Dimensions. Specimen *a*: Diameter of base 20 millim., diameter of lower portion of scapus 15 millim., height 7 millim. Specimen *b*: Diameter of central portion of scapus 9 millim., height 8 millim.

Habitat. Sullivan Island, Mergui Archipelago; 6 fathoms. January 13, 1882.

This species is so closely allied to the "*Phellia pectinata*" of R. Hertwig, as described in his 'Challenger' Report, that there can be no doubt that they must be placed within the same genus.

The genus *Phellia* as defined by Gosse (Ann. Mag. Nat. Hist. (3) ii. 1858, p. 192, and 'Actinologia Britannica,' p. 134) and accepted by Verrill (Trans. Connect. Acad. i. 1868, p. 489) and Andres (Le Attinie, 1884, p. 117) is well characterized; the scapus may be rugose or wrinkled, but distinct nodules are absent.

While apparently agreeing in many respects with this genus, in Hertwig's form the scapus terminates "above in twelve knobs, which are prolonged on to the inverted soft-membraned section [capitulum] as twelve longitudinal combs." The new species just described also possesses twelve nodules. I am indebted to my friend Canon A. M. Norman for an Actinian which closely resembles the form depicted on Plate XX. fig. 1, which he dredged twenty years ago at Shetland, and which I am elsewhere describing (Trans. Roy. Irish Acad.). Lastly, Gosse described in 1859 a new British Sea-Anemone which he named *Hormathia Margaritæ* (Ann. Mag. Nat. Hist. (3) iii. 1859, p. 47, also Actin. Brit. p. 219, pl. viii. fig. 1), the new genus being thus diagnosed:—"Base adherent, greatly expanded. Column pillar-like, much corrugated, surrounded by a single horizontal row of warts. Disk slightly concave, scarcely exceeding the column. Tentacles moderately long and slender, perfectly retractile. There is but a single known species, *H. Margaritæ*." This species has only once been recognized since; F. E. Schulze records it from 96 fathoms off N.E. Scotland (log. no. 79) on *Fusus antiquus* (Jahresb. d. Com. z. wiss. Untersuch. d. deutschen Meere (Exped. 1872), 1875, p. 140).

Anatomical details are wanting for the type species of both of Gosse's genera *Phellia* and *Hormathia*; but it appears pretty

evident that Hertwig should have referred his species to the former rather than to the latter of the two genera. In which case the following would constitute the recognized species of the genus *Hormathia*, viz. *H. Margaritæ*, Gosse, *H. pectinata* (R. Hert.), *H. Andersoni*, Hadd. I shall shortly in another place discuss the systematic relationships of this genus.

Of the three specimens collected by Dr. Anderson, one (*a*), Pl. XX. fig. 1, is attached to a piece of broken shell, the base being greatly expanded and partially enwrapping the fragment of shell. In the other two specimens (*b* and *c*), Pl. XX. figs. 2 & 3, the base is dome-shaped and constricted off from the upper portion of the column; possibly these were free forms, as the arrangement of the base would form an efficient sand-anchor.

As was previously mentioned, one specimen was sacrificed for anatomical purposes. First, I bisected it vertically, and then devoted one half to transverse sections; a portion of the other was utilized for vertical sections. This specimen was in a good state of preservation.

Professor Hertwig has in his 'Challenger' Report, pp. 80–83, given a good account of the genus *Hormathia*, as represented by his *P. pectinata*. Our form is so closely allied to this, that little need here be added. Fig. 3 (Pl. XX.) is a slightly diagrammatized view of a vertical section through the entire animal. The powerful mesodermal circular muscle, the folded œsophagus, and absence of gonidial grooves alone call for remark. The ectoderm is figured as extending entirely round the body; as a matter of fact in the specimen in question it only occurred in the more protected portions, as, for instance, in the slight hollow round the central boss, at the basal constriction on the pedal disk, and on all the invaginated surfaces.

Two figures of transverse sections are given: one (Pl. XX. fig. 4) is taken through the circular muscle, and shows that the sphincter forms an uninterrupted circular muscle, the apparent terminations in the section being due to the section passing out of the plane of the muscle; the second section passes through the œsophagus, and illustrates a characteristic feature of the Chondractininæ, that only the primary pairs of mesenteries reach the œsophagus. This section is slightly oblique, the left-hand side being at a somewhat lower level than the right. At the latter the tips of three tentacles are cut across.

The mesenteries have no features worthy of special note.

Fig. 6 represents a section through the tertiary mesentery indicated by an asterisk (*) in fig. 5. The secondary and tertiary mesenteries alone are fertile. The total number of mesenteries is 96 (12+12+24+48).

The invaginated ectoderm consists of a ciliated columnar epithelium, that on the tentacles is crowded with curved nematocysts (fig. 7); granular gland-cells are common in the epithelium of the œsophagus. Where it is preserved, the ectoderm of the column is coated with an investment of grains of sand apparently imbedded in a mucous matrix often with shreds of cuticle; on the pedal disk, however, the cuticle is strongly developed between the arenaceous investment and the epithelium.

The character of the mesoglœa (mesoderm) is sufficiently indicated in fig. 10. This figure also illustrates the structure of the circular muscle in vertical section.

The concrements observed by Professor Hertwig in the superficial layer of mesoderm in his specimen are here absent; but oval foreign bodies occur in the mesoglœa mainly towards the apex of the invaginated section of the body-wall, either within or outside the circular muscle. They appear to be the ova and embryos of some parasite, possibly of a Nematode worm.

The endoderm consists of the usual histological elements. The madder-coloured pigment of the tentacles and oral disk is confined to the endoderm. In those mesenterial filaments (craspeda) which have a trilobed section, the central lobe only possesses unicellular glands which are of the granular type.

The acontia (Pl. XX. fig. 9), in addition to granular gland-cells, are crowded with nematocysts (fig. 8); these are rather longer and more slender than those of the tentacles, the former being about ·0083 of an inch, and the latter about ·0015 of an inch in length.

DESCRIPTION OF THE PLATES.

Plate XIX.

Myriactis tubicolæ, gen. & sp. nov.

b. Craspeda (mesenteric filaments). *d.* Unicellular glands. *en.* Endoderm. *g.* Reproductive organs (gonads). *h.* Mesenteries; I.–IV. indicate the rank of the pairs of mesenteries. *i.* Oral disk. *k.* Body-wall. *l.* Pedal disk. *me.* Mesoglœa (mesoderm). *ml.* Longitudinal muscles of mesenteries. *mp.* Parietobasilar muscle. *ms.* Circular muscle. *o.* Ova. *s.* Œsophagus. *sc.* Suckers. *sr.* Œsophageal groove. *t.* Tentacles. *z.* Zooxanthellæ.

The combinations of lenses mentioned below refer to Zeiss's system.

Fig. 1. Side view of a preserved specimen. Natural size.
2. Portion of same. × 2 diameters.
3. Portion of base, seen from below. × 2 diameters.
4. Inner view of part of the body, showing one gonidial groove (œsophageal groove) and a secondary septum. Natural size.
5. Transverse section through one twelfth of the body below the œsophagus. $\frac{2}{a^*0}$.
6. Transverse section through a mesentery. $\frac{3}{a^*10}$.
7. Portion of a longitudinal section through the capitulum, showing the endoderm crowded with zooxanthellæ, the feeble endodermal circular muscle, and the nature of the mesoglœa. $\frac{2}{A}$.
8. Portion of teased tube, with an alcyonarian and a sponge-spicule. $\frac{2}{B}$.
9. Isolated nematocyst, partially exploded. $\frac{2}{D}$.

Plate XX.

Hormathia Andersoni, sp. n.

a. Acontia. *b.* Mesenteric filaments (craspeda). *d.* Unicellular glands. *ek.* Ectoderm. *en.* Endoderm. *g.* Reproductive organs (gonads). *h.* Mesenteries; I.–IV. indicate the rank of the pairs of mesenteries. *i.* Oral disk. *k.* Body-wall. *l.* Pedal disk. *lp.* Lip of mouth. *m.* Muscles. *me.* Mesoglœa (mesoderm). *ml.* Longitudinal muscles of mesenteries. *mr.* Radial muscles of oral disk. *ms.* Circular muscle. *n.* Nematocysts. *rh.* Directive mesenteries. *s.* Œsophagus. *sg.* Grains of sand forming investment to the ectoderm. *t.* Tentacles; 1 primary, 2 secondary.

The combinations of lenses mentioned below refer to Zeiss's system.

Fig. 1. View from above of specimen *a*. × 2 diameters.
2. Side view of specimen *b*. × 2 diameters.
3. Vertical section through specimen *c*. × 4 diameters.
4. Transverse section through upper portion of body-wall. $\frac{2}{a^*5}$.
5. Transverse section through the œsophagus. $\frac{2}{a^*5}$.
6. Horizontal section through the tertiary mesentery indicated by an asterisk (*) in fig. 5. $\frac{3}{A}$.
7. Nematocysts from a tentacle. $\frac{2}{F}$.
8. Nematocysts from an acontium. $\frac{2}{F}$.
9. Transverse section through an acontium. $\frac{2}{D}$.
10. Vertical section through horizontal portion of circular muscle. $\frac{2}{C}$.

Report on Annelids from the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum. By Frank E. Beddard, M.A., F.Z.S. (Communicated by Dr. John Anderson, F.R.S., F.L.S.)

[Read 16th June, 1887.]

(Plate XXI.)

Eupompe indica, n. sp. (Plate XXI. figs. 1 & 3.)

A single specimen of an Annelid contained in the collection appears to belong to an undescribed species, which I would refer to the genus *Eupompe*.

It presents numerous points of agreement with *Panthalis melanonotus* and with *P. nigromaculata*, already known through Grube's researches* to inhabit the shores of the Philippine Islands; it agrees, in fact, with those two species rather more closely than with *Eupompe Grubei*, the only described† species of its own genus.

A careful study of this species and of the description of other species published by Kinberg‡ and Grube§ has convinced me that there are no grounds for distinguishing the genera *Eupompe* and *Panthalis*; and as the former name appears first in his descriptions, I retain it as having the priority.

In comparing Kinberg's diagnoses of the genera *Eupompe* and *Panthalis* (which I need not quote in full), I find that the only points of difference concern the protrusible pharynx and the arrangement of the elytra. The diagnosis of *Panthalis* contains a statement with respect to the ventral cirri which is not found in the diagnosis of *Eupompe*. A comparison of the figures of these structures, however (*loc. cit.* pl. vii. figs. 34 F, 35 F, and 34 F′, 35 F′), shows that there is hardly sufficient difference in their shape and position whereon to found a specific, let alone a generic, distinction. The elytra in *Eupompe* are flat, not meeting in the dorsal middle line anteriorly, but covering the dorsal surface posteriorly; the elytra in *Panthalis* are described as being numerous, the anterior series flat, the posterior bell-shaped; the first

* "Beiträge zur Kenntniss der Annelidenfauna der Philippinen," Mém. d. l'Acad. Imp. Sci. St. Pétersbourg, t. xxv. (sér. 7), 1878, p. 48.

† Kinberg, 'Kongl. Svensk. Fregatten Eugenies Resa,' Annulata, p. 24.

‡ *Loc. cit.* § *Loc. cit.*

few anterior elytra meet in the middle dorsal line, the rest leave the dorsal surface uncovered in the middle line.

With regard to the shape of the elytra, Grube finds that in *P. melanonotus* some are bell-shaped*; and that therefore this generic distinction must fall to the ground.

This species (*P. melanonotus*) agrees with Kinberg's definition of the genus in so far that a few of the anterior pairs of elytra meet in the middle dorsal line, while the remainder do not. Not so, however, *P. nigromaculata*. In this species the anterior elytra do not meet in the middle dorsal line, while the posterior do, as in *Eupompe*. The Mergui species is a connecting-link between the extremes; the three anterior pairs of elytra, as well as a large number of the posterior pairs, do meet in the middle dorsal line, while the elytra of intermediate position do not. It is clear, therefore, that the arrangement of the elytra is only of value as a specific distinction.

The only remaining generic distinction† is the pharynx. Grube says nothing about this, probably for the same reason as myself, being unwilling to injure the only example of the species contained in Dr. Anderson's collection.

Even if the differences in the pharynx of the type species of the genera described by Kinberg are found also in other species, it appears to be largely a question of opinion and of authority whether the difference is sufficient to constitute a generic distinction. In my own opinion the comparatively slight modifications in an organ, which often undergoes such variations in closely allied species, as in the case of *Nereis*, cannot be considered of sufficient importance to warrant a generic separation.

The specimen measures about 110 millim. in height; it is of an elongated form, only slightly narrowed towards the posterior extremity. The colour is of a yellowish brown; the elytra are coloured of a rich brown, which is rather more conspicuous on the inner side. The dorsal side of the body, as in other species, is covered with closely-set wrinkles, which render it impossible to map the segments in this region; on the ventral side the intersegmental furrows are obvious.

The dorsal surface is marked by a median longitudinal dark

* *Loc. cit.* p. 49.

† The difference between the setæ is not referred to in the generic definition, and can hardly be regarded as of generic importance.

stripe, which corresponds to the dorsal blood-vessel; posteriorly this lies in a groove; on each side of the groove the integument is thickened, and of the yellowish-brown colour which produces the distinctive appearance of the worm; beyond this the body is translucent and colourless, the thickened area is wider anteriorly and is somewhat diminished in width posteriorly; where the elytra do not meet in the middle line, it corresponds more or less accurately to the bare space left by the elytra.

The ventral side of the body is also marked by a conspicuous longitudinal groove; this commences at the 8th segment, where it is considerably wider and occupied by a median elevation, which reaches back about as far as the 30th segment, and gradually dies away.

The disposition of the elytra has been already referred to; they alternate regularly with cirri throughout the body, except on the fourth and fifth segments, which are both provided with elytra and not cirri.

The dorsal cirri are attached, as in other species, by a swollen base; both dorsal and ventral cirri are short.

The setæ appear to me to differ but little from those of *Eupompe Grubei* (Kinberg, *loc. cit.* pl. vii. fig. 35 G).

The head is illustrated in Pl. XXI. figs. 1 and 3, and is entirely characteristic. It may be noted that the cephalic lobe bears two eye-spots (*e'*) in addition to the two large eyes (*e*).

Chloeia merguiensis, n. sp. (Plate XXI. figs. 2, 8, & 9.)

The largest specimen of this Annelid measured 54 millim. in length, the greatest breadth being 10 millim.

The shape of the body is not ovoid, but elongate; this appearance is at any rate presented by the worm when the setæ have been for the most part removed.

The dorsal side of the body is covered with innumerable grooves, and presents a tessellated appearance; the areas bounded by the grooves are of an elongated rhomboidal shape, their long axis coinciding with the long axis of the body; the skin covering the parapodial outgrowths is for the most part smooth. Each segment is divided by two rather more conspicuous grooves into three divisions; the middle one is wider anteriorly than posteriorly, since the grooves fall obliquely and tend to approximate posteriorly; the lateral divisions bear the parapodia and the branchiæ which are just outside the grooves; the median area is marked

by a transverse zigzag groove, which is caused by the regular arrangement in this region of the rhomboidal areas of the skin.

The dorsal surface of the body is also marked by patches of pigment which have a regular and characteristic arrangement; each segment has a median stripe which widens out anteriorly into a triangular patch; the transverse furrow marks the junction between the triangular patch and the narrow stripe; posteriorly two curved pigment-bands pass one on each side along the furrow separating the dorsal from the lateral portions of the segment. The whole pigmented area has, as Horst has remarked in the case of *Chloeia parva**, a marked resemblance in shape to an anchor. Each segment has also a broad pigmented band on the anterior side of the parapodial outgrowth; in the anterior segments of the body this latter band is continuous with the curved lateral pigmented bands; in these segments also there is a short pigmented streak behind the parapodial outgrowths; in the posterior segments this streak gradually dies away.

The ventral surface of the body is comparatively smooth, with the exception of a few of the anterior segments which bound the mouth; these are much wrinkled by longitudinal furrows; the third and fourth segments of the body are fused in the middle ventral line into a rounded projection which bounds the mouth posteriorly; this process is greatly furrowed; the middle ventral line of the body is marked by a distinct and rather transparent line which corresponds to the nerve-cord.

The caruncle extends back as far as the fourth segment, but its posterior end is free, and it is not attached to this segment nor to much of the third; the caruncle bears a longitudinal pigmented stripe.

The setæ are much more abundant in the neuropodium than in the notopodium; they are of considerable length in the former, and have everywhere a white silky appearance.

The dorsal setæ (fig. 2) are all of one kind; they are stout, and serrated at the free extremity. The general aspect of these setæ is in fact closely similar to that of other species. The extreme tip of the seta is often of a yellow colour, and slightly serrated on the margin which bears the lateral teeth before the commencement of the latter; below the lateral serrations and on

* 'Notes from the Leyden Museum,' vol. viii. p. 168.

the opposite side of the seta there is a short slender tooth-like process directed forwards; this is only found in the setæ of the anterior segments; in the setæ of the posterior segments its place is indicated by a swelling. The imbedded extremity of these setæ is sharply pointed. A large portion of the shaft is marked by faint constrictions, which give it a transversely striate appearance in the posterior setæ.

The ventral setæ are long and slender, and bifid at their extremity, one limb of the bifurcation being shorter than the other.

The branchiæ commence at the fourth segment, and gradually increase in size in the posterior segments. Their shape is precisely as described by Prof. M'Intosh in *Chloeia flava**. To describe the branchiæ of *C. merguiensis* would be merely to recapitulate Prof. M'Intosh's description. The colour of the branchiæ is the same as that of the general body-surface; the main stem is slightly pigmented.

The first pair of branchiæ, *i. e.* those borne by the fourth segment, were in a rudimentary condition as compared with those which follow; the main branches of the stem were either devoid of secondary branches, or were furnished with only one or two at the base. The complexity of these organs appears to increase in the first few segments.

The dorsal cirri are deeply pigmented and of considerable length, especially on the middle and posterior segments; the anterior segments appear to bear an additional minute cirrus in place of the missing branchiæ, as is mentioned by Prof. M'Intosh in *C. flava*; this second cirrus is not pigmented.

The ventral cirri are not so long as the dorsal and are unpigmented.

The anal cirri are short and thick, unpigmented.

The anus is dorsal in position.

This species is plainly distinguishable from *Chloeia flava* by the colour and shape of the setæ, the spur of the dorsal setæ being much more evident than in the present species. Furthermore, the pigmentation of the body in the two species is quite different.

It is not so easy, however, to distinguish the present species from *C. parva*, and accordingly I distinguish it from that species with a certain amount of doubt.

* Report on the Annelids collected during the Voyage of H.M.S. 'Challenger.' Zool. Chall. Exp. vol. xii. (part xxxiv.).

The distribution of pigment on the body agrees very closely with Baird's, and particularly with Horst's, description. On the other hand, Baird's description of the branchiæ as being "small, simply branched, and ... of a dark colour," hardly confirms what has been said above respecting the exact resemblance between the branchiæ of my species and of *C. flava*.

The character of the dorsal setæ as described by Horst is the chief obstacle to my definitely regarding the Mergui specimens as belonging to the species *C. parva*. In the first place, I could observe no such difference between the shaft and the tip of the seta as he describes. It is true that the shaft has usually a somewhat fibrous appearance, while the tip is more transparent; but I could observe no abrupt line of demarcation. In the second place, the presence of a small spur does not coincide, in the anterior bristles, with the want of serration.

Eurythoë alcyonia, *Savigny*.

Pleïone alcyonia, *Savigny, Système des Annelides*, p. 62.

This species has been carefully described in Horst's memoir already quoted. I have examined a large number of specimens, which agree closely with Horst's description except as regards the *colour* of the setæ.

I find in my specimens the great variety in the characters of the setæ of the dorsal and ventral parapodia as described by Horst. The second kind of setæ described by him, those with a "slightly bifid tip, one of the divisions being a mere spur, while the other is extremely elongated and tapering," are of a horny-yellow colour throughout the whole of the distal region. The other setæ have a colourless extremity. Horst's description states the exact converse. If this is not an accidental error in his description, the variation in the colour is curious and worth noticing.

I did not observe any "hastate" setæ in the notopodium; but they are present in the neuropodium in my specimens: I could not find more than one in each segment, and they were deeply imbedded in the soft tissue, the spear-like extremity alone protruding. These setæ are stout.

Branchiomma intermedium, n. sp. (Plate XXI. figs. 4–7.)

The collection contained two specimens of this species, one of which only was perfect, and measured about 100 millim. in length, including the branchiæ. There were also a number of fragments,

of various sizes, of the tubes of the worm; these are of considerable thickness, the greater portion being formed by a coating of fine mud and sand, in which is imbedded a quantity of entire and broken shells of various kinds; the part of the tube fabricated by the animal itself is thin, and of a tough, somewhat cartilaginous consistency. The colour of both specimens is a pale brown, the branchiæ being somewhat darker, but still of a uniform brown tint. The anterior region of the buccal segment (fig. 4) is marked by a broad black band, and the two halves of the collar where they meet in the median ventral line (fig. 5) are similarly pigmented.

The collar, instead of being confined to the first segment, passes obliquely downwards, and terminates on the third seta-bearing segment; on all the segments the collar is situated on the dorsal side of the parapodia and close to them. The relations of the collar can be seen by an inspection of figs. 4 and 5.

The "thorax" contains eight segments, which are distinguished from the abdominal segments by the much larger size of the *tori uncinigeri*. The middle ventral line of each of the thoracic segments is marked by a thickened lighter-coloured area, which extends over the greater part of the ventral surface; this area gets smaller in the posterior segments, and in the abdominal region is bisected by the ventral groove. The latter occupies the median ventral line up to the eleventh segment; on the tenth segment it is bent towards the right side, and, after crossing between the eighth and ninth, reaches the dorsal median line at the sixth segment. On the dorsal side of the body this groove runs at the bottom of a rather deep depression which marks these segments.

The setæ of the dorsal *tori uncinigeri* are of two kinds, as in other species of this genus, and show no peculiarities in their shape. They are stout setæ with a double curvature at the extremity, which becomes gradually attenuated towards the tip. These parapodia also bear rounded mamillary processes, possibly of a sensory nature, which appear to resemble those figured by Claparède in *Trophonia eruca* *. I do not find any such process on the corresponding region of the parapodium in the abdomen, although the surface is irregularly divided into rounded prominences.

* "Annélides chétopodes du Golfe de Naples," Mém. Soc. Phys. Gen. t. xx. pl. xxv. fig. 2.

The branchial filaments are furnished at their tips with well-developed eyes, a single eye to each branchial filament.

In the relation of these eyes to the extremity of the branchial filament, the present species is particularly like *Branchiomma vigilans* *; that is to say, that the terminal region of the branchial filament is prolonged for a considerable distance beyond the eye, which is attached to its under surface.

The eye of *B. intermedium*, however, appears to differ a little in shape from the last-named species as well as from the others; it is somewhat mushroom-shaped (Pl. XXI. fig. 6); the stalk of attachment to the branchial filament is pigmented.

An interesting point about the branchiæ of this species is illustrated in the same figure; towards the extremity is a double fold just overlying the eye; the two halves of this fold appear to coalesce (figs. 6 and 7) posteriorly, and gradually to die away towards the base of the branchial filament. It seems to me permissible to compare this structure to the dorsal filaments on the branchiæ of *Dasychone*, and on that account I have named this species "*intermedium*." This character does not seem to occur in other species—it has not, at any rate, been figured or referred to—and therefore will serve to distinguish the present species.

Another species which, coming from the same quarter of the globe, will be confounded with this, is *Sabella acrophthalmos* of Grube†. Grube, however, says nothing about the dorsal laminæ upon the branchial filaments, and compares the species generally with *Branchiomma vesiculosum*. I apprehend, therefore, that the relation of the eyes to the gill-filaments is more like that of *B. vesiculosum* than *B. vigilans*.

There are two tentacles about one third of the length of the branchial filaments; each tentacle is slightly curved, and tapers gradually towards its free extremity, which bears a certain amount of pigment on the inner side; the inner (curved) edge of the tentacle bears a number of extremely delicate hair-like filaments.

DASYCHONE SERRATIBRANCHIS, *Grube*.

Dasychone serratibranchis, *Grube, Beiträge für Annelidenfauna etc.* p. 262.

The collection contains several specimens of a *Dasychone* which I refer to this species.

* *Loc. cit.* p. 501. † *Loc. cit.* p. 258.

On the Structure of the Eyes in Chloeia merguiensis.

So far as I am aware, there is no description of the minute structure of the eyes in *Chloeia*, or, indeed, in any of the Amphinomidæ. The excellent state of preservation of the specimens of *Chloeia merguiensis* has enabled me to contribute some observations on the eyes of this species to what is already known of the structure of the Annelid eye. This worm possesses, in common with other Amphinomidæ, two pairs of eyes situated one in front of the other; these are recognizable to the naked eye as four black spots upon the procephalic lobe.

The first point to which I directed my attention was to ascertain whether or not there was any difference in structure between the anterior and posterior pairs, as there is, for example, between the eyes of *Nereis cultrifera**. I did not, however, detect any differences of a similar nature, or of any kind whatsoever between the eyes of either pair †.

The following description, with the reservation stated in the footnote, applies to both pairs.

The retina (fig. 8, *r*) consists of a single row of tall narrow cells, as in other Annelids, which terminate in long rods (*n*), the structure of which, owing to their excessive slenderness, I am unable to describe. The retinal cells are for the most part rather longer than their rods; and appear to be all deeply pigmented, the colour of the pigment being black. Curiously enough, a small region of the retina on one side of the eye has an orange-coloured pigment deposited in the retinal cells; this is evidently not an accidental variation, as I found that in all four eyes of the single specimen, which I examined microscopically, the same region of the eye presented an exactly similar condition of the retinal pigment.

The cells of the retinal layer are not, however, equally pigmented throughout. The pigmented area is about half the extent of the retinal area, the lower half of these cells being entirely free from pigment; the pigment also appeared to be largely extrinsic, though a portion of it is certainly intrinsic, *i. e.* within the substance of the retinal cells. It is therefore probable that there is in *Chloeia* a resemblance to *Nereis*, in which Annelid Carrière

* Carrière, 'Die Sehorgane der Thiere,' München u. Leipzig, 1885, p. 31.

† I should state, however, that I did not observe very clearly the relations of the lens in the first pair.

has figured* and described two kinds of retinal cells: (1) pigmented cells pigmented throughout their whole length, and (2) clear cells entirely free from pigment. The very small size of the pigmented cells causes the eye of *Chloeia* to resemble more nearly that of the Alciopidæ (presuming that the pigment-layer is really contained in separate cells in the Alciopidæ); *Chloeia* is, in fact, in this particular intermediate between *Nereis* and the Alciopidæ.

Carrière did not find, or at least does not figure, any rods attached to the extremity of the retinal cells in *Nereis*; the whole of the interior of the eye is filled with a plug of tissue termed by him the vitreous body (*Gallertkörper*). Patten † suggests, with apparent reason, that part of this, at any rate, is in all probability composed of a layer of rods. If this is not the case, the eye of *Nereis* differs in a very striking fashion from the eye of *Chloeia* and the Alciopidæ ‡. The retinal layer is continuous anteriorly with a delicate layer of cells, the eye being therefore, as in other Annelids, a closed sac. There is not, however, a space left in the eye between the retinal layer and the vitreous layer; the whole of the available space is occupied by a lens which has rather a peculiar shape, as shown in fig. 8 of Plate XXI.; this lens is deeply stained by borax carmine. In that particular, and in its laminated structure, it agrees exactly with the cuticle which covers the eye externally; the structure of the lens, in fact, appears to be closely similar to that of the Alciopidæ §, and to differ from that of *Nereis*. In the Alciopidæ a considerable space is left between the lens and the extremities of the rods; there is no such space in *Chloeia*, the lens being nearly in contact with the rods (Pl. XXI. fig. 6): in this particular, therefore, it resembles the lens of *Nereis*.

An important feature in the eye of Chloeia *is the continuity of the cuticle and the lens.* A careful examination of consecutive sections showed plainly that there is no break whatever between the cuticle, which covers the eye externally, and the lens; the latter appears to be simply a thickening of the former. I am not disposed to deny that the connection between the lens and

* *Loc. cit.* p. 31 *et seq.*

† Greeff, "Untersuchungen über die Alciopiden," Nov. Act. Acad. Leopold.-Carol. Bd. xxxix. (1876).

‡ Mitth. a. d. Zool. Stat. zu Neapel, Bd. vi. (1886), p. 701.

§ Greeff, *loc. cit.*

the outer cuticle may not be a secondary fusion, analogous, therefore, to the fusion of cuticle and vitreous body in *Elater*, *Lampyris*, &c. described by Grenacher *. The condition of the eye in certain Alciopidæ, for example in *Nauphanta celox* †, where the hypodermis and vitreous layer intervening between the cuticle and lens has become extremely rudimentary, suggests that this is the case. On the other hand, the resemblance to what Profs. Lankester and Bourne ‡ would term (if it were an Arthropod eye) a monomeniscous diplostichous non-retinulate eye is not a little striking.

DESCRIPTION OF PLATE XXI.

Fig. 1. *Eupompe indica*, n. sp. Anterior segments. *e*, eye; *e'*, eye-spots.
2. Dorsal seta of *Chloeia merguiensis*, n. sp.
3. Side view of head of *Eupompe indica*, n. sp.; *e*, eye.
4, 5. *Branchiomma intermedium*, n. sp.
6. Tentacle of ditto, viewed laterally.
7. Transverse section of ditto.
8. Eye of *Chloeia merguiensis*, n. sp. *r*, retina; *n*, rods; *e*, hypodermis; *l*, vitreous body (?).
9. Base of retinal rods, viewed in transverse section.

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* Grenacher, 'Untersuchungen über das Sehorgan der Arthropoden.'

† Greeff, *loc. cit.* p. 69, pl. v. fig. 43.

‡ Q. J. M. S. vol. xxiii. (1883), p. 210.

Report on the Pennatulida of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By Prof. A. Milnes Marshall, M.A., M.D., F.R.S., and G. Herbert Fowler, B.A., Ph.D. (Communicated by Dr. John Anderson, F.R.S., F.L.S.)

[Read 3rd November, 1887.]

(Plates XXII. & XXIII.)

The collection of Pennatulida entrusted to us for examination and report is an interesting one, for though it only includes representatives of five genera and ten species, of these latter two are new, of two others only single specimens have hitherto been described, and three others are as yet very imperfectly known.

The zoological position of the genera and species is shown in the following Table, abridged from the classification proposed by Kölliker in his Report on the Pennatulida collected by H.M.S. 'Challenger' *. The genera and species represented in the Mergui collection are alone mentioned :—

Order PENNATULIDA.

Section I. Pennatuleæ.

Subsection 1. *Penniformes.*

Family i. Pteroeididæ.

Pteroeides elegans, *Herklots.*
Pteroeides Lacazii, *Kölliker.*
Pteroeides chinense, *Herklots.*
Pteroeides Esperi, *Herklots.*

Family ii. Pennatulidæ.

Subsection 2. *Virgularieæ.*

Family i. Virgularidæ.

Virgularia Rumphii, *Kölliker.*
Virgularia prolifera, *sp. nov.*

Family ii. Stylatulidæ.

Section II. Spicatæ.

Section III. Renilleæ.

* Kölliker, Report on the Pennatulida, Zool. Chall. Exp. part ii. (1880), pp. 33–35.

Section IV. Veretilleæ.

Family i. Cavernulariidæ.

Cavernularia obesa, *Valenciennes*.

Family ii. Lituariidæ.

Lituaria phalloides, *Pallas*.
Policella manillensis, *Kölliker*.
Policella tenuis, *sp. nov.*

The specimens, which are in excellent condition, were obtained in shallow water; and a large proportion of them from mud-flats exposed at spring-tides.

In the following descriptions we have employed the term "ray," as the equivalent of the German "Strahlen," to indicate the bars of calcareous spicules which traverse the leaves of many Pennatulida; and have used the word "spine" to designate the ends of the rays which project freely beyond the margin of the leaf.

In describing the leaves, we have used the term "ventral border" to indicate the free ventral edge of the leaf, from the attachment to the rachis to the tip of the leaf. By the "height" of a leaf we mean the greatest measurement across the leaf at right angles to the ventral border. All measurements are given in millimetres.

Description of the Specimens.

Section I. Pennatuleæ.

Subsection 1. *Penniformes.*

Family i. Pteroeididæ.

Genus Pteroeides, *Herklots.*

Pteroeides elegans, *Herklots.* (Plate XXII. figs. 1 & 2.)

A single specimen of this species was obtained from the Andaman Islands.

The species was established by Herklots *, in 1858, on a single specimen in the Leyden Museum, believed to come from the Indian Ocean. A fuller description of this specimen, the only one recorded as yet, was given by Kölliker † in 1872.

The colony (fig. 1) is long and slender; the feather longer than the stalk, and the rachis and stalk of nearly equal and

* Herklots, 'Notices pour servir à l'étude des Polypiers Nageurs ou Pennatulides' (Amsterdam, 1858), pp. 21, 22, and pl. vi. fig. 2.

† Kölliker, Anatomisch-systematische Beschreibung der Alcyonarien: I. Die Pennatuliden (Frankfurt a. M., 1872), pp. 57, 58.

uniform diameter. The general colour is brownish yellow mottled with purplish spots, especially near the edge of the leaves. The axis extends the whole length of the colony, is moderately flexible, and hooked at both ends.

The top of the rachis projects about 4 millim. beyond the uppermost leaf, and bears on its dorsal surface a longitudinal row of four small rudimentary polypes, which probably represent the dorsal zooid stripe of other species.

The leaves are small, and directed upwards, overlapping one another like tiles. The largest ones are a little above the middle of the rachis: the uppermost two or three pairs are small and very stiff: in the lower half of the rachis the leaves gradually diminish in size, but retain their lateral position. The leaves are fan-shaped, the free dorsal border sometimes nearly straight as though truncated, sometimes irregularly notched. The rays are broad, 11 in number as a rule, and very conspicuous on the under surfaces of the leaves; their distal ends project as short irregularly placed spines. The polypes or autozooids are small, and arranged in 4 or 5 rows along the edge of each leaf and on both surfaces. There is a prominent, sharply defined basal zooid plate, which does not touch the zone of the autozooids, and is yellow in colour. There is no ventral zooid stripe. Small calcareous needles are present in considerable numbers in the leaves, round the bases of the autozooids, but there are no spicules in the cutis of either the rachis or stalk.

The principal dimensions of the specimen are given below; for the sake of comparison the measurements as recorded by Kölliker of the specimen in the Leyden Museum are also given.

	Andaman Island specimen.	Specimen in Leyden Museum.
Length of colony	165	203
Length of stalk	57	38
Length of feather	108	154
Width of feather	10	10–12
Diam. of rachis, greatest	5	6·5
Diam. of stalk, average	5·5	8
Number of leaves	right side 34 +8 left side 39 +13	right side 40 +6 left side 43 +8
Height of largest leaf	8	
Ventral border of largest leaf	8	11
Base of attachment of largest leaf	4	5
Number of rays	11–12	
Length of spines	0 to ·5	

Pteroeides Lacazii, *Kölliker*. (Plate XXII. figs. 3–6.)

Of this extremely variable species there are 34 specimens in the collection; 22 from the Andaman Islands, 12 from the Mergui Archipelago. These differ a good deal among themselves, but fall into two well-marked divisions, which we propose to describe as varieties α and β respectively.

Pt. Lacazii, var. α. (Plate XXII. fig. 3.)

This group, which includes 21 of the specimens from the Andaman Islands, is characterized by the following points:—

The feather is narrower than in variety β, and is of nearly uniform width along the greater part of its length. The leaves are more falciform in shape; the rays are less numerous, but stronger and more regularly arranged; the spines are longer, and the margin of the leaf more deeply notched.

The principal dimensions of this variety are as follows:—

	a.	*b.*	*c.*	*d.*
Length of colony	150	237	174	163
Length of stalk	75	97	78	87
Length of feather	75	140	96	76
Width of feather	48	47	37	33
Width of rachis, ventral surface	17·5	16	10·5	11
Diam. of stalk, average	12	12	10	9
Number of leaves	40 +4 rud.	47 +4 rud.	39 +7 rud.	41 +7 rud.
Height of largest leaf	13	20	11	10
Ventral border of largest leaf	19	18	17	14
Base of attachment of largest leaf	9	9	4	4
Number of rays	15	16	13	11–12
Length of spines	2–2·5	1·5–3	0·7–2	1·5–3

Pt. Lacazii, var. β. (Plate XXII. figs. 4–6.)

The second variety includes the 12 specimens from the Mergui Archipelago, and one from the Andaman Islands.

In these the feather is oval in shape, being widest at or slightly above its middle. The leaves are fan-shaped, and softer than in variety α. The rays are rather more numerous, but hardly project beyond the margin of the leaf, which is almost entire, and fringed with short spicules. The stalk is markedly thicker than in variety α.

The principal dimensions of this variety are as follows:—

	a.	*b.*	*c.*
Length of colony	215	160	245
Length of stalk	83	73	105
Length of feather	132	87	140
Width of feather	60	52	65
Width of rachis, ventral surface	14	14	20
Diam. of stalk, average	13	12	17
Number of leaves	41 +rud.	25 +5 (topmost leaves lost)	39 +5 rud.
Height of largest leaf	20	19	24
Ventral border of largest leaf	28·5	21	26
Base of attachment of largest leaf	5	9	6
Number of rays	20	18–20	18–20
Length of spines	0·5–1·5	0·5–1	0·3–1

Several of the specimens are mutilated, apparently by the leaves being eaten off. This occurs far more commonly in the lower than in the upper half of the feather, the lower leaves being in some cases stripped off almost to their bases. This may perhaps point to the injury being inflicted by some animal crawling on the sea-bottom.

In three specimens of variety α and one of β the lower end of the axis, ensheathed in a membranous covering, projects freely, for a distance of 9 to 24 millim. in different forms, from an aperture at the lower end of the stalk.

Inasmuch as the axis extends to the extreme top of the rachis in some of these specimens, the projection of its lower end must be due to shrinking upwards of the stalk, not to shifting downwards of the axis; and has probably been caused by contraction, due to the spirit in which the specimens are preserved. The terminal aperture has smooth rounded lips, and is formed by enlargement of the small pore which is present during life.

One specimen of variety β (fig. 5) is noteworthy, on account of the formation of additional leaves on the ventral surface of the rachis. Along the right side there is an incomplete longitudinal row of single polypes, about 3–4 millim. to the inner side of the bases of the leaves; the largest polypes having a length of 10 millim.

On the left side there are, about the middle of the rachis, two large, irregular leaves with well-developed zooid plates; the larger of the leaves being 27 millim. long and 12 wide at the base. Other smaller leaves, or single polypes, occur distributed

in imperfect longitudinal rows along the middle third of the rachis.

In most specimens of both varieties, small crabs are found lying between the leaves; these have no uniformity of position, are quite unattached, and cause no modification in either the leaves or rachis. Small Copepoda also occur in considerable numbers in the same situation.

PTEROEIDES CHINENSE, *Herklots*. (Plates XXII. & XXIII. figs. 7–11.)

We have referred to this species ten specimens from the Andaman Islands.

The species was established by Herklots in 1863 *, and described more fully by Kölliker in 1872 †, but, so far as we can ascertain, has not been noticed by other authors.

Kölliker's account is based on four specimens; one in the Leyden Museum from Amoy, in China, two in the Hamburg Museum from the Indian Ocean, and one in the Copenhagen Museum from Japan. He includes also in the species, as a variety *macracantha*, a single specimen in the Copenhagen Museum, from Japan, in which the feather is much wider proportionately to its length, the leaves larger, the rays less numerous and stronger, and the spines longer.

All our specimens agree in the following points:—The colonies are of medium size, averaging about 100 millim. in length; the rachis is longer than the stalk, but never twice its length; the feather is about as wide as it is long, in some cases wider, and its greatest width is below its middle; the stalk is thick, straight and firm, and there is a slight swelling at its junction with the rachis; the axis is slender and flexible, extending almost to the top of the rachis, and rather more than halfway down the stalk. The colour is very variable; the ground-colour both of feather and stalk is usually an orange-yellow, mottled with purplish spots. The autozooids are always purplish in colour.

The leaves vary in thickness, and are about 30 in number on each side; in the upper half of the feather they overlap and conceal the dorsal surface of the rachis. The lowermost 4 to 6 leaves on both sides are irregular in shape, usually spatulate, and approach one another on the ventral surface of the rachis; sometimes they

* Herklots, Nederlandsch Tijdschrift voor de Dierkunde, 1863, i. pp. 31–34.

† Kölliker, Anatomisch-systematische Beschreibung der Alcyonarien: I. Die Pennatuliden (Frankfurt, 1872), pp. 87–88, and Taf. v. figs 40, 41.

are directed across the ventral surface, and they may overlap (fig. 8). In the mature leaves the rays are well developed, from 16 to 22 in number, and project as very obvious spines. The autozooids are arranged in 3 or 4 rows along the margins of both surfaces of the leaf, and the mouths of the cells are pigmented. There is a well-developed marginal zooid plate present in all cases, usually markedly dentate along its distal margin, and consisting of small, usually colourless siphonozooids. Larger siphonozooids, usually pigmented, are irregularly distributed over the basal portion of the zooid plate, and also over the upper surface of the leaf; a well-marked ventral zooid stripe is present at the base of each leaf (fig. 8). The dorsal zooid stripe of the rachis is short, does not extend below the 3rd or 4th pair of leaves, and consists of 2 or 3 rows of siphonozooids.

Our specimens fall into two well-marked groups, which we propose to describe as varieties.

Pt. chinense, var. *a*. (Plate XXII. figs. 7–9.)

Of this form there are nine specimens, all from the Andaman Islands.

The general ground-colour is brownish yellow; the stalk is mottled with purplish spots; the leaves are yellow, with the polype-mouths and the larger siphonozooids purple. This general yellow colour dotted with purple spots is very characteristic of all ten specimens.

The feather is oviform to triangular in outline, and widest close to its lower end. The rachis is wide, especially near its lower end; the stalk is shorter than the rachis, and thick. The lowermost leaves are markedly spatulate, and those of the two sides may overlap one another on the ventral surface of the rachis (fig. 8).

The mature leaves (fig. 9) are of moderate thickness, and are fan-shaped, the ventral border being nearly straight and the tip very slightly hooked. The rays are 16 to 22 in number; they are not very conspicuous on the under surface of the leaf, but project beyond its edge as stout marginal spines arranged somewhat irregularly, and obviously consisting of bundles of smaller spicules.

The zooid plate (fig. 9) is large; it extends along two thirds of the length of the ventral border of the leaf, and is continued along the rays so as to present a strongly toothed margin. The ventral zooid stripe is well developed, and present in all the

leaves (fig. 8). The dorsal zooid stripe of the rachis is short, consisting of 2 to 4 rows of siphonozooids placed opposite the uppermost 3 pairs of leaves.

The following table gives the principal dimensions of three specimens of this variety. Of these, the first one (*a*) is the most typical one, *b* and *c* being more divergent forms, which in some respects approximate to the second variety (*β*).

	a.	*b*.	*c*.
Length of colony	108	107	93
Length of stalk	40	51	40
Length of feather	68	56	53
Width of feather	65	89	51
Width of rachis, ventral surface	23	31	18
Distance apart of lowest leaves	11	10	12
Diam. of stalk, average	15	15	17
Number of leaves	29 +4 rud.	27 +5 rud.	27 +4 rud.
Height of largest leaf	14	22	13
Ventral border of largest leaf	22	28	21
Base of attachment of largest leaf	7	11	8
Number of rays	20	18–22	16–20
Length of spines	2–2·5	2–3	2–2·5

Pt. chinense, var. *β*. (Plate XXIII. figs. 10 & 11.)

A single specimen of this form was obtained from the Mergui Archipelago. In general appearance it agrees fairly closely with var. *α*, from which it differs in the following points:—

The colony is almost uniformly purple in colour; the leaves brown at the base, with a broad purple marginal band corresponding to the zone of autozooids. The feather is markedly wider than it is long. The leaves are thick and fleshy, especially at their margins, and are only slightly notched between the spines, and the spines are shorter.

It is quite possible that these differences may be due to local circumstances.

The principal dimensions of this variety are as follows:—

Length of colony	98 mm.
Length of stalk	44
Length of feather	54
Width of feather	72
Width of rachis, ventral surface	21
Distance apart of lowest leaves	9·5

Diam. of stalk, average	16 mm.
Number of leaves	21 +6 rud.
Height of largest leaf	17
Ventral border of largest leaf	26
Base of attachment of largest leaf	9·5
Number of rays	19–21
Length of spines	2

Pteroeides Esperi, *Herklots*. (Plate XXIII. figs. 12–15.)

To this form we refer eleven specimens, all from the Mergui Archipelago. They differ a good deal among themselves in colour, and in general appearance and proportions, but we have found it impossible to separate them.

The general characters agree with those given by Kölliker *, so that there is no need to describe them in detail. Some of the specimens agree in many points with *Pteroeides chinense*, and it is not easy to find reliable differences between the two species. In *Pt. Esperi*, however, the length of the rachis is greater relatively to its width, and the feather is longer relatively to the stalk. The lowermost leaves do not approach so closely on the ventral surface of the rachis, and are not spatulate in form. The leaves are more sickle-shaped, the rays fewer in number, 13–16, and more conspicuous; the spines are more pointed and slender, and the margins of the leaves more deeply notched between them.

Our specimens fall into two groups, which we propose to speak of as varieties α and β.

Pt. Esperi, var. α. (Plate XXIII. figs. 12, 13.)

In this variety, of which there are eight specimens, the leaves are markedly sickle-shaped, and the rays very conspicuous on their under surface; the zooid plate is smaller than in *P. chinense*, does not extend so far along the ventral border of the leaf, is very slightly dentate at its margin, and is very often brown in colour. The principal measurements of these specimens are as follows, a being a typical one, b and c more extreme forms :—

* Kölliker, Alcyonarien, pp. 108–113.

	a.	*b.*	*c.*
Length of colony	88	90	82
Length of stalk	26	34	29
Length of feather	62	56	53
Width of feather	53	53	45
Width of rachis, ventral surface	15	14	10
Distance apart of lowest leaves	10	9	9
Diam. of stalk, average	13	10	12
Number of leaves	21+5 rud.	24+7 rud.	21+4 rud.
Height of largest leaf	13	14	10
Ventral border of largest leaf	24	28	21
Base of attachment of largest leaf	5	5	4·5
Number of rays	16	16	13
Length of spines	2·5–4	2–2·5	2·5

Pt. Esperi, var. β. (Plate XXIII. figs. 14, 15.)

The three specimens of this form are chiefly characterized by the soft flabby condition of the rachis and leaves, the latter being thin, almost membranous, and twisted about in a very irregular fashion, as shown in fig. 14. It is very possible, however, that this flabbiness may be, at least in part, an accidental or temporary condition, and it would be well not to attach much weight to it. In other respects these specimens are in many ways intermediate between the preceding variety and *Pt. chinense*. In relative proportions of feather and stalk, and of length and width of the feather, as also in the number of rays in the leaves, and the marked notching of their margin, they closely resemble *Pt. Esperi*, var. α; while, on the other hand, they differ from this, and approach *Pteroeides chinense*, in the shape of the leaves, and in the size, shape, and other characters of the zooid plate. They differ from both these forms in the much greater extent to which the dorsal surface of the rachis is exposed, but this is very possibly to be associated with the generally flabby condition of the specimens. The principal measurements of variety β are as follows:—

Length of colony	120 mm.
Length of stalk	38
Length of feather	84
Width of feather	57
Width of rachis, ventral surface	13
Distance apart of lowest leaves	5
Diam. of stalk, average	15
Number of leaves	23+5 rud.

Height of largest leaf	13 mm.
Ventral border of largest leaf	25
Base of attachment of largest leaf ...	5
Number of rays	13
Length of spines.....	2·5–3·5

Subsection 2. *Virgularieæ.*

Family i. Virgulariidæ.

Genus Virgularia, *Lamarck.*

Virgularia Rumphii, *Kölliker.*

Of this fine species there are three specimens, two of which are entire, while the third has been cut off, apparently by the dredge, at the junction of stalk and rachis. In consequence of their great length, all three have been broken in order to allow of their preservation in tubes of ordinary size.

Kölliker named the species from a single specimen, from Amboina, in the Berlin Museum*; we have met with no other account of it, and have therefore thought it well to describe our specimens in some detail.

The colonies, which are very long, up to 900 millim., are slender, rod-like, and of nearly uniform diameter along their entire length. The stalk is long and cylindrical, and ends below in a dilated vesicle, which is fairly obvious in the largest specimen, though contracted and inconspicuous in the other. In this, as in other species of Pennatulida, the presence or absence of a terminal vesicle to the stalk depends very largely on the degree of contraction of the specimen, and is a character of no practical value in classification.

The axis is stout, brittle, and oval in transverse section. Its upper end is abruptly truncated, and projects freely for some millimetres above the fleshy part of the rachis. This projection occurs during life, as in one specimen a couple of barnacles were adherent to the exposed part of the axis. At the lower end of the rachis the axis tapers rapidly; it enters the stalk, but only extends a short distance along it, ending in a slender hooked extremity. The surface of the axis along the whole length of the rachis is sculptured by irregularly arranged and intercrossing grooves.

The fleshy part of the rachis along the greater part of its

* Kölliker, Alcyonarien, pp. 202–205, and pl. xiii. figs. 123–124.

length is very thin, forming little more than a membranous sheath to the axis, from which the leaves arise. At the lower end of the rachis there is on either side a longitudinal row of single small zooids, about ·50 millim. in length (*cf.* fig. 16), above which the leaves commence. These are, for some distance, very small and very close together, but as they pass upwards become gradually larger and further apart. Even in the lowest leaves the component polypes are indicated by slight notchings of the margins. The largest leaves occur about the junction of the middle and upper thirds of the rachis, above which point they diminish slightly in size. At the upper end the leaves are small, shrivelled, and closely approximated to one another, appearing as mere wrinklings of the surface.

The leaves, even the largest ones, are of small size, and along the lower half of the rachis are little more than transverse ridges. Each leaf consists of 40 to 42 polypes arranged in a single row, but slightly alternating in the largest leaves, owing to displacement from mutual pressure. The ventral border of the leaf is concave, and is continued as a ridge on to the ventral surface of the rachis; in this ridge and the adjacent part of the rachis there is a very obvious network of branching canals, as described and figured by Kölliker*. The siphonozooids are arranged in transverse rows at the bases of the leaves, the number of zooids in each row being about the same as that of the polypes in the corresponding leaf.

As in other species of *Virgularia*, the genital products are contained in the lower immature leaves. Of the three specimens, two are female and one male.

Considerable quantities of sand occur between the leaves closely adherent to the rachis, especially in its lower half. This derives some interest in consequence of the statement made by Rumphius†, that the allied species, *V. juncea*, which lives in very shallow water, has the habit of retracting almost completely into the sand at low water or when disturbed.

The principal measurements of the three specimens are as follows, the corresponding dimensions as given by Kölliker‡ of the specimen in the Berlin Museum being added for comparison:—

* Kölliker, *op. cit.* pl. xiii. fig. 123

† Rumphius, D'Amboinsche Rariteitkamer (Amsterdam, 1705), pp. 43–44.

‡ Kölliker, *op. cit.* p. 205.

	a.	*b.*	*c.*	Specimen from Amboina, in Berlin Museum.
Total length of colony.....	598	775	945	523
Length of stalk	Absent.	200	290	101
Length of rachis	585	568	635	422
Length of axis exposed above upper end of rachis.....	13	7	20	.....
Length of lateral zooid stripe...	42	65	42	24
Length of rachis with immature leaves.....	280	260	330	215
Length of rachis with developed leaves.....	263	243	283	183
Diam. of rachis { lower half ...	4·5	5	4	.....
Diam. of rachis { upper half ...	4	3·5	3·5	.....
Diam. of stalk	Absent.	7	5	8
Diam. of terminal vesicle	Absent.	8·5	Inconspicuous.	14
Number of immature leaves ...	450 circa.	450 circa.	500 circa.	439 circa.
Number of developed leaves ...	110 circa.	85 circa.	100 circa.	76
Number of small leaves at top of rachis	35	18	26	8
Number of polypes per leaf ...	40	42	42	40–44
Height of leaf	2·5	2	1·5	3–3·5
Greatest distance apart of leaves	3·5	3	3·2	.....
Diam. of axis	3·7×3	3×2·5	4×3	3×2·7

Virgularia prolifera, sp. nov. (Plate XXIII. figs. 16, 17.)

Colony slender, rod-like, dark brown or black in colour *. Stalk short, with a very obvious terminal vesicle, often inconspicuous from contraction, separated by a constriction from the rachis. A well-marked lateral zooid stripe at each side of lower end of rachis; the lowermost leaves placed laterally, and forming small transverse ridges very closely packed together. Fully developed leaves in upper third of rachis alternating with one another, and slightly overlapping along dorsal surface of rachis; not more than 2 millim. apart. Polypes 22 to 30 in number; the full number present in the immature leaves. Siphonozooids in single transverse rows at bases of leaves. Axis thick and rigid in rachis; upper end truncated and projecting beyond soft parts, or merely covered by thin skin; lower end tapering rapidly, entering the stalk, but not reaching the vesicle; axis oval in transverse section, and with the surface corrugated.

We have established this species for 15 specimens from the Mergui Archipelago. Nearly all these are perfect at their lower

* Dr. Anderson informs us that this dark colour, amounting to blackness in some cases, is due entirely to the action of the spirit in which the specimens were preserved.

ends, but all show the truncation of the upper end of the rachis that is so characteristic a feature of the genus *Virgularia*.

The species approaches most closely to *V. Lovenii*, Kölliker, of which only a single fragment, from Port Jackson, Australia, has as yet been described *.

In *V. Lovenii* the leaves are, however, much further apart (3–4 millim.) than in *V. prolifera* (1–2 millim.), and of smaller size; the autozooids also are less distinct from one another, and the siphonozooids are described and figured as arranged in irregular transverse rows, while in *V. prolifera* the rows are very regular. Kölliker's figures † of *V. Lovenii* are even more unlike our specimens than is his description, so that we feel fairly confident that the new species will prove to be a good one.

The principal measurements of four of our specimens, including the most divergent examples, are given in the following table:—

	a.	*b.*	*c.*	*d.*
Length of colony	243	165	170	263
Length of stalk	25	31	45	43
Length of rachis	218	134	125	220
Length of lateral zooid stripe of lower end of rachis	27	10	15	22
Length of rachis with immature leaves	110	63	65	116
Length of rachis with developed leaves	76	58	30	80
Length of upper end of rachis with small leaves	5	3	15	2
Greatest width of feather	6·5	7	5	12
Diam. of rachis in middle of length.	3	2·2	2·5	4·5
Diam. of stalk	4·7	4	5	6·5
Diam. of terminal vesicle	5	9	5	17
Diam. of axis, upper end	2×1·8	1·3×1·1	2×1·7	2×1·7
Number of immature leaves in lower part of rachis	200 circa.	150 circa.	150 circa.	220 circa.
Number of developed leaves	44	32	14	45
Number of small leaves at top of rachis	3	3	15	3
Greatest distance apart of leaves	2	2	1·5	2
Number of polypes per leaf	24	22	26	30
Height of largest leaf	2·5	3	1·3	4
Ventral border of largest leaf	2·2	3	1·2	5

* Kölliker, *op. cit.* p. 201, and pl. xiii. figs. 121, 122.

† Kölliker, *op. cit.* pl. xiii. figs. 121, 122.

Section IV. Veretillea.

Family i. Cavernulariidæ.

Genus Cavernularia, *Valenciennes*.

Cavernularia obesa, *Val.* (Plate XXIII. fig. 18.)

Of this variable species there are twelve specimens in the collection, all from the Andaman Islands.

The majority of these agree in all respects with the description given by Kölliker *; two specimens, however, present special characters, and may be described as a distinct variety.

Cav. obesa, var. *a*.

The two specimens in question, while agreeing in all essential respects with the typical form, are characterized by their very irregular shape. In one the stalk is absent, apparently cut off by the dredge. The rachis is cylindrical and of nearly uniform diameter in its lower three-fourths; the upper fourth is much narrower, and is separated by a marked constriction from the lower part, from which it projects somewhat obliquely as an irregular finger-like process.

The second specimen, which is drawn the natural size in fig. 18, is complete. The stalk is very short; the rachis, which is rather flabby in texture, expands from below upwards, and is produced at one side into a rounded terminal knob or bud. This knob appears to be the seat of most active growth, inasmuch as on it the polypes are smaller and much closer together than in other parts. The whole of the surface of the rachis between the polypes is covered, as usual in this species, with minute siphonozooids.

This irregular mode of growth, curiously like the budding of *Alcyonium*, is probably to be associated with the absence, in *Cavernularia obesa*, of the calcareous axis usually found in Pennatulida.

For the sake of comparison we give the principal measurements of some of the specimens, including those of the second example of var. *a*.

* Kölliker, *op. cit.* pp. 338–343, and pl. xxii. figs. 199–201.

	a.	*b.*	*c.*	*d.*	*e.*	Var. *a.*
Length of colony	232	172	120	69	41	79
Length of stalk	44	39	27	19	9	13
Length of rachis	188	133	93	50	32	66
Diam. of rachis, greatest	38	35	40	20	13	25
Diam. of rachis, in middle	32	27	30	20	13	22
Diam. at junction of rachis and stalk	27	25	27	12	10	8
Average distance apart of polypes	1·5	1·5	1·5	1·8	1·6	2·5
Diam. of polype-mouths	0·7	0·5	0·7	0·8	0·5	1

Family ii. Lituariidæ.

Genus Lituaria, *Valenciennes.*

Lituaria phalloides, *Pallas.* (Plate XXIII. figs. 19–21.)

Of this species Kölliker* notes that though it is probably widely distributed in the Indian Ocean, yet the actual number of recorded specimens is very small. Kölliker's description is drawn up from a single specimen in the Paris Museum from Sumatra, and during the voyage of the 'Challenger' a single example only was obtained, from Japan †.

In Dr. Anderson's collection there are eleven adult specimens, ten from the Andaman Islands, and one from the Mergui Archipelago, and nine young specimens from the Mergui Archipelago.

The adult specimens are all much alike; the majority are truncated at the upper end of the rachis, but two others are perfect, and bear small polypes at the extreme end. The specimens agree closely with the description given by Kölliker, the only points of difference of any moment that we have noted being the following:—

There is no line of boundary between the rachis and the stalk. The autozooids (polypes) extend lower down the rachis than the siphonozooids, but these lower ones are of very small size. There is in many specimens a very obvious plane of symmetry, the autozooids gradually increasing in size from the dorsal to the ventral surface. The siphonozooids do not cover the whole surface of the rachis between the autozooids, but are very distinctly arranged in rings around the latter. The cups

* Kölliker, *op. cit.* pp. 313–316.

† Zool. Chall. Exp., Report on the Pennatulida, p. 32.

lodging the autozooids when retracted are black or dark brown. Finally the stalk is shorter relatively to the rachis than in Kölliker's specimen.

The single specimen from Mergui is rather paler in colour than the Andaman Islands examples, but agrees with these in other respects.

The axis in *Lituaria* (fig. 20) extends the whole length of the colony. In the stalk it is slender, and ends below in a flexible hooked extremity. Passing up into the rachis it gradually increases in size, being thickest at its upper end. Along the greater part of its length it is quadrilateral; wider from side to side than dorso-ventrally, and grooved longitudinally on all four faces. Its upper part presents laterally a number of cup-like depressions, lodging the deeper parts of the polype-cavities. These depressions, which increase in size and depth towards the top of the axis, are separated from one another by thin sharp-edged partitions, produced at places into prominent teeth (fig. 20), which during life come very close to the surface of the rachis.

In the young specimens (fig. 21), which vary in length from 13 to 19 millim., the fleshy cœnenchym of the rachis is very scanty, and the polypes few in number. The axis is very well developed, and its surface is deeply excavated to form cups for the lodgment of the polypes, the partitions between the cups coming quite to the surface, and forming a conspicuous mosaic pattern. The top of the rachis and axis is pointed, and the polypes are largest some little distance below it. In the smallest specimen there are 10 well-developed polypes, but no siphonozooids; in the largest of the nine there are about 20 polypes and a few siphonozooids in addition.

The principal dimensions of one of the adult specimens are as follows:—

Length of colony	145 mm.
Length of stalk	62
Length of rachis	83
Diam. of top of rachis	5
Diam. at junction of stalk and rachis	4
Diam. of stalk	3·5
Diam. of terminal vesicle	5

Genus Policella, *Gray*.

Policella manillensis, *Kölliker*.

Of this species there are two specimens; one from the Andaman Islands, the other from the Mergui Archipelago. The two differ a good deal in comparative firmness or flaccidity, in the varying degree of protrusion of the polypes, in colour, and in other secondary points. The figure given by Kölliker * is, in many respects, intermediate between the two.

In the Andaman Islands specimen the whole cœnenchym is compact and firm; the axis is about three fourths the length of the colony; the autozooids are mostly in a state of complete retraction, and when expanded are smaller than in the other specimen. Along the lower 20 millim. of the rachis the autozooids are smaller, almost colourless, and arranged in longitudinal rows, separated by longitudinal folds of the cutis. The siphonozooids are exceedingly numerous, occupying the whole of the surface of the rachis between the autozooids, except in the lowest 20 millim., where they are absent. There are no calcareous spicules in the rachis, but small otolith-like bodies, $0{\cdot}008 \times 0{\cdot}004$ millim., occur in considerable numbers in the deeper layers of the stalk.

The general colour of the rachis and stalk is yellow-ochre; the bodies of the autozooids are dark brown, paler at the base, and with yellowish-white tentacles.

In the specimen from the Mergui Archipelago the cœnenchym is much less firm, the rachis being soft and fleshy, and the stalk only slightly denser. The axis is shorter, hardly more than half the length of the colony, and more slender. The autozooids are larger, and are in a great many cases fully expanded; the transition from the fully-formed ones of the upper half of the rachis to the immature ones at its lower end is much more gradual than in the Andaman Islands specimen. The siphonozooids are smaller and less numerous, and are arranged in longitudinal rows between the autozooids. There are a few calcareous spicules in the cutis of the rachis, and numerous otolith-like bodies in the stalk.

The rachis and stalk are almost colourless; the autozooids are a dark purplish brown in their distal third, transparent at their bases, and have white tentacles.

* Kölliker, *op. cit.* pl. xxii. fig. 189.

The principal dimensions of the two specimens are as follows:—

	Andaman Islands specimen.	Mergui specimen.
Length of colony	168	175
Length of stalk	48	37
Length of rachis	120	138
Length of axis	120	92
Diam. of stalk	17	7
Diam. of rachis	19	11
Diam. of axis	3·5×2·5	2×1·8
Length of largest autozooid	8–10	11
Diam. of largest autozooid	1·1	1·4
Tentacles of largest autozooid	2·6	4
Diam. of immature autozooid	0·64–0·5	0·54–0·4
Diam. of siphonozooids	0·4	0·16

Policella tenuis, sp. nov. (Plate XXIII. figs. 22, 23.)

Colony slender and of somewhat flabby consistency; nearly uniform in width along its whole length, tapering slightly at both ends. Stalk slightly firmer than rachis, but not separated from it by a sharp line of demarcation. Axis rigid, less than half the length of the colony, quadrangular with rounded angles and slightly grooved sides. Polypes very long and slender, completely retractile, largest about the middle of the rachis, rudimentary at lower end of rachis. Siphonozooids covering whole surface of rachis between the polypes. A few small calcareous bodies in the rachis, and small otolith-like bodies in the stalk.

Of this form a single specimen was obtained from the Mergui Archipelago. The whole colony, including the polypes, is of an ashen-grey colour; the rachis is soft, wrinkled, and its surface markedly slimy.

The axis extends about halfway down the stalk, and not quite halfway along the rachis.

The great length and slenderness of the polypes, the absence of any line of demarcation between rachis and stalk, the shortness of the axis, and the general flabby condition of the whole colony serve to distinguish the species at once from *P. manillense*.

The principal measurements of the specimen are as follows:—

Length of colony	252 mm.
Length of stalk	68
Length of rachis	184
Length of axis	110

Diam. of stalk	12 mm.
Diam. of rachis	13
Diam. of axis	4·5 × 4
Length of largest autozooid	12–14
Diam. of largest autozooid	0·8
Tentacles of largest autozooid	3·5
Diam. of immature autozooid	0·48
Diam. of siphonozooids	0·16–0·24
Length of calcareous bodies of rachis	0·6
Diam. of otolith-like bodies of stalk	0·006

DESCRIPTION OF THE PLATES.

In Figs. 5, 16, 20, and 22 the lower ends of the specimens have been drawn by the lithographer as bent up in an unnatural manner, in order to accommodate the figures to the size of the Plate. The specimens are naturally straight.

Plate XXII.

Fig. 1. *Pteroeides elegans*, latero-dorsal view, ×1.
2. *P. elegans*, leaf, under surface, ×3.
3. *P. Lacazii*, var. *α*, leaf, under surface, ×1.
4. *P. Lacazii*, var. *β*, dorsal surface, ×1.
5. *P. Lacazii*, var. *β* with supernumerary leaves, ventral surface, ×1.
6. *P. Lacazii*, var. *β*, leaf, under surface, ×1.
7. *P. chinense*, var. *α*, dorsal surface, ×1.
8. *P. chinense*, var. *α*, ventral surface, ×1.
9. *P. chinense*, var. *α*, leaf, under surface, ×1.

Plate XXIII.

Fig. 10. *P. chinense*, var. *β*, dorsal surface, ×$\frac{4}{5}$.
11. *P. chinense*, var. *β*, leaf, under surface, ×$\frac{4}{5}$.
12. *P. Esperi*, var. *α*, dorsal surface, ×$\frac{4}{5}$.
13. *P. Esperi*, var. *α*, leaf, under surface, ×$\frac{4}{5}$.
14. *P. Esperi*, var. *β*, dorsal surface, ×$\frac{4}{5}$.
15. *P. Esperi*, var. *β*, leaf, under surface, ×$\frac{4}{5}$.
16. *Virgularia prolifera*, sp. nov., dorsal surface, ×1.
17. *V. prolifera*, sp. nov., leaf, ×3.
18. *Cavernularia obesa*, var. *α*, ×$\frac{4}{5}$.
19. *Lituaria phalloides*, ×1.
20. *L. phalloides*, axis, ×1.
21. *L. phalloides*, young specimen, ×4.
22. *Policella tenuis*, sp. nov., ×1.
23. *P. tenuis*, sp. nov.: (*a*) Calcareous bodies from rachis, × 210; (*b*) Otolith-like bodies from stalk, ×210.

Report on the Myriopoda of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By R. I. Pocock, Assistant in the Zoological Department, British Museum. (Communicated by Dr. John Anderson, F.R.S., F.L.S.)

[Read 1st December, 1887.]

(Plates XXIV. & XXV.)

No species of Myriopoda have hitherto, so far as I am aware, been recorded from the Mergui Archipelago, but considering the proximity of this group of islands to the mainland of the Malay Peninsula, it is not surprising that most of the large and conspicuous forms obtained are referable to species which have been from time to time described from various parts of the Oriental Region.

Those that are new are, with one exception, small and inconspicuous individuals, which would in all probability have been overlooked or ignored by any but a scientific collector.

Very little need here be said about the Chilopoda. One specimen only, a species of *Himantarium*, is new. The rest are well known Oriental forms. With regard to these I have deemed it sufficient to give references to the excellent descriptive papers of Dr. Meinert and Dr. Haase.

The Diplopoda are in some respects of greater interest, and have been treated in consequence at greater length. Knowing from experience the immense difficulties to be encountered in the endeavour to identify merely from descriptions species of this group, I have thought it advisable to describe and figure, whether old or new, every specimen occurring in the collection. Fortunately, in most cases, individuals of each sex were taken; it has been possible, therefore, to examine the male copulatory apparatus, and to point out the specific distinctions presented by this organ. I have described as new one species of *Glomeris*, two of *Paradesmus*, two of *Spirostreptus*, and one of *Spirobolus*.

It is with great pleasure that I take this opportunity of expressing my obligations to Dr. Meinert and to Dr. Karsch for kindly comparing most of the specimens here enumerated with the types of species preserved in the Museums at Copenhagen and at Berlin, to which I had no access.

With the object of assisting fellow-workers, by affording them some means of ascertaining what has already been done with regard to this group of animals in the East, I have added at the

end of my paper a list of the principal publications which treat in any way of the Myriopoda of the Oriental Region. Of these special mention may be made of the excellent monograph of the Chilopoda published by Dr. Erich Haase ("Die Indisch-Australischen Chilopoden," Abh. Ber. zool. Mus. Dresden, 1887).

I. CHILOPODA.

Family Scolopendridæ.

Genus Scolopendra, *Linn. Syst. Nat.* p. 1062, ex parte; *Newport, Trans. Linn. Soc.* xix. p. 377.

Scolopendra subspinipes, *Leach, Trans. Linn. Soc.* xi. p. 383.

Var. de Haanii, *Brandt, Recueil etc.* p. 59.

This variety, characterized by the absence of spines from the under surface of the anal femora, is very commonly met with in the Oriental Region.

Specimens were taken in Sullivan Island, King Island, and Kisseraing.

Genus Otostigma, *Porath, Bih. Sv. Vet.-Akad. Handl.* B. iv. p. 18.

Syn. Branchiotrema, *Kohlrausch, Arch. f. Naturg.* Jahrg. 47, p. 70.

Otostigma carinatum, *Porath, op. cit.* p. 20.

Var. insulare, *Haase, op. cit.* p. 69.

Four specimens, one from Sullivan Island and three from King Island.

This southern variety of the Chinese species has been recorded from Java and Ceylon.

Family Geophilidæ.

Genus Mecistocephalus, *Newp. Proc. Zool. Soc.* x. p. 178.

Mecistocephalus punctifrons, *Newp. t. c.* p. 179, 1842.

Syn. M. heros, *Meinert, Proc. Amer. Phil. Soc.* xxiii. p. 214, 1886.

One adult specimen from Mergui, one adult and one young from Sullivan Island, and one young from King Island.

A widely distributed Oriental species.

Dr. Meinert, by whom these specimens were examined, identified them with his *Mecistocephalus heros*, a species recorded from the Island of Mauritius. After carefully comparing them with the type specimen of *Mecistocephalus punctifrons* (Newport), and finding that they differ from it in no constant character, I have

been obliged to add *heros* to the list of synonyms appertaining to *M. punctifrons*. For these synonyms, see Haase, *op. cit.* p. 104.

Genus Orphnæus, *Meinert, Nat. Tidsskr.* 3. vii. p. 17.

Orphnæus brevilabiatus, *Newport*, sp. (Plate XXIV. figs. 2, 2 *a*.)

Syn. Geophilus brevilabiatus, *Newport, Trans. Linn. Soc.* xix. p. 436.

Geophilus bilineatus, *Peters, Reise Mossam., Ins.* p. 531, pl. xxiii. fig. 4.

Orphnæus lividus, *Meinert, Nat. Tidsskr.* 3. vii. p. 19.

One female specimen from Sullivan Island.

This specimen was kindly identified by Dr. Meinert with his species *Orphnæus lividus*, but since it agrees in all respects with the type specimen of *Geophilus brevilabiatus* (Newport), which is preserved in the British Museum, there is no doubt that Dr. Haase (*op. cit.* p. 111) is perfectly correct in his supposition that Dr. Meinert redescribed *Geophilus brevilabiatus* (Newport) as *Orphnæus lividus*.

To the list of synonyms made out by Dr. Haase for this species may be added *G. bilineatus* (Peters).

This species is very abundant in the Oriental Region.

Genus Himantarium, *C. Koch, Syst. Myr.* p. 82;
Meinert, Nat. Tidsskr. 3. vii. p. 21.

Himantarium indicum, *Meinert, Proc. Amer. Phil. Soc.* xxiii. p. 228. (Plate XXIV. figs. 3–3 *b*.)

One male specimen from King Island, named by Dr. Meinert.

The type of this species was taken at Kulu.

Himantarium Meinerti, sp. nov. (Plate XXIV. figs. 1–1 *b*.)

Length 85 mm. Body narrowed anteriorly and posteriorly. Maxillary feet almost reaching the frontal margin; smooth; sternum twice as wide as long; with anterior margin slightly sinuate and unarmed; basal segment unarmed; claw strongly curved and unarmed.

Cephalic plate smooth, slightly wider than long; posterior margin almost straight; not covering maxillary feet posteriorly.

Basal plate a little narrower than the cephalic plate, four times as wide as it is long. Pre-basal plate visible.

Antennæ long, at the base in contact, tapering towards the apex; hairy; segments longer than wide; ultimate segment slightly longer than the penultimate.

Dorsal plates smooth, strongly bisulcate; area between the sulci irregularly striated longitudinally.

Ventral plates with shallow median depression; porous area occupying the posterior portion of the plate.

Anterior pair of feet a little shorter and a little more slender than the succeeding pairs.

Posterior pleuræ not coxiform, clothed with short hairs; porous: last ventral plate with lateral margins slightly converging posteriorly; with rounded angles and straight hinder margin.

Anal feet (in the female) much longer than the preceding pair; slender; ultimate segment equal in length to the penultimate and unarmed.

115 pairs of legs.

A single female specimen from Sullivan Island.

I have named this species after Dr. Meinert, to whom so much of our knowledge of the Chilopoda is due.

II. DIPLOPODA.

Family Glomeridæ.

Genus Glomeris, *Latr. Hist. Nat. d. Crust.* iii. p. 44; *Leach, Zool. Misc.* iii. p. 32, 1817.

[Glomeris carnifex, sp. n. Segments shining, black above, with testaceous posterior margins; lateral portion of second segment pink or pale brick-red; lateral margins of the remaining segments either reddish or testaceous; posterior half of posterior somite pale pink or brick-red.—Tenasserim. Collected by Mr. E. W. Oates; see Note, p. 301.]

Glomeris carnifex, var. pallida, var. n. (Plate XXIV. figs. 7, 7 *a*.)

Colour of under surface of head and of somites testaceous; upper surface of somites black, with testaceous posterior and lateral margins; a central longitudinal testaceous line, and a large lateral testaceous spot, which in the anterior somites unites with the marginal lateral testaceous patch.

Segments shining; thickly and finely punctured. First dorsal plate with two transverse striæ; second with from seven to ten lateral striæ; remaining dorsal plates with from three to five striæ.

Eye on each side consisting of from six to eight ocelli arranged in a linear series and of a single ocellus situated on the outside

of the upper extremity of this series. In one female specimen the left eye consists of sixteen ocelli, nine being arranged in a linear series, with three on the inside and four on the outside of the series. This abnormal arrangement calls to mind the aggregate eye of the Sphærotheria.

Posterior dorsal plate of different individuals exhibiting different degrees of emargination.

In the male the coxæ of the eighteenth pair of feet are not coalesced, and these limbs are relatively larger when compared with the copulatory feet and with the preceding pairs, than they are in, e. g., *G. connexa*.

Copulatory feet very stout, composed of five segments; intercoxal lamina pyriform, with short and slender lateral processes; second segment towards its distal end giving off inwardly a setiferous process; third segment bearing two processes, an anterior and a posterior—the former short, conical, setiferous, the latter broad and somewhat quadrate; fourth segment bearing an upturned tooth; fifth segment curved.

Nine specimens, five males and four females, preserved in spirit of wine. From Elphinstone Island.

This variety differs from the typical form in the absence of the red colouring-matter on the segments.

The occurrence of this genus in the Oriental Region is of peculiar interest, since its headquarters appear to be the Mediterranean district of the Palæarctic Region. In the Ethiopian, Oriental, and Australian Regions its place is taken by the allied genera *Sphærotherium* and *Zephronia*.

In 1865, however, Dr. Wood (Proc. Acad. Nat. Sci. Philad. p. 172) described a species of *Glomeris* from Hong Kong. To this he gave the name *bicolor*; but his description of it is so inadequate, that I am unable to say whether or not it is identical with this species from Tenasserim and Mergui. So far as may be judged by the description, it appears to apply to a different form.

Family Polydesmidæ.

Genus Stenonia, *Gray, Todd's Cyclop. Anat. Phys.* iii. p. 546.
Subgen. Acanthodesmus, *Peters, Monatsber. K. Preuss. Akad. Wiss. Berlin*, 1864, p. 546.

Acanthodesmus pilipes, *Peters, t. c.* p. 544. (Plate XXIV. figs. 4–4 *c*.)

♂ and ♀. Length about 74 mm., width 13 mm.

Colour for the most part dark reddish brown above, paler beneath; keels, antennæ, and legs testaceous. In young specimens the prevailing colour is a light reddish brown, the central portion of each dorsal plate being scarcely darker than the keels and legs. One adult female also presents this peculiarity of coloration.

Keels and keel-bearing portion of each dorsal plate densely and finely granular, with a row of larger granules at the posterior margin. Posterior dorsal plates marked indistinctly with three transverse rows of tubercles. Anterior dorsal plates more coarsely granular than the posterior.

External margin of each keel very obscurely denticulated, and, at the hinder end of the body, produced posteriorly into a short sharp process. In the young specimens, *i. e.* those possessing but 19 somites and of which the males are without copulatory feet, the granules are relatively coarser and the lateral denticles of the keels much more strongly marked than in the adults. In the largest individual of the series of adults, which is unfortunately a female, the lateral margins of the keels are smooth.

Each somite provided with three tubercles on the outside and two on the inside of the point of articulation of the legs.

Legs and antennæ thickly clothed with short hairs. First dorsal plate nearly double as wide as it is long; anterior and posterior margin bearing a single row of tubercles. Each anal valve with a single tubercle; subanal plate with a tubercle on each side of the middle line. In the male the copulatory foot is composed of two subequal segments; in the proximal segment the proximal half is slender and simple, the distal half stout; in the distal segment the proximal half is stout, the distal half slender and terminating in two long, approximately equal, hook-like processes.

This species is allied to *Stenonia margaritifera* (Gervais, Ins. Apt. iv. p. 102), and to *Stenonia Schetelyi* (Karsch, Archiv. Naturg. 1881, p. 37), but differs from both in the shape of the copulatory foot. This organ is in *St. Schetelyi* terminated by a single long curved process; in *St. margaritifera* by two curved processes, one long and one short; and in *St. pilipes* by two long curved processes.

Eleven adult specimens (three males and eight females) and four young specimens (two males and two females) were brought from Sullivan Island, King Island, and Owen Island.

My thanks are due to Dr. Karsch for the name of this species.

It is perhaps worth while to point out in connection with this

species that the long series of forms from which the above description has been taken shows well to what an extent characters which have been regarded as valuable for the separation of species may vary with age in individuals which are without doubt specifically identical.

Genus Paradesmus, *Sauss. Linn. Entom.* xiii. p. 325.

Paradesmus Karschi, sp. nov. (Plate XXIV. figs. 5–5 *b*.)

Length about 43 mm., width about 5 mm.

Colour: the anterior cylindrical portion of each somite very dark chocolate-brown above and at the sides; testaceous beneath. Upper surface of keel-bearing portion yellow with brown anterior margin; lateral portions brown; sternal portion testaceous. Upper and under sides of keels testaceous. First dorsal plate testaceous, with patch of brown colour towards the anterior margin.

Legs pale brown; head and antennæ black.

Body smooth and shining.

Keels horizontal, with very thick lateral margin, upon which is situated the foramen repugnatorium. Keels of the first segment well developed and not projecting below those of the second.

First dorsal plate more than double as wide as it is long; very nearly as wide as the second, and double as long as the keel-bearing portion of the second.

Head with a median longitudinal sulcus.

Each dorsal plate bearing a transverse sulcus, running from the base of one keel to the base of the other. Posterior somite triangular, truncate, with an anterior larger and a posterior smaller tubercle on each side; subanal plate bituberculate.

Copulatory foot of the male slender and curved, terminating with two hooked dissimilar processes: the posterior of these two processes is wider and at the apex tridentate; the anterior, slender and pointed, is closely adherent to the posterior.

Five male and five female adult specimens, preserved in spirit of wine, from King Island and Sullivan Island.

The form of the copulatory foot shows that this species, which I have named after Dr. Karsch, is closely allied to *Paradesmus vicarius* (Karsch, Archiv f. Naturg. 1881, p. 38).

Paradesmus crucifer, sp. nov. (Plate XXIV. figs. 6–6 *b*.)

Length about 60 mm., width about 5 mm.

Colour: upper surface of each somite pale reddish brown, with

a median longitudinal darker band running from the anterior to the posterior border. Basal portion of upper surface of keels dark brown, passing into yellow towards the apex; raised margin of keels clear yellow; a dark-coloured band passing from the base of one keel to that of the other, and cutting the longitudinal band at right angles, forms with it a cross-shaped mark. Upper portion of the sides of each somite dark chocolate-brown, passing below and on the underside into light brown; under surface of keels pale yellow. Head almost black. Posterior portion and keels of first dorsal plate yellow; anterior portion black. Legs clear yellow; antennæ yellow, with apical segment and distal end of penultinate segment brown.

Body smooth and shining.

Keels almost horizontal, slightly raised, situated at the summit of the sides of the segments. Antero-external border very convex and bearing in a depression the foramen repugnatorium. Keels of first segment well developed and slightly depressed.

First dorsal plate more than double as wide as it is long; very nearly as wide as the second and double as long as the keel-bearing portion of the second.

Keels of posterior segments strongly projecting backwards. Head with a median longitudinal sulcus.

Each dorsal plate bearing a transverse sulcus running from the base of one keel to that of the other. Posterior portion of each dorsal plate obscurely striated longitudinally. Posterior somite triangular, truncate, bifid, bearing three tubercles on each side. Subanal plate rounded, with a tubercle on each side of the middle line.

A single female specimen from King Island. The right antenna is abnormally developed, having one segment fewer than the left.

This species may at once be distinguished from the preceding by the difference of colour, by the slightly raised keels, and by the convexity of the antero-lateral margins of the keels.

Family Iulidæ.

Genus Spirostreptus, *Brandt, Bull. Mosc.* 1833, p. 203.

Subgen. Nodopyge, *Brandt.*

Spirostreptus (Nodopyge) opinatus, *Karsch, Zeits. Naturwiss.* liv. p. 23. (Plate XXV. figs. 2–2 *c*.)

Length 153 mm. Number of somites 62 to 66.

Hind half of each somite brown with reddish posterior margin; head, antennæ, and first dorsal plate light brown; legs clear yellow.

Somites smooth and shining.

Lower lateral portions of the hinder half of each somite longitudinally striated; fore part of each somite concentrically striated.

Belly-grooves oblique; those on the central somites as long as the two basal segments of the legs.

First dorsal plate not extending laterally below the succeeding ones; antero-inferior border rounded, with margin elevated and thickened. The groove that marks this thickening extending up to and beyond the outer margin of the ocular area; postero-lateral portions striated. Forehead with median sulcus.

Posterior somite produced into a short, slightly upturned spine, projecting slightly beyond the anal valves.

Anal valves with margins thickened and slightly compressed; sub-anal plate triangular, marked off from the posterior segment by a groove.

In the male the antennæ are relatively longer and the margin of the anal valves more convex than in the female.

The anterior lamina of the copulatory organ produced below into two processes, the inner of which is slender and styliform. The upper slender portion of the anterior lamina is attached to a small triangular plate, by which it is connected with the corresponding portion of the opposite side. The posterior lamina, viewed from the front, is seen to be dilated below, rod-like above; the inferior border of the lower dilated portion giving off two processes, an external and an internal; the external process projecting downwards and outwards. To the rod-like upper portion is attached the central portion of the copulatory organ. This consists of a slightly curved, elongate piece, which below is produced into an upcurled membranous expansion. At the proximal end of this is a simple styliform process, the upper margin of which is slightly serrated. This distal end of the membranous portion is bifid and setiferous. From the outer side towards the distal end springs a long curved spur.

Four specimens, three females and one male, from Sullivan Island.

The species was described by Dr. Karsch from Tenasserim.

Spirostreptus (Nodopyge) aterrimus, sp. nov. (Plate XXV. figs. 1–1 *d*.)

Length 217 mm. Number of somites 66–67.

Hind half of each somite shining black, with reddish tinge at its posterior margin; anterior portion black but less shining. Head dark brown, shining. Legs and antennæ shining dark brown, with distal margin of each segment yellow.

Each somite divided by a sulcus, which is deeper at the sides than above, into an anterior and posterior portion: posterior portion smooth above, striated at the sides and below; anterior portion marked towards its free margin by fine concentric striæ.

Belly-grooves oblique; those of the posterior somites shorter than those of the central and anterior somites.

First dorsal plate not extending laterally below those that succeed it; antero-inferior border rounded, with raised and thickened margins; the groove that marks this thickened margin reaching up to the ocular area; postero-lateral portions very faintly striated.

Forehead with median sulcus.

Posterior segment produced into a short upturned spine, projecting slightly beyond the margin of the anal valves.

Anal valves with margins thickened and strongly compressed; sub-anal plate triangular, not separated by a groove from the posterior segment.

In the male the antennæ are relatively longer than they are in the female; the head is shorter; the raised margin of the first dorsal plate thicker, and the free border of the anal valves more convex.

Anterior lamina of copulatory organ simple and spatulate, dilated below, slender above; the apex of the upper slender portion attached to a small triangular plate, by which it is connected with the corresponding piece of the opposite side. The posterior lamina, viewed from the front, dilated below, rod-like above; the inferior border of the lower dilated portion giving off two processes, an external and an internal; the external process projecting downwards and inwards. The anterior and posterior laminæ of the copulatory organ are continuous behind, and they together form a sheath for the central lamina, which is above attached to the superior rod-like portion of the posterior lamina. Each central lamina consists of a slightly curved, elongate, more or less cylindrical piece, which below is produced into an upcurled membranous expansion. At the proximal end of this there is an elongate slender piece, terminated by a small sharp hook. From the inner margin near its proximal extremity this membranous portion gives off a sharp, slightly curved spur; its

distal extremity, which is very much curled, terminates in three irregular processes, the central of which bears a series of fine bristles.

Two specimens, one male and one female, from Mergui.

This species was identified by Dr. Karsch as a variety of *Sp. opinatus*, but the form of the copulatory foot, an organ which that naturalist had no opportunity of examining, serves at once to distinguish it. From the form of this organ it appears to be allied to *S. lankaensis* (Humbert), but in other particulars it is undoubtedly different.

Spirostreptus regis, sp. nov. (Plate XXV. figs. 3, 3 *a*.)

Length 55 mm. Number of somites 61.

Hind half of each somite deep brown, with paler margin; front half testaceous; anal somite testaceous; margins of valves and apex of spine brown; first dorsal plate testaceous in the centre, brown in front and behind, with anterior and posterior margins pale yellow. Antennæ, legs, and front of head testaceous. Body smooth and shining.

Each somite divided by a sulcus into an anterior and posterior portion. Posterior portion below marked with the usual longitudinal striæ; above very faintly grooved in the same direction. Grooves less strongly marked in the anterior than in the posterior somites.

First dorsal plate not extending laterally below the succeeding one; lateral portion striated and much attenuated; antero-inferior margin very round and marked off by a groove.

Forehead with median sulcus.

Posterior somite produced into a very short, very slightly upcurled spine, which projects slightly beyond the margins of the anal valves.

Anal valves with margins thickened and slightly compressed; posterior border very convex; sub-anal plate triangular, marked off from posterior somite by a sulcus.

A single female specimen from King Island.

Genus Spirobolus, *Brandt, Bull. Mosc.* 1833, p. 202.

Spirobolus caudulanus, *Karsch, Zeits. Naturwiss.* liv. p. 60. (Plate XXV. figs. 4–4 *b*.)

Length 75 mm. Number of somites 52.

Each somite pale olive-green, with darker posterior portions; centre of the dorsal portion blood-red; posterior somite and

anal valves very pale olive-green; antennæ, legs, and region of labrum ferruginous.

Each somite marked below by a sulcus, which becomes fainter and finally disappears towards the dorsum. Foramen repugnatorium situated immediately behind this sulcus, above the middle of the somite; a small area surrounding the foramen black and smooth. Each somite thickly and finely punctured; lateral inferior portion as high as the foramen, striated. Posterior portion of each somite more strongly striated, less strongly punctured.

First dorsal plate laterally scarcely overlapping and not extending lower than the second; anterior border nearly straight, forming with the posterior border a blunt rounded angle; antero-inferior margin with a strongly marked groove.

Lower portion of clypeus with strongly marked central sulcus; upper portion of sulcus very faintly indicated. Labral region marked with two impressions on each side of the middle line.

Posterior somite produced into a stout, blunt process, which projects slightly beyond the margins of the anal valves. Margins of anal valves strongly thickened and compressed. Sub-anal plate posteriorly angulate.

A single female specimen from King Island.

The specimen described by Dr. Karsch, which is also a female, was from Siam. The male appears to be unknown.

Spirobolus phranus, *Karsch*, *t. c.* p. 65. (Plate XXV. figs. 6–6 *e*.)

Length 52 mm. Number of somites 55.

Posterior portion of each somite testaceous, anterior portion brownish grey. Legs, antennæ, and lower portion of clypeus testaceous.

Each somite marked with circular sulcus into an anterior and a posterior portion; very finely punctured; laterally and inferiorly longitudinally striated. Dorsally the central portion is furnished with numerous linear elevations, which, running parallel to the margins of the somite, and anastomosing in every direction, give rise to a reticulated pattern; the interstices formed by the intersection of these elevations posteriorly break up into more or lese elliptical areas, and disappear on the hinder portion of the somite. Foramen repugnatorium inconspicuous, situated upon the middle portion of the somite. Somites not provided with scobina.

First dorsal plate laterally narrowed, not projecting below the second; anterior border merging almost imperceptibly with the lateral; not striated; marked with marginal sulcus.

Lower portion of clypeus with a longitudinal median sulcus, upon each side of which are two widely separated punctures.

Last somite produced into a blunt process, which scarcely projects beyond the margins of the anal valves. Margins of anal valves very slightly compressed, convex. Sub-anal plate triangular.

Anterior lamina of copulatory organ is more or less quadrate, and is attached to that of the opposite side by a conspicuous triangular piece; each of the upper angles of the triangular piece is produced into a long process which curves over the upper end of the semiquadrate lamina; the anterior lamina is on each side extended backwards and comes into contact with the posterior lamina, which itself, more or less quadrate, forms the posterior wall of the channel in which lies the central foot-lamina. Attached to the upper margin of the anterior lamina and projecting backward from it, there is a simple slightly curved rod, with the posterior extremity of which articulates the central lamina. This consists of a stout piece, with smooth curved rounded anterior border, blunt distal end, and with inner and hinder borders membranous and excavated. In the lower portion of the excavation lies a curled pointed flagellum.

Four specimens, two males and two females, from King Island, and Owen Island.

The female of this species, described from Bangkok, has hitherto only been known.

Spirobolus Andersoni, sp. nov. (Plate XXV. figs. 5–5 *d*.)

Length of large specimen 52 mm. Number of somites 55.

Anterior and posterior portions of each somite testaceous; central portion slate-coloured; legs, margins of first dorsal plate, antennæ, and region of labrum testaceous. Each somite divided by two circular sulci into three parts. Foramen repugnatorium situated between the middle and posterior divisions; middle and posterior divisions strongly striated at the sides; dorsally marked with scattered crescentic impressions; posterior portion finely striated longitudinally. Entire somite finely punctured. The crescentic impressions form a well-marked line running parallel with the margins of the somite; this line is fainter upon the posterior than upon the anterior somites.

Lateral portions of first dorsal plate very much narrowed; anterior margin meeting the posterior margin in a rounded angle; margin of the angle and of the lower half of the dorsal plate with raised border; not striated.

Lower portion of the clypeus with well-marked sulcus, upon each side of which are four punctures.

Posterior segment produced into a more or less pointed process, which projects beyond the margins of the anal valves.

Margins of anal valves convex and not compressed. Sub-anal plate triangular, with posterior angle rounded.

Anterior lamina of copulatory foot wide above, narrow below, and at its distal end abruptly passing into a slender projection; inner margin nearly straight; outer margin sinuate. Laterally it is in contact with the posterior lamina, which is pointed below, and bears near the distal extremity on the outer side a conspicuous indentation. Above there is a simple slender piece, articulated to the free extremity of which is a backwardly-projecting claviculiform rod. To the posterior end of this rod articulates the central lamina, which apparently consists of two segments, an upper and a lower; the two together, being hollowed out behind, form a complete sheath, chitinous in front, membranous in the rear. Upper segment slightly curved, with smooth round anterior margin, giving off at the point of junction with the lower segment two short processes; lower segment much smaller than the upper, terminates below in a pointed projection.

Four specimens, two males and two females, from Elphinstone Island.

Note.—At the time when I began to draw up this Report upon the Myriopoda of the Mergui Archipelago, it was not possible, owing to the lack of similar Reports, to compare directly the fauna of this group of islands with that of any one district in the Oriental Region. An exception, however, to this statement must be made in the case of Ceylon; for the Myriopoda of this island have been worked out by Mons. A. Humbert. All that could be said in this respect was that the islands present general faunistic affinities—which certainly is true enough—with the rest of the Indian and Indo-Malayan area.

But while the present paper has been in the hands of the printers I have fortunately had an opportunity of examining two extensive collections of Burmese Myriopods. The first of

these was made by Sig. M. L. Fea, and has been kindly instrusted to my care by the Marquis G. Doria for the purpose of identifying the specimens it contains. The second, still more extensive than the first, was amassed by Mr. E. W. Oates, who has, with great liberality, lately presented it in its entirety to the Natural History Museum.

An inspection of these two collections is sufficient to show that the Myriopod fauna of Mergui is in most respects obviously related to that of South Burmah, and has certainly been derived from it. Consequently, in the case of the species of *Glomeris*, described on p. 290, I have thought it advisable to insert the description of what I consider is probably the parent species, namely that occurring on the mainland, and to treat the insular form as a variety. Otherwise, if the Mergui form be now described as a new species, it will be necessary, when reporting on the Burmese collection, to make the Burmese form the variety; that is, the continental, and probably therefore the parent, form will stand as a variety of its own descendant—the insular form.

On the other hand, it is desirable to consider another view of the case which would arise if there were met with on the mainland specimens resembling the Mergui form, *pallida* and others constituting a series of gradations from it to the red-bordered form *carnifex*. In that case *carnifex* should perhaps be considered a variety of *pallida*.

Or, again, supposing even that *pallida* does not occur on the mainland, there is still the possibility that it (the Mergui form) may not be derived from the Burmese form *as it at present exists*, but that it may be the unmodified descendant of a form which on the mainland, owing to keener competition, has been transformed into *carnifex*, while in Mergui it has remained unchanged, safe from such competition in its insular isolation. In that case either the two forms should constitute distinct species, or *carnifex* should rank as a variety of *pallida*.

But to support this last hypothesis there is no evidence. In fact such evidence as there is, namely half a dozen specimens of *carnifex* from Tenasserim, and half a dozen of *pallida* from Mergui, is in favour of the view which has been adopted, *i. e.* that *pallida* is a variety of *carnifex*. If the question of the relationship is capable of solution, the solution can only be arrived at by the exertions of collectors in both the districts in parts of which specimens have hitherto only been taken.

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Note.—Not to overburden the text, I have purposely refrained from giving references to many works which treat generally of the Myriopoda. An almost complete list of the papers dealing with Oriental and Australian Chilopoda occurs scattered through Dr. Haase's monograph, of which special mention has been made; and in Dr. Latzel's 'Die Myriopoden der Öster.-Ungar. Monarchie,' ii. (Wien, 1884), will be found a nearly complete list, up to date, of all the publications of which this group (Myriopoda) constitutes a part or the whole of the subject-matter.

DESCRIPTION OF THE PLATES.

Plate XXIV.

Fig. 1. *Himantarium Meinerti*, sp. n. Anterior end of body, from above.
1 *a*. „ „ Anterior end of body, from below.
1 *b*. „ „ Posterior end of body, from below.
2. *Orphnæus brevilabiatus*. Anterior end of body, from above.
2 *a*. „ „ Posterior end of body, from below.
3. *Himantarium indicum*. Anterior end of body, from above.
3 *a*. „ „ Anterior end of body, from below.
3 *b*. „ „ Posterior end of body, from below.
4, 4 *a*, 4 *b*. *Acanthodesmus pilipes*. From above.
4 *c*. „ „ Copulatory foot.
5. *Paradesmus Karschi*, sp. n. From above.
5 *a*. „ „ Copulatory foot.
5 *b*. „ „ Apex of copulatory foot.
6, 6 *a*, 6 *b*. *Paradesmus crucifer*, sp. n. From above.
7. *Glomeris carnifex*, sp. n., var. *gallida*, nov. Copulatory feet.
7 *a*. „ „ „ „ „ Eighteenth pair of feet.

Plate XXV.

Fig. 1. *Spirostreptus aterrimus*, sp. n. Anterior end of body, from the side.
1 *a*. „ „ Posterior end of body, from the side.
1 *b*. „ „ A median somite, from below.
1 *c*. „ „ Copulatory apparatus, from the front.
1 *d*. „ „ Internal lamina of copulatory foot.
2. „ *opinatus* (Karsch). Anterior end of body, from the side.
2 *a*. „ „ Posterior end of body, from the side.
2 *b*. „ „ Copulatory apparatus, from the front.
2 *c*. „ „ Internal lamina of copulatory apparatus.
3. „ *regis*, sp. n. Anterior end of body, from the side.
3 *a*. „ „ Posterior end of body, from the side.
4. *Spirobolus caudulanus* (Karsch). Anterior end of body, from the side.
4 *a*. „ „ Posterior end of body, from the side.
4 *b*. „ „ Posterior end of body, from below.
5. „ *Andersoni*, sp. n. Anterior end of body, from the side.
5 *a*. „ „ Posterior end of body, from the side.
5 *b*. „ „ Copulatory apparatus, from the front.
5 *c*. „ „ Copulatory apparatus, from the side.
5 *d*. „ „ Internal lamina of copulatory apparatus.
6. „ *phranus* (Karsch). Anterior end of body, from the side.
6 *a*. „ „ Posterior end of body, from the side.
6 *b*. „ „ Copulatory apparatus, from the front.
6 *c*. „ „ Copulatory apparatus, from the side.
6 *d*. „ „ Internal lamina of copulatory apparatus.
6 *e*. „ „ Apex of internal lamina of copulatory foot.

Report on the Comatulæ of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By P. Herbert Carpenter, D.Sc., F.R.S., F.L.S., Assistant Master at Eton College.

[Read 21st June, 1888.]

(Plates XXVI. & XXVII.)

The Comatulæ collected by Dr. Anderson at Mergui were all obtained at one locality, King Island. Most of them belong to the genus *Antedon*, two species of which are represented by five and by twelve examples respectively; while there are three other individuals belonging to as many different species, one of which is new to science. The genus *Actinometra* is represented by three examples of a new and remarkable type, which I found to be the host of a parasitic *Myzostoma*. Three of the species of *Antedon* were similarly infested; and the *Myzostoma*-species found on them have been placed in the hands of Professor von Graff for identification and description.

The following list contains the names and specific formulæ of the Mergui Comatulæ, which are classified on the principles set forth in the Report on the Comatulæ dredged by the 'Challenger'*.

Genus ANTEDON, *de Freminville*.

Series I.

Elegans-group.

A. Andersoni, sp. n. A. R. 2. 2. 2. 2. $\frac{bc}{c}$.

A. elegans, Bell. A. R. 3. 2. (2). $\frac{b}{c}$.

Series II.

Milberti-group.

A. Milberti, Müll., sp. A. $\frac{b}{b}$.

* Zool. 'Challenger' Exped., part lx., 1888.

Series III.

Palmata-group.

A. spicata, Carpenter. A. 2. 2. (2). $\frac{bc}{b}$.

A. conjungens, Carpenter. A. 2. 2. 2. $\frac{b}{b}$.

Genus ACTINOMETRA, *Müller*.

Series I.

Paucicirra-group.

A. notata, sp. n. *a*. R. $\frac{d.p.p'(p'').br.}{2}$. $\frac{bc}{b}$.

Description of the Specimens.

ANTEDON ELEGANS, *Bell*.

Specific Formula. A. R. 3. 2. (2). $\frac{b}{c}$.

1882. Antedon elegans, *Bell, Proc. Zool. Soc. Lond.* 1882, p. 534.

1882. Antedon elegans, *Carpenter, Proc. Zool. Soc. Lond.* 1882, pp. 746, 747.

1884. Antedon elegans, *Bell, Rep. Zool. Coll. H.M.S. 'Alert,'* Lond. 1884, p. 162, pl. xiii. figs. B, B *a*.

1888. Antedon fluctuans (elegans), *Carpenter, Zool. 'Chall.' Exped.* part lx. 1888, pp. 94, 264, pl. viii.

Habitat. King Island. Five specimens. Two of them "sublittoral;" two "on corals;" one with the cirri coiled round a Gorgoniid.

Remarks. This species was first described by Bell in the 'Alert' Report. But he overlooked its most important character, the syzygial union of the two outer radials. Three examples of it were dredged by the 'Challenger,' and were described by myself as *Antedon fluctuans*; for I was then in ignorance of the real character of *A. elegans*. This I only discovered subsequently, when examining Bell's type for the purpose of determining its relation to the other tridistichate species of *Antedon* with articulated radials. The sheet containing the description of *A. fluctuans* had then been printed off, and the plate lettered with this name; but a note was inserted further on in the Report* to point out the identity of *A. fluctuans* with *A. elegans*, Bell; and the latter name was used both in the classified list of *Antedon*-

* Zool. 'Challenger' Exped. part lx., 1888, p. 264.

species on p. 53 and in the distribution-lists at the end of the Report.

The five examples of *A. elegans* from Mergui are mostly larger than those obtained by the 'Challenger' and 'Alert' in the Arafura Sea and Torres Strait respectively. The arms of the largest one reach 10 centim. in length, and their earlier joints are relatively shorter, with a more wedge-shaped outline and a greater tendency to overlap than is visible in the 'Challenger' specimens. The number of arms is small, however, rarely exceeding thirty; for the post-palmar series which occur in three of the four individuals obtained by the 'Challenger' are not present at all in those from Mergui; and the full complement of palmar series is rarely found on any ray. As a rule, only the two inner series are present; so that there are six arms to the ray, viz. 1, 2, 2, 1, as in *A. spinifera*; while the distichal axillaries are sometimes altogether absent. Both these conditions are well shown in the specimen figured by Bell. On the other hand, the Mergui forms show but little tendency to any variation from the type of two palmars, such as occurs in Bell's specimen and in one of those obtained by the 'Challenger.'

The rays of the latter are quite free laterally; but those of the largest specimen from Mergui are more closely in contact, and the distichal joints sometimes exhibit a tendency to the straight-edged and wall-sided character which is so marked in many deep-sea Comatulæ. This is much more distinct in the Philippine variety of *A. elegans*, which I hope to describe shortly together with the other Comatulæ obtained by Professor Semper in the same locality.

All the Mergui specimens are much more darkly coloured than those obtained by the 'Challenger' and 'Alert,' two of them being almost black; another is a dark reddish brown, mottled with lighter patches; and one has a more uniform lighter shade of the same colour. The youngest individual has its cirri coiled round a Gorgoniid (*Plexaura*) of the same dark reddish-brown colour as itself; while a *Myzostoma* infesting one of the two blacker specimens is as darkly coloured as its host.

Antedon Andersoni, sp. n. (Plate XXVI. figs. 1–5; Plate XXVII. fig. 8.)

Specific Formula. A. R. 2. 2. 2. 2. $\frac{bc}{c}$.

Description of an Individual. Centro-dorsal a thick disk, bearing about forty cirri, which reach 60 millim. in length. They consist of 60–70 tolerably uniform joints, the distal halves of which have sharp spines. First radials partially visible; the second and third narrow, strongly convex, and united by syzygy. The rays are quite free laterally, and divide four or five times; each series of two articulated joints, the first nearly square, and the axillary pentagonal, often as long or longer than wide. All these joints are relatively deep and narrow, with a strongly rounded dorsal surface.

Arms very numerous, fifteen or eighteen to the ray, with compressed joints, the lower ones oblong, and their successors more unequally quadrate. A syzygy in the third brachial, with others following at very uncertain intervals (5–13 joints); but they are apparently altogether absent in some arms.

The first pinnule (on 2nd brachial) is slender and tapering, consisting of 35 or more elongated joints, and reaching nearly 25 millim. in length. The next few brachials bear quite short pinnules, with only some six or eight joints; and their successors increase slowly in length, but never become specially long.

Disk much incised, and not regularly plated, though the integument is very dense and tough.

Colour very dark, almost black—probably deep purple in life,—with lighter patches on the arms. Sacculi very abundant on the pinnules.

Disk 25 millim.; spread 35 centim.

Habitat. King Island; sublittoral. One specimen and a detached disk.

Remarks. This is a fine species which may be referred for the present to the *Elegans*-group; though it differs from the three members of the group which are at present known in certain essential characters. If other species resembling it should eventually be discovered, it may be useful to establish a second group in Series I. of the *Antedon*-species, and to call it the *Andersoni*-group. The three existing members of the *Elegans*-group are all tridistichate, and have a well-plated disk; whereas *Antedon Andersoni* is bidistichate, and the disk has nothing like the large plates covering the interpalmar areas which occur in *A. multiradiata*, *A. elegans*, and *A. microdiscus*. But, on the other hand, it is very tough and leathery, and the ambulacral grooves are more or less completely closed by the approximation of their

sides. This is also visible in the lower parts of the brachial ambulacra, which are often entirely closed by an irregular alternation of processes from opposite sides (Pl. XXVI. figs. 4, 5). There is, however, no indication either of side-plates or of covering-plates on the pinnule-ambulacra, which are of the usual character. But isolated portions of the brachial ambulacra effervesce strongly with acid, and the perisome would therefore seem to contain a considerable amount of diffused limestone particles which are not concentrated into definite spicules or plates, as in most other Crinoids. This would partly account for the hardness and leathery character of the perisome on the disk.

The condition of the disk and the bidistichate rays are the essential points of difference between *A. Andersoni* and the three existing members of the *Elegans*-group. It resembles, but surpasses them all in the great length of its cirri (Pl. XXVII. fig. 8), and also in the length of the first pinnule; but this pinnule is on the second brachial and not on the second distichal as in the *Elegans*-group, while its successors do not decrease slowly in length, but exhibit a sudden and remarkable diminution in size (Pl. XXVI. fig. 2), that of the third brachial consisting of but half a dozen small joints. The following pinnules increase gradually in length, but never reach any considerable size.

Another characteristic feature of *A. Andersoni* is the convex shape of the joints forming the rays and their subdivisions, and also the lateral compression of the arm-joints. Owing, however, to the rays being so widely separated, there is no trace whatever of that lateral flattening of their bases which is so characteristic of the *Basicurva*, *Spinifera*, and *Granulifera*-groups, and occasionally shows itself also in *A. elegans*. It is very marked in the fossil *A. costata*, for which Walther* has recently proposed to restore the generic name *Solanocrinus*, originally applied to this species by Goldfuss. For he believes that the fossil species which he refers to this genus are devoid of the syzygies in the arms which occur more or less frequently in other Crinoids. He attempts to establish some other characters which would distinguish the genus from *Antedon*—an attempt which he would scarcely have made had he been better acquainted both with the literature of the subject and with the condition of many recent species

* "Untersuchungen über den Bau der Crinoiden, mit besonderer Berücksichtigung der Formen aus dem Solenhofener Schiefer und dem Kelheimer Diceraskalk," Palæontographica, 1886, Bd. xxxii. p. 175.

of *Antedon*, as I have pointed out elsewhere*; and the only character, therefore, on which he can possibly rely for the separation of *Solanocrinus* from *Antedon* is the presence of syzygies in the arms of the latter and their absence in those of the former genus. But the material on which he has founded this generalization seems to me to be altogether insufficient. Few, if any, of his very limited number of specimens have as many as forty arm-joints remaining, and these are rarely in a satisfactory state of preservation; so that it is somewhat rash to speak positively about the total absence of syzygies in the arms of *Solanocrinus*. In fact, I have shown reason to believe that syzygies are present even in some of the arms which are figured and described by Walther as being entirely devoid of them.

On the other hand, *Antedon Andersoni* is remarkable for the rarity of the syzygies in the arms. It was a long time before I could discover any at all, except that in the third brachial. In fact, I did not succeed in finding any in some arms; while in others they are often separated by intervals of ten or a dozen joints. In *A. elegans* and *A. multiradiata* the second syzygy may not be till the fortieth or even the sixtieth brachial, and the intervals between its successors may be fifteen or twenty joints. Were these species in the fossil state, therefore, with only the lowest portions of the arms preserved, and that but badly, it would be easy to overlook the syzygy in the third brachial, and to infer that none were present in the arms at all; though such an inference would not be in accordance with the facts of the case. I cannot but suspect, therefore, that Walther's attempt to establish the absence of syzygies as a diagnostic character of *Solanocrinus* is due partly to a generalization on imperfect material, and partly to an insufficient acquaintance with the variations in the distribution of the syzygies among recent Comatulæ.

Any member of the *Elegans*-group, preserved in the fossil state, would make a fairly good *Solanocrinus*; for each species has a relatively large centro-dorsal, bearing a good number of cirri, with few syzygies between the brachials, but one between the two outer radials. This latter condition certainly occurs in *Solanocrinus costatus*, and probably also in *S. imperialis* and

* "The Generic Position of *Solanocrinus*," Ann. & Mag. Nat. Hist. 1887, ser. 5, vol. xix. pp. 82, 83.

S. gracilis, as I have explained elsewhere*; and I am inclined to regard these last-mentioned species as the ancestral forms of the existing members of the *Elegans*-group. On the other hand, *Antedon scrobiculata* and *A. aspera*, with a bifascial articulation between the two outer radials, were the Jurassic representatives of the majority of the recent species of *Antedon*, in which the two outer radials are also united by a bifascial joint.

Antedon Milberti †, *Müll.*, sp. (Plate XXVII. figs. 6, 7.)

Specific Formula. A. $\frac{b}{b}$.

1888. Antedon Milberti, *Carpenter, Zool. 'Chall.' Exp.* part lx. p. 194, pl. xxxv. figs. 4–6.

A dozen examples of this widely distributed species were obtained at King Island, half of them from mud-flats exposed at spring-tide. They are mostly of a light reddish-brown colour, but one is more yellowish brown, and another is almost white. Most of the larger specimens have the bases of the rays somewhat flattened laterally, as is often the case in this species, and there is a good deal of variation in the relative sizes of the lower pinnules. The fourth pinnule on the side is sometimes considerably shorter than the third, and sometimes nearly equal to it (Pl. XXVII. figs. 6, 7).

This species is infested by a *Myzostoma*, which will be described by Professor von Graff.

Antedon spicata, *Carpenter*. (Plate XXVII. figs. 3–5.)

Specific Formula. A. 2. 2. (2). $\frac{bc}{b}$.

1881. Antedon spicata, *Carpenter, Notes from the Leyden Museum*, 1881, vol. iii. p. 190.

A single individual, which I take to belong to this species, occurred at King Island (sublittoral). But it has rather more cirri than the type specimen at Leyden, and in this respect approaches the allied species *Antedon indica* and *A. tuberculata*, which resemble it in having long and stiff pinnules on the fourth and fifth brachials. In *A. indica*, however, the first pinnule is much smaller than the large second one, as is well shown in Smith's figure‡, while in *A. spicata* it may nearly equal its suc-

* Ann. & Mag. Nat. Hist. 1887, ser. 5, vol. xix. pp. 83–87.

† The bibliography of this species will be found in the 'Challenger' Report.

‡ Zoology of Rodriguez, Echinodermata: Phil. Trans. 1879, vol. clxviii. pl. li. fig. 3 *b*.

cessor in length, though it is far more slender (Pl. XXVII. fig. 3). That of *A. tuberculata* is also short, though stiffer than in the other two forms.

This species approaches *A. spicata*, however, in the character of its third pinnule, which is composed of elongated joints like those of the second, and not of numerous smaller joints as in *A. indica*. In some arms of *A. spicata* this third pinnule is smaller on the outer than on the inner side of the arm, *i. e.* the pinnule on the seventh is larger than that on the sixth brachial (Pl. XXVII. fig. 3). But the component joints of these large and stiff pinnules have not the extreme length which they reach in *A. tuberculata*; and the characters of this Mergui example of *A. spicata* confirm my separation of this species from *A. tuberculata*; for the latter has but twelve joints in a second pinnule which reaches 15 millim. long, while in the former species a pinnule of the same length consists of sixteen joints or more. In both alike, however, the rays have marginal projections which seem to be absent in *A. indica*. But the cirri of *A. tuberculata* are stouter, though with a somewhat smaller number of joints than occur in *A. spicata* (Pl. XXVII. fig. 4). The type specimen of the latter has no post-palmar axillary, but one occurs in the Mergui example, which necessitates the addition of a 2 (in brackets) to the specific formula.

ANTEDON CONJUNGENS, *Carpenter*. (Plate XXVII. figs. 1, 2.)

Specific Formula. A. 2. 2. 2. $\frac{b}{b}$.

1888. Antedon conjungens, *Carpenter, Zool. 'Chall.' Exp.* part lx. p. 233, pl. xlv. fig. 1.

One mutilated individual which seems to belong to this species was obtained at King Island (sublittoral). Like the other Comatulæ from this locality it is very darkly coloured, while the two specimens found by the 'Challenger' on the Zebu Reefs are light grey, with occasional dark patches, and the margins of the lower parts of the rays are more produced towards the ventral side than is the case in the Mergui form. The characters of the cirri and of the arm-divisions are, however, the same in both; and the pinnule-arrangement is also generally similar in the two types. The largest pinnule is on the fourth brachial, and it is much larger on the outer than on the inner arm of each distichium; in the former case the pinnule on the second brachial is also of con-

siderable size, but on the inner arms it is a good deal smaller (Pl. XXVII. figs. 1, 2).

The chief point of difference between the Mergui and the Philippine specimens is in the size of the third pinnule, that on the sixth brachial. In the outer arms of the Mergui individual (Pl. XXVII. fig. 1) its length relatively to that of its predecessor on the fourth brachial is but little smaller than in the type-specimens from Zebu; but on the inner arms (Pl. XXVII. fig. 2) the difference between the second and third pinnules is more marked. Those of the type specimens are sometimes nearly equal, though not always so; but in the Mergui form the difference is often considerable (Pl. XXVII. figs. 1, 2); it is not so great, however, as in *Antedon protecta*, in which the third pinnule is much reduced in size, not only on the inner, but also on the outer arms.

Actinometra notata, sp. n. (Plate XXVI. figs. 6–12.)

Specific Formula. A. R. $\frac{d.\ p.\ p'.\ (p'').\ br.}{2}\frac{bc}{b}$.

Centro-dorsal a thick disk, bearing 30 or 35 marginal cirri. These have about 25 joints, the later ones short and wide, with but little trace of spines.

First radials more or less concealed; the two outer ones united by syzygy. Arms 31 to 50 or more in number. The distichal and palmar series each of two joints united by syzygy, with one or two further divisions of the same character; the first two brachials also united by syzygy. The next syzygy is sometimes in the third or fourth, but usually not till the tenth or fifteenth brachial, and others follow at intervals of 2–4 joints. The lowest brachials are nearly oblong, and their successors triangular and wider than long, soon becoming more quadrate, and finally nearly oblong again.

The first pinnule is on the second brachial, and is very long and flagellate with a large terminal comb, reaching nearly 40 millim. on the outside of the ray. The following pinnules diminish rather rapidly in length, and lose their comb after about the eighth brachial, but never become specially short. The two basal joints of the first three or four pinnules on each side are more or less carinate.

Mouth obscurely radial; the disk may have calcareous granules in the anal interradius, or be entirely naked. All the arms are grooved.

Colour in spirit, dark blackish brown.

Disk 30 millim.; spread 25 centim.

Habitat. King Island; sublittoral. Three specimens.

Remarks. This fine species exhibits the same peculiarities of the rays and their subdivisions as are characteristic of *Actinometra paucicirra*; but whereas the presence of palmar series is an exception in *A. paucicirra*, so that the number of arms is limited to twenty, palmars are always present in *A. notata*. Furthermore, they may be followed by one or even by two post-palmar series (Pl. XXVI. fig. 7), and the number of arms therefore is sometimes twice as great as in *Actinometra paucicirra*. In the latter species, too, which normally has but four arms to the ray, the two outer arms generally have a syzygy in the third brachial; but in *A. notata*, with six to twelve arms on the ray, this character occurs but rarely (Pl. XXVI. fig. 6). The latter species is further distinguished from *A. paucicirra*, which has no cirri in the adult condition, by the large size of the centro-dorsal, and its numerous and well-developed cirri (Pl. XXVI. figs. 11, 12). It would seem, however, that the centro-dorsal of *A. notata* undergoes a certain amount of retromorphosis before reaching maturity; for it is relatively largest in the youngest individual (Pl. XXVI. fig. 8), partly concealing the second radials, which are united laterally, and its dorsal surface, though flat, is not hollowed in any way. In the two adult individuals, however, portions of the first radials are visible, in one case a considerable amount (Pl. XXVI. fig. 7), while the dorsal surface of the centro-dorsal is distinctly hollowed.

The disk of the youngest individual is entirely naked; while those of the two larger forms bear well marked calcareous granules in the anal interradius. The arrangement of the ambulacra in one of them is very singular (Pl. XXVI. fig. 6). The mouth seems to be radial, and the number of groove-trunks connected with the peristome is very considerable. The aboral portion of the left antero-lateral ray B^2, which includes the arms borne upon its posterior distichal axillary, has an altogether abnormal groove-supply. The ambulacra of its anterior arms (b^3) are directly connected with the peristome, as is often the case; one would therefore expect to find those of its posterior arms, b^4, supplied by a branch of the single primary ambulacrum, which in the ordinary species of *Actinometra* passes round the disk to reach the left postero-lateral ray (see woodcut). In the specimen before me, however, the ambulacrum proceeding in this direction from the left posterior

angle of the peristome comes to a sudden end on the disk, immediately after its first bifurcation; and all the ambulacral grooves

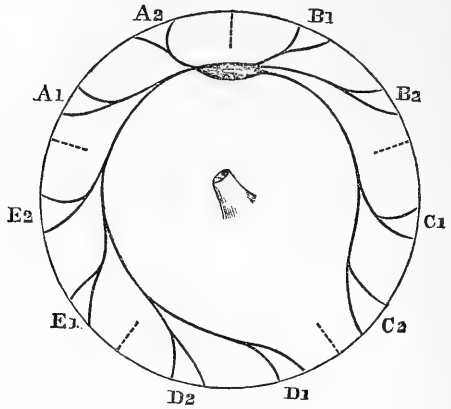

Diagram of the disk of a normal *Actinometra*, with interradial mouth *.
The dotted lines mark the interambulacral regions of the disk. A_1 A_2 . . . . E_1 E_2 the five pairs of secondary ambulacra.

of the corresponding ray (C) together with those of the distal arms on the B ray (b^4) are connected with the single groove-trunk, which comes round the right side of the disk to supply the hinder arms of the D ray (Pl. XXVI. fig. 6). I cannot account in any way for this abnormal arrangement, which does not appear to be accidental, at any rate so far as the union of the right and left posterior ambulacra is concerned (C^2 and D^1). But it is just possible that the parasitic growths which appear upon some of the brachial ambulacra may have also shown themselves on the disk, and have destroyed the connection between the primary groove-trunk of the left posterior ray and its peripheral branches, a connection which was not fully restored by the regeneration of that part of the disk. But I imagine that it would be going too far to assume that the connection between C^2 and D^1 ambulacra arose in consequence of this loss; for there are so many cases in which a large proportion of the hinder arms of an *Actinometra* are entirely devoid of ambulacra, that there would not seem to be any absolute necessity for the isolated left poste-

* From the Report on the 'Challenger' Comatulæ, by kind permission of the Editor, Dr. John Murray.

rior arms in this individual being brought into communication with the peristome.

It would be interesting to learn to what extent these arms are isolated; whether, for example, the water-vessel continues onward in its normal course, although there is no ambulacrum above it. I think it not improbable that such might be the case, as it certainly is so in the ungrooved and non-tentaculiferous arms of several species.

The parasitic growths to which I have referred above are of a very singular character. They only present themselves upon this one individual, and occur along some of the brachial ambulacra, blocking them more or less completely. Some of them have been removed and sent to Professor von Graff, who will report upon them separately.

DESCRIPTION OF THE PLATES.

Plate XXVI.

Figs. 1–5. *Antedon Andersoni*, sp. n.

Fig. 1. Dorsal view of the calyx and arm-bases, × 2.
2. Side view of the second and following brachials, with their pinnules, × 2.
3. Side view of the lower part of an arm, × 2.
4. Portion of a brachial ambulacrum, as seen after removal of the pinnules, × 4.
5. The same, with one pinnule *in situ*, × 4.

Figs. 6–10. *Actinometra notata*, sp. n.

Fig. 6. A disk, with abnormally distributed ambulacra, × 1½.
7. Dorsal aspect of the adjacent portions of two rays in an adult individual, × 2.
8. Dorsal aspect of the calyx and arm-bases in an immature specimen, × 2.
9. Dorsal view of the middle part of an arm, × 2.
10. Side view of the second and following brachials, with their pinnules, × 2.
11. A cirrus, × 2.
12. Another, less mature, × 2.

Plate XXVII.

Figs. 1, 2. *Antedon conjungens*, Carpenter.

Fig. 1. Side view of the second and following brachials in the outer arm of a distichium, with their pinnules, × 3.
2. The same part of an inner arm, × 3.

Figs. 3–5. *Antedon spicata*, Carpenter.

Fig. 3. Side view of the second and following brachials, with their pinnules; the second pair of pinnules have their ends broken away. × 3.

4. A cirrus, × 3.

5. Dorsal view of the middle part of an arm, × 3.

Figs. 6, 7. *Antedon Milberti*, Müll., sp.

Fig. 6. Side view of the second and following brachials, with their pinnules, × 2.

7. The same, from another individual, × 2.

Fig. 8. *Antedon Andersoni*, sp. n.

Fig. 8. A cirrus, × 2.

On the Echinoidea of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By Prof. P. Martin Duncan, M.B. (Lond.), F.R.S., F.L.S., and W. Percy Sladen, F.G.S., Sec. L.S.

[Read 21st June, 1888.]

The Echinoidea collected by Dr. Anderson are represented by six species; and although these are all known forms their association in such a limited area is remarkable, and, so far as we are aware, without precedent. The fact that all the regular Echinids belong to the family Temnopleuridæ is especially striking; and the circumstance is the more noteworthy, as in a collection from the Andaman Islands, described last year by Prof. Jeffrey Bell, not a single Temnopleurid is recorded; and, furthermore, out of nine genera mentioned by him as occurring at the Andaman Islands, not one is represented in the collection placed in our hands from the Mergui Archipelago.

All the species, with the exception of one, are essentially Indian-Ocean forms; the majority of the examples, however, present a certain amount of variation when compared with specimens from other localities which is sufficient to impart a local character. These differences are recorded in the following notes; but we have not thought them of sufficient importance to warrant in any case their recognition by name as a definite variety.

Perhaps the most interesting form in the collection, which is not a characteristic Indian-Ocean species, is *Arachnoides placenta*. The home of this Echinid is Australia and New Zealand; and, with the exception of an example in the Boston Museum from Burmah, mentioned by Alex. Agassiz, no other occurrence of the species in the Indian Ocean proper is on record.

Subclass **EUECHINOIDEA**, *Bronn*.

Order DIADEMATOIDA.

Suborder *STEREOSOMATA*.

Family TEMNOPLEURIDÆ.

Subfamily TEMNOPLEURINÆ.

Genus TEMNOPLEURUS, *Agassiz*.

1. TEMNOPLEURUS TOREUMATICUS (*Klein*), *Agassiz*.

Cidaris toreumatica, *Klein*, 1734, *Nat. Disp. Echin.* p. 22.

Temnopleurus toreumaticus, *Agassiz*, 1841, *Monogr. Scutelles*, p. 7.

Locality. King Island (native name *Padaw*).

Genus SALMACIS, *Agassiz*.

1. SALMACIS SULCATA, *Agassiz*.

Salmacis sulcata, *Agassiz*, 1846, *Cat. Rais., Ann. Sci. Nat.* vol. vi. p. 359.

Locality. King Island (native name *Padaw*); 25th Jan. 1882.

Remarks. Test slightly conical, with large well-marked pits. Spines rather short, those on the actinal surface a rich dark purple or violet, but white at the base and occasionally at the tip; close to the peristome more white is present. Miliaries and many secondaries altogether white.

Colour of the test green, with a brighter or yellowish shade along the median areas of the ambulacral and interambulacral areas.

2. SALMACIS DUSSUMIERI, *Agassiz*.

Salmacis Dussumieri, *Agassiz*, 1846, *Cat. Rais., Ann. Sci. Nat.* vol. vi. p. 359.

Locality. King Island (native name *Padaw*); 25th Jan. 1882.

Remarks. Most of the specimens of this species known in Museums are denuded of spines. The example under notice is well preserved. The spines at the ambitus are remarkable for their length and disproportionate size in relation to the other

spines on the test; the Urchin, when viewed from above, has in consequence the appearance of being furnished with a richly variegated fringe. These spines are white, banded on the outer two thirds with narrow rings of reddish purple. The other spines on the test, which are small, delicate, and sharply pointed, are white. The colour of the test is creamy white. The naked median areas are broad and very conspicuous.

3. Salmacis bicolor, *Agassiz.*

Salmacis bicolor, *Agassiz*, 1841, *in Valentin, Anat. Genre Echinus*, p. viii.

Locality. King Island (native name *Padaw*); Jan. 1882; sublittoral.

Remarks. One of the examples from King Island is somewhat higher and more conical in the test than the other specimen; and both are relatively higher and more conical than examples from Mauritius. In general habit and coloration the lower example from King Island strikingly recalls examples from Madras. This may probably be a variety. The colour of the spines is light green, banded with rich reddish purple and a light pinkish purple at the base, both on the abactinal and actinal surfaces.

Order CLYPEASTROIDA.

Family Laganidæ, (subfamily) *A. Agassiz.*

Genus Laganum, *Klein.*

1. Laganum depressum, *Agassiz.*

Laganum depressum (*Lesson & Garnot, MS.*), *Agassiz*, 1841, *Monogr. Scutelles*, p. 110.

Locality. King Island (native name *Padaw*); 25th Jan. 1882.

Family Scutellidæ, *Agassiz.*

Subfamily Arachninæ.

Genus Arachnoides, *Klein.*

1. Arachnoides placenta (*Linné*), *Agassiz.*

Echinus placenta, *Linné*, 1766, *Syst. Nat.* ed. xii. p. 1105.

Arachnoides placenta, *Agassiz*, 1841, *Monogr. Scutelles*, p. 94.

Locality. King Island (native name *Padaw*); Feb. 1882.

Remarks. The single example collected by Dr. Anderson is

of large size, and differs somewhat in the marginal contour from Australian and New-Zealand specimens; the odd anterior radial area being rather more prominent, and the anterior pair of interradial areas flatter in their curvature, which causes the margin of the test to be less fully rounded in front, and the greatest breadth to be more conspicuously posterior to the postero-lateral petals. The marginal contour is, however, subject to such a great amount of variation throughout the family, that we do not consider it of sufficient importance to give a name to the variety; and until a further series of examples is available, we confine ourselves to the simple record of the circumstance.

On the Asteroidea of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.

By W. Percy Sladen, F.G.S., Sec. L.S.

[Read 21st June, 1888.]

(Plate XXVIII.)

The collection of Asteroidea made by Dr. Anderson in the Mergui Archipelago, although small, is particularly interesting. It is noteworthy, not only from the fact that it contains several new as well as rare forms, but also because some of the examples which I have referred to known species show variations which are sufficient to impart a character to the collection as a whole, and to indicate the existence of local conditions whose action upon types of a more plastic nature than that of the series of forms so far collected would probably result in new morphological developments. That the representatives of other forms occur in this area is highly probable; and it seems to me, therefore, a reasonable expectation that a number of "new species" may ultimately be found in the Mergui Archipelago when further dredging operations are carried out. From what I have seen, I think it is not too bold to throw out the suggestion that the Mergui area may be looked upon as a moulding ground wherein Malayan types assume a modified form, approaching to a certain extent the Indian-Ocean facies, but maintaining a local and independent character.

It is interesting to note that out of twelve species of Asterids from the Andaman Islands recently determined by Prof. F. Jeffrey Bell*, only one—*Archaster typicus*—occurs in the Mergui collection; and out of seven genera, only two are represented—*Archaster* and *Astropecten*.

Dr. Anderson has kindly given me detailed particulars of the localities, which I append verbatim, not only on account of their intrinsic interest, but as furnishing an explanation of the character of the fauna:—

"The locality in King Island from which the Asterids and Echinids were obtained is a small bay on the eastern side of the island, near its northern end. It is well sheltered as it opens towards the north, and is protected by high land to the west, south, and east, the mountains to the west and south rising to an altitude of 2530 and 2125 feet. It is thus completely shut in from the storms of the south-west monsoon. The bay is shallow, as its depth ranges only from 2 to 9 fathoms, the average being 4 fathoms. Its bed is almost entirely covered with a deep deposit of mud brought down by a number of small streams that flow into it, especially at its head, from which the sea retires for about two miles at low water, exposing extensive mud-flats deeply furrowed by the channels of the little rivers. A few small islands occur at the limit of low water, and off one of them my vessel was stationed for about a month. At low tide the mouth of one of the streams was close to the island, in line with its seaward face, while another occupied a similar position on its eastern side. The island was only a few acres in extent, and was surrounded by mud-flats except on its northern side, which had a rocky shore. Here at low water, with a freshwater stream flowing out through the mud-flat on either side, sponges, corals, and Alcyoniid and Gorgoniid Alcyonaria abounded, and were partially exposed at spring-tides, the water bathing them being richly charged with mud. The Asterids and Echinids were found under these conditions, also the Comatulids, and the few Hydroida and Actiniæ, and the great mass of the Mollusca described by Prof. v. Martens.

"The sea between King Island and the mainland, and along the entire coast, from Tavoy Point to the Pak chun estuary, contains

* Proc. Zool. Soc. Lond. 1887, p. 140.

much less salt than it does around the outer islands of the Archipelago, as the Tavoy and Tenasserim rivers discharge a great body of water, supplemented by the outflow of many other but smaller streams. Another result of this freshwater discharge is that the bed of the sea around the inner islands is covered by a thick layer of mud brought down by these rivers. King Island is situated 10 miles to the west of Mergui.

"The conditions, however, that prevail at Owen Island are very different, as this island, which is about 73 miles south of King Island, and nearly 30 miles to the west of the main land, lies fully exposed to the Bay of Bengal. The little bay in this island, visited by me, occurs at its southern end. Its head was margined by bright yellow sand—high and dry—on which were numerous examples of a *Spirula* thrown up during the storms of the south-west monsoon. This sand was succeeded by a bank of coral, while the sides of the bay were strewn with stems and broken fragments of coral, lying over gravel and sand. On this part of the shore I obtained the Echinoderms from Owen Island, and among them, I believe, more than one species of Sand-star —one, a small active form that rapidly buried itself in the sand when the stones under which it was found were disturbed.

"The western side of Sullivan Island also lies open to the Bay of Bengal, and as the prevalent wind at night was from the east, I had, for safety's sake, to anchor my vessel under the shelter of the high land of the island, within some rocky islets that defined a kind of bay into which a number of small streams flowed. When I attempted to dredge, I found the bottom to be composed entirely of mud about one mile from the shore. It yielded a few Mollusca and some immature Pennatulids. In the tidal way between the islets and the main island corals occurred in profusion, and among them I obtained the Echinoderms from Sullivan Island. This island is situated about 13 miles to the south of Owen Island.

"Sir William James Island is 10 miles to the south of Sullivan Island, and out at sea.—J. A."

Subclass **EUASTEROIDEA**, *Sladen.*

Order PHANEROZONIA, *Sladen.*

Family ARCHASTERIDÆ (*Viguier*), *emend. Sladen.*

Subfamily ARCHASTERINÆ, *Sladen.*

Genus ARCHASTER, *Müller & Troschel.*

1. ARCHASTER TYPICUS, *Müller & Troschel.*

Archaster typicus, *Müller & Troschel,* 1840 (April), *Monatsber. d. k. Akad. d. Wiss. Berlin,* p. 104; *System der Asteriden,* 1842, p. 65.

Astropecten stellaris, *Gray,* 1840 (November), *Ann. & Mag. Nat. Hist.* vol. vi. p. 181.

Archaster nicobaricus, *Möbius* (n. sp. *Behn, MS.*), 1859, *Neue Seesterne des Hamburger und Kieler Museums,* p. 13 (*Abhandl. a. d. Gebiete Naturw. hrsg. v. d. naturwiss. Verein, Hamburg,* Bd. iv. Abth. 2, 1860).

Localities. King Island (native name *Padaw*); Feb. 1882. Sir William James Island; 7th Dec. 1881.

Family ASTROPECTINIDÆ (*Gray*), *emend.*

Subfamily ASTROPECTININÆ, *Sladen.*

Genus ASTROPECTEN, *Linck.*

1. ASTROPECTEN ANDERSONI, n. sp. (Plate XXVIII. figs. 1–4.)

Localities. King Island (native name *Padaw*); Feb. 1882; sublittoral. Sullivan Island (native name *Lampi*); Feb. 1882; 10 fathoms.

Rays five. R=50 mm.; r=12 mm. R>4 r.

Breadth of a ray between the third and fourth supero-marginal plates, 10·5 mm. The majority of the examples collected are about two thirds this size.

Rays elongate, narrow, tapering gradually to the extremity, which is rather obtuse. Disk small. Interbrachial arcs slightly rounded.

The paxillar area is compact and uniform, from three to four times the breadth of the supero-marginal plates at about midway between the base and the extremity of the ray. The paxillæ are moderately large and distinctly stellate, the tabulum bearing in the centre from one to four short papilliform spinelets, and the

margin surrounded by eight to twelve rather longer claviform spinelets, which radiate horizontally. There is a little diminution in the size of the paxillæ towards the centre of the disk, and much crowding, but no trace occurs of any epiproctal prominence or peak whatever, its position being frequently occupied by a slight invagination. The paxillæ are arranged in short transverse rows at the sides of the rays, the irregular median space being broad. The paxillæ become very small towards the end of the rays.

The supero-marginal plates, which are about thirty in number from the median interradial line to the extremity, are small, rather higher than broad, the disproportion of the dimensions being greatest at the base of the ray, and appear slightly tumid when viewed from above. They are covered with papilliform granules which are uniform in size and shape, and not very closely placed; and fine cilia are present in the furrows between successive plates. Each supero-marginal plate bears near its abactinal margin a single erect tapering spinelet, the size of the spinelets decreasing gradually along the ray.

The infero-marginal plates, which are broader than high, extend slightly beyond the level of the superior series, and form a gently rounded curve towards the actinal surface. Each plate bears a single elongate, delicate, subcylindrical, sharply pointed lateral spine, directed horizontally and at an angle of about 45° to the axis of the ray. Behind the lateral spine is a single small companion, similar in shape and character, but not more than one third the length. In large specimens the first miliary spinelet or squamule near this spine may be larger than any of the others; but there is no trace whatever of a transverse series of spinelets along the aboral margin of the plate. In large specimens there may also be a single small spine above and external to the large lateral spine. The surface of the plate is covered with short papilliform spinelets rather than squamules, which are robust, uniform, and widely spaced; and the furrows are occupied by numerous, more delicate and cilia-like spinelets.

The armature of the adambulacral plates consists of short and rather robust spines, which form only two distinct series. The inner or furrow series consists of three short, cylindrical, slightly tapering spinelets, which radiate apart and arch over the furrow, the middle spine being longest. The outer series consists of two unequal spinelets, the aboral one being very large, robust,

conical and pointed, and the companion one little more than one fourth the length, cylindrical and obtusely tipped. The large robust spine stands perpendicularly, and the small papilla is usually directed at an angle towards the furrow and adorally. On the outer surface of the plates near the base of the ray, especially in large examples, there may be one or two similar papillæ; but I do not consider them sufficiently important to rank as a third series.

The mouth-plates are elongate and narrow, with a single row of eight to ten short, robust, conical spinelets on their surface, which are very small outwardly, but increase in length as they approach the mouth, the innermost spine being longer than any of the others and directed horizontally. On the free margin of the mouth-plate there is a lineal series of short, rather robust spinelets, directed horizontally, which increase in length as they approach the inner extremity of the plate; the innermost spinelet, being very little shorter than the innermost spinelet of the superficial series above-mentioned and standing on the same level, forms with it the horizontal fan of mouth-spines which proceeds from each mouth-angle and covers the mouth.

The madreporiform body is small, and situated at about its own diameter distant from the margin.

Colour in alcohol, a light shade of chocolate-brown, or an ashy grey, in the latter case being lighter.

Remarks. This species is the most nearly related to *Astropecten javanicus*, Lütken, from which, however, it may be distinguished by the narrow marginal plates, by the character of the adambulacral armature, and by the spinulation of the inferomarginal plates. The facies of the two forms is quite different, although, from its general structure, I am inclined to think that *A. Andersoni* is probably a descendant of *A. javanicus*, or of a common ancestor, modified by isolation and changed conditions of existence.

2. Astropecten Hemprichii, *Müller & Troschel.*

Astropecten Hemprichii, *Müller & Troschel*, 1842, *System der Asteriden*, p. 71.

? Astropecten articulatus, *Michelin*, 1845, *Essai d'une Faune de l'Ile Maurice*, *Mag. de Zool.* 2e série, 7e année, p. 24 (*non* Asterias articulatus, *Say*, 1825).

Astropecten mauritianus, *Möbius*, 1881, *Beitr. z. Meeresfauna d. Insel Mauritius*, p. 50 (*non* Astropecten mauritianus, *Gray*, 1840).

Locality. Sir William James Island; 7th Dec. 1881.

Remarks. I feel little hesitation in referring a single example to this species, which has recently been carefully described and figured by De Loriol* on the basis of material obtained from Mauritius. The type specimen, preserved in the Berlin Museum, was collected by Hemprich and Ehrenberg in the Red Sea. The form appears to be closely allied to *Astropecten scoparius*.

3. Astropecten notograptus, n. sp. (Plate XXVIII. figs. 5–8.)

Locality. King Island (native name *Padaw*).

Rays five. R=16·5 mm.; r=6 mm. R>2·5 r. Breadth of a ray between the second and third supero-marginal plates, 5·5 mm.

Rays rather broad at the base, tapering rather rapidly on the outer portion to a pointed extremity. Interbrachial arcs subacute.

The paxillar area is wide, measuring more than three times the width of the supero-marginal plates about midway between the base and the extremity of the ray, and is very regular in composition. The paxillæ, which are large and compactly crowded, have a wide tabulum on which are borne from five to eight low uniform granules; and eight to eighteen very short papilliform spinelets, little more than elongate granules, surround the margin and radiate outward horizontally. In the centre of the disk a well-developed conical peak is present.

The supero-marginal plates, about seventeen or eighteen in number from the median interradial line to the extremity, are slightly broader than long, and form a well-developed rounded margin to the ray. The surface of the plates is covered with large, slightly spaced granules which diminish a little in size at the margins, and become more or less cilia-like in the sutures or channels between neighbouring plates. On the innermost plate on each side of the median interradial line is a small, but well-developed tubercle; but no spinelets or tubercles of any kind are borne on the other supero-marginal plates.

The infero-marginal plates, which are much broader than high, do not extend beyond the superior series. Each plate bears a single lateral spine, of moderate length, which tapers throughout, is sharply pointed, cylindrical, and very slightly flattened. At the base of this spine are one or two small compressed spinelets

* Mém. Soc. Phys. Hist. Nat. Genève, t. xxix. No. 4, p. 74, pl. xxi. figs. 7, 8.

or enlarged squamules, one of which is usually more prominent and near the aboral margin of the plate. No other spinelets are present on the infero-marginal plates, which are covered with rather large, moderately well-spaced, uniform squamules.

The armature of the adambulacral plates consists of short robust spinelets, which form two distinct series and an indistinct median series. The inner or furrow series consists of three short, robust, obtusely tipped spinelets which radiate apart and arch over the furrow, the middle spine being longest. The outer series consists of two spinelets which are shorter and more robust than the furrow series, and have a flat subspatulate form; and the aboral spinelet of the pair is frequently larger and much broader than its companion, but sometimes subequal. The indistinct median series consists of two very small papilliform spines, one placed on each margin of the plate, which might almost be counted as the outer spinelets of a furrow series of five spinelets.

The mouth-plates are elongate and narrow, with a single row of eight to ten short, robust, papilliform spinelets on their surface, which are small outwardly but increase in length as they approach the mouth, the innermost spinelet being longer than any of the others and directed horizontally. On the free margin of the mouth-plate there is a lineal series of short, rather robust spinelets, directed horizontally, which increase in length as they approach the inner extremity of the plate, the innermost spinelets being long and forming the horizontal fan of mouth-spines which proceed from each mouth-angle and cover the mouth. The adambulacral plate adjoining the mouth-plate is much broader and shorter than the others, and bears a lineal series of eight or nine short papilliform spinelets on each side, the two series being apposable.

The madreporiform body is entirely hidden by paxillæ.

Colour in alcohol, an ashy grey mottled with lines and bars of chocolate-brown. On the inner third of the ray there is a line of colour adjacent to the marginal plates which is continuous with and meets the corresponding band of the adjacent ray on the disk, forming a V-shaped mark thickened in the angle. At the junction of the median and outer third of the ray is a broad transverse band of colour which passes over the paxillar area and marginal plates uninterruptedly.

Remarks. This species is allied to *Astropecten granulatus*, Müller & Troschel; but is distinguished by the character of the

marginal plates, by the spinulation of the infero-marginal plates, and by the armature of the adambulacral plates. The presence of the small tubercle on the innermost pair of supero-marginal plates in the interbrachial arc, and the colour markings also serve to distinguish the forms. *Astropecten notograptus* presents several points of affinity with *A. monacanthus*, mihi; but the broad marginal plates, the large paxillæ, the simple spinulation of the infero-marginal plates, and the difference in the character of the adambulacral armature (although only slight) serve to distinguish the Mergui species.

Subfamily Luidiinæ, *Sladen*.

Genus Luidia, *Forbes*.

1. Luidia forficifer, *Sladen*.

Luidia forficifer, *Sladen*, 1888, *Zool. 'Chall.' Exp.* part li., *Report on Asteroidea*, p. 258, pl. xliv. figs. 5 & 6, pl. xlv. figs. 5 & 6.

Localities. King Island (native name *Padaw*); Feb. 1882. Sir William James Island; 7th Dec. 1881.

Remarks. One adult example, unfortunately in a bad state of preservation, and a small one, almost too young for accurate determination, appear to me to belong to this species. It was dredged during the 'Challenger' Expedition in the Arafura Sea and in Torres Strait at a depth of 6 to 28 fathoms, on sea-bottoms of coral-mud and green mud.

2. Luidia maculata, *Müller & Troschel*.

Luidia maculata, *Müller & Troschel*, 1842, *System der Asteriden*, p. 77.

Locality. King Island (native name *Padaw*); 24th Jan. 1882; sublittoral.

A single young example having nine rays. The major radial dimension is 65 mm.

Family Pentagonasteridæ, *Perrier*.

Subfamily Goniodiscinæ, *Sladen*.

Genus Goniodiscus, *Müller & Troschel*.

1. Goniodiscus articulatus (*Linné*), *de Loriol*.

Asterias articulata, *Linné*, 1753, *Mus. Tessinianum*, p. 114, tab. ix. fig. 3.

Artocreatis altera species, *Seba*, 1758, *Thesaurus*, t. iii. p. 11, tab. vi. figs. 7 & 8.

Goniaster articulatus, *Lütken*, 1864, *Videnskab. Medd. naturh. Foren. i Kjöbenhavn*, p. 147.

Goniodiscus articulatus, *De Loriol*, 1884, *Rec. Zool. Suisse*, t. i. p. 638, pl. xxxv. figs. 1–1 *j*.

Locality. King Island (native name *Padaw*); Jan. 1882; sublittoral.

Remarks. This handsome form was described and figured by Linné in the 'Museum Tessinianum;' and the same example is stated by Lütken* to have been the original of Seba's figure in his 'Thesaurus,' t. iii. pl. 6. figs. 7 & 8. Until four years ago the species—excepting the existence of the well-preserved type—might be said to have been lost sight of, and its locality was unknown.

In 1884, M. P. de Loriol gave a careful description and excellent figures of an example collected at Singapore; he also discussed the erroneous views of previous writers on the species in question. With M. de Loriol's determination I entirely agree; and his description accords closely with the notes which I made when examining the Linnean type of *Asterias articulata* in the University Museum at Copenhagen.

The specimen collected at Mergui by Dr. Anderson is intermediate in size between Linné's specimen and that described by de Loriol, the measurements being R=66 mm., r=34 mm. In general outline it approaches more nearly to the type than does de Loriol's large example, the interbrachial arc being more widely rounded, which causes the rays to appear rather more defined. In other respects the Mergui example accords closely with the description of that from Singapore; and I feel no doubt as to the specific identity of the three examples.

Family Asterinidæ (*Gray*), *emend. Perrier*.

Subfamily Asterininæ, *Sladen*.

Genus Nepanthia, *Gray*.

1. Nepanthia suffarcinata, n. sp. (Plate XXVIII. figs. 9–12.)

Locality. Owen Island; 2nd Jan. 1882.

Rays five. R=48 mm.; r=13–15 mm. R>3r. Breadth of

* Videnskab. Medd. naturh. Foren. i Kjöbenhavn, f. 1864, p. 148.

a ray at the base, 15 mm.; breadth at 10 mm. from the base, 10 mm.

Rays elongate, semicylindrical, flattened actinally, broad and inflated at the base, then rapidly becoming narrower, and maintaining a nearly uniform breadth until near the extremity, which is obtusely rounded. Interbrachial arcs acute. Abactinal area of the disk more or less inflated, marked with well-defined channels along the median interradial lines which extend nearly to the centre. Actinal surface plane; with the margin abruptly angular.

The abactinal area is covered with small, narrow, conspicuously crescent-shaped plates, which are disposed in regular alternating longitudinal rows. Within the concavity is placed a single papula, which is guarded on its adcentral side by small plates (usually two in number, but sometimes more are present), all included within the arc of the crescentiform plates. The plates bear a great number of uniform microscopic spinelets which form a compact velvet-like covering. The plates along the sides of the ray are somewhat modified in form, often appearing jawbone-shaped rather than crescent-shaped, and the longitudinal disposition of the series is even more conspicuous than in the median radial region.

The marginal plates are very small, and the infero-marginal series forms the angular ambitus of the ray, the superior series being quite in the lateral wall of the ray. The plates of the inferior series are slightly larger and more definite than their companions, and all bear compact groups of microscopic spinelets similar to those on the abactinal plates.

The armature of the adambulacral plates consists of:—(1) A furrow series of 7 or 8 spinelets united by membrane, which radiate apart, and form a fan slightly obliquely placed and high in the furrow; the spinelets are cylindrical, obtusely tipped, and the middle ones are longer than the others. (2) On the actinal surface of the plate is an obliquely placed semicircular fan of 5 or 6 obtusely conical, robust, papilliform spinelets which radiate apart; and behind these is an irregular tuft of minute cilia-like spinelets.

In the actinal interradial areas four longitudinal rows of intermediate plates extend along the ray up to the extremity; on the disk four other rows may be counted, but these die out gradually, and do not extend far beyond the base of the ray. The plates of

the series adjacent to the adambulacral plates are slightly larger than any of the others; and all the intermediate plates bear compact tufts of numerous microscopic conical and sharply pointed spinelets.

The madreporiform body is rather large, and is situated nearer the centre of the disk than midway between that point and the margin. Its surface, which is somewhat undulating, is marked with wide and much convoluted striations. Several prominent small plates surround the margin.

Colour in alcohol, a dirty ashy grey, with a slightly brownish shade.

Remarks. This species in some respects occupies an intermediate position between *Nepanthia maculata*, Gray, and *Nepanthia brevis*, Perrier; but it differs from both of these by its general facies, by the different character of the lateral series of plates along the ray, by the small, truly crescentiform plates of the median abactinal area, and by the character of the armature of the adambulacral plates.

Genus Asterina, *Nardo.*

1. Asterina cepheus (*Müller & Troschel*), *v. Martens.*

Asteriscus cepheus, *Valenciennes, MS.*

Asterina Burtonii, *Gray*, 1840, *Ann. & Mag. Nat. Hist.* vol. vi. p. 289.

Asteriscus cepheus, *Müller & Troschel*, 1842, *System der Asteriden*, p. 41.

Asterina cepheus, *v. Martens*, 1866, *Archiv f. Naturgesch.* Jahrg. xxxii. Bd. i. p. 85.

Localities. King Island (native name *Padaw*); Feb. 1882. Sir William James Island; 7th Dec. 1881.

Remarks. The examples of this species collected in the Mergui Archipelago are rather more discoid than usual, the interbrachial arcs being less incurved than usual; the spinulation also is much more delicate and cilia-like. The differences, however, do not appear to me to be sufficient to warrant their recognition by name; and a good series of examples is desirable before they can be ranked as a variety with any degree of certainty.

DESCRIPTION OF PLATE XXVIII.

Fig. 1.	*Astropecten Andersoni*, n. sp.	Abactinal aspect, magnified 1½ diameters.
2.	„ „	Actinal aspect, magnified 1½ diameters.
3.	„ „	A portion of the abactinal surface, magnified 15 diameters.
4.	„ „	Adambulacral and infero-marginal plates, magnified 8 diameters.
5.	*Astropecten notograptus*, n. sp.	Abactinal aspect, magnified 3 diameters.
6.	„ „	Actinal aspect, magnified 3 diameters.
7.	„ „	A portion of the abactinal surface, magnified 40 diameters.
8.	„ „	Adambulacral and infero-marginal plates, magnified 14 diameters.
9.	*Nepanthia suffarcinata*, n. sp.	Abactinal aspect, magnified 1½ diameters.
10.	„ „	Actinal aspect, magnified 1½ diameters.
11.	„ „	A portion of the abactinal surface, magnified 15 diameters.
12.	„ „	Adambulacral plates and adjacent portion of the actinal surface, magnified 15 diameters.

Report on the Mammals, Reptiles, and Batrachians, chiefly from the Mergui Archipelago, collected for the Trustees of the Indian Museum.

By John Anderson, M.D., LL.D., F.R.S., F.L.S., F.Z.S., &c.

[Read 20th June, 1889.]

As the object of the Expedition sent by the Indian Museum to Mergui was to bring together materials for the illustration of the marine fauna of that portion of the Bay of Bengal, it was impossible to undertake a systematic investigation of the vertebrate fauna of the islands themselves.

A small collection, however, of Mammals, Reptiles, and Batrachians was formed, and it is now proposed to place the names of the species on record. The Mammalia number 23, the Reptilia 53, and the Batrachia 12 species.

Among the five species of bats represented in the collection, *Emballonura semicaudata* is new to the Malayan Peninsula; while another, *Pteropus edulis*, is also an addition to the fauna of the Mergui district. A large bat, probably this species, occurs likewise on the islands in the neighbourhood of Sullivan or Lampi Island to the south.

A race of *Sus scrofa* is the mammal most generally distributed over the Archipelago. It is found on all the large islands, and on islands not over a square mile in extent. It is known to occur as far west as the Elphinstone group to the north, and Clara Island to the south, these two localities, with King Island and Mergui, being the northern and southern limits of my observations. Whether this animal extends to the most westerly chain of islands, stretching from Tenasserim island in the north to Great Western Torres in the south, has not been ascertained, as these islands have not been explored.

Tragulus Kanchil is another feature of the Archipelago, and is almost as widely distributed as the pig. On Elphinstone Island it was nearly as numerous as on King Island and at Mergui, where the undergrowth of the forest is alive with it at sundown.

After these two species, the squirrels, *Sciurus caniceps* and *S. bicolor*, are the mammals most commonly seen.

Arctogale leucotis occurs on King, Owen, and Sullivan Islands, thus rendering it probable that it has a wide distribution over the Archipelago. *Paradoxurus hermaphroditus*, on the other hand, was only observed on King Island.

The two monkeys found on the islands are *Semnopithecus obscurus* and *Macacus cynomolgus*; the former being the more widely distributed, while the latter seems to be more confined to the islands near the mainland, where mud-banks are exposed at low water, the food of this monkey consisting largely of Crustacea found in such situations.

Tupaia ferruginea is very abundant in the neighbourhood of the few villages on the banks of a creek at the head of the bay, on the north-eastern side of King Island. It was also met with on a recent clearing made by some Selungs in the centre of the island, and again on Elphinstone and Sullivan Islands.

The only locality in which I observed the nocturnal *Nycticebus tardigradus* was King Island, an island intimately linked to the mainland by a succession of islets separated from each other by narrow channels.

The tiger is found on all the large islands close to the mainland, its most western range being King and Domel Islands; and on the former it is said to be so numerous and aggressive, that the few villagers, on the eastern side, seldom venture into the forest; and at the village of Taing, at the head of the creek already mentioned, it is unsafe to penetrate into the jungle, as the Burmese and Karens settled there wage war on the animal by setting formidable dart- or spear-traps, the triggers of which, so to speak, are thread-like fibres stretched across the runs of wild animals, and, if broken through, entail almost certain death. The tiger, however, is unknown on such western islands as the Elphinstone and Grant groups, and on Sullivan Island, 70 miles to the south and distant about 10 miles from the coast; but it occurs on Campbell and Forbes Islands to the south of Kisseraing, the former being separated from the mainland by a channel only one mile in width, whereas the latter is eight miles in breadth, but linked to the coast by two small intermediate islands, the widest sea-passage being three miles.

Both elephants and rhinoceroses find their way on to the island of Kisseraing; but the former are unknown on any of the other islands. The latter, however, I was informed by Mr. Leslie, of the Maleewon Police, whose duties frequently took him past Campbell and Forbes Islands, occurred on those islands; but whether *Rhinoceros sondaicus*, the dried hide of which is sold in Mergui bazaars for food, or a two-horned species, he could not say. He also told me that he had once met a two-horned rhinoceros swimming in the sea close to High Island, about twenty miles distant from the mainland, but with islands everywhere in sight.

The names of the less prominent mammals met with are recorded in the accompanying list; but all the species, with the exception of the two bats already mentioned and *Rhizomys erythrogenys*, are well-known forms on the neighbouring mainland.

One of the features of the Reptilian fauna of the Archipelago is the occurrence of *Crocodilus porosus* in the neighbourhood of almost every island of any size, at least within the area that came under my observation. The great bay on the eastern side of King Island is fringed by mangrove swamps, through which some small freshwater streams flow. The detritus brought down by these streams has converted the head of the bay into a great mud-bank continuous with the mangrove swamps, and at low water it is an

extensive mud-flat cut up by the narrow channels down which the streams run. Near its seaward extremity there are a few wooded islets, their rocky beaches facing the sea being rich in corals and *Gorgoniæ*, partially visible at the lowest tides, while their other sides continuous with the mud-flats are covered with stony patches, among which are found brilliantly coloured sponges, *Pennatulidæ* and *Actiniæ* occurring in profusion in the soft deep mud of the great bank. Among these remarkable estuarine conditions this crocodile is frequently seen basking at low water on the banks of the seaward extensions of the streams close to the corals and sponges. On the other hand, it is equally abundant on the rocky shores of Elphinstone, Domel, and Sullivan Islands, all of which are more or less surrounded by coral, washed by the salt sea.

The lizard, *Varanus salvator*, was also met with on all the islands I visited.

Calotes Emma is the tree-lizard most frequently seen on the islands; whereas *C. versicolor* appears to be the species most prevalent at Mergui.

The call of the great gecko, *G. verticillatus*, became a familiar sound to me at night during my sojourn in the Archipelago; and *Hemidactylus frenatus* I found to be common at the village of Taing, on King Island.

Among the shrubs and *Casuarina*-trees fringing in some places the western shore of Sullivan Island, *Draco tæniopterus* was not uncommon; and I also found it on Elphinstone Island, and observed it in considerable numbers among the dorian and mangosteen orchards of the eastern side of King Island; but I did not meet with a single specimen of *D. maculatus*, which occurs at Mergui along with the former.

The skink, *Lygosoma maculatum*, is much more prevalent and seemingly more widely distributed than *Mabuia multifasciata*, as it occurs at Mergui, and on King, Elphinstone, and Sullivan Islands, whereas the latter species, which is common at Mergui and on King Island, was not found at Elphinstone Island, and only one specimen was obtained at Sullivan Island.

Five snakes were found on Elphinstone Island, viz. *Compsosoma melanurum*, *Tropidonotus chrysargus*, *Tragops prasinus*, *Bothrops gramineus*, and *B. purpureus*; whereas on the much larger King Island, so intimately connected with the mainland, ten species, all distinct from the former, were obtained, viz. *Tropidonotus junceus*,

T. nigrocinctus, *T. trianguligerus*, *Hypsirhina enhydris*, *Hipistes hydrinus*, *Psammodynastes pulverulentus*, *Python reticulatus*, *Naja tripudians*, and *Ophiophagus elaps*—forms all more or less aquatic in their habits; and a *Bothrops*, possibly *B. cantoris* or *B. porphyraceus*, Blyth. Only four species were procured on Sullivan Island, viz. *Tropidonotus junceus*, *Lycodon aulicus*, *Dipsas carinata*, and *Python reticulatus*. Three snakes—*Tragops prasinus*, *Naja tripudians*, and another example of the foregoing unnamed *Bothrops*—were encountered on Kisseraing Island in the course of a few hours, which would seem to indicate that that island is rich in snakes. Of the foregoing serpents, *Tropidonotus chrysargus* and *Dipsas carinata* are apparently new to the Tenasserim province.

The Hydrophids are extensively represented in the harbour of Mergui, which lies on the seaward face of an island formed by two mouths of the Tenasserim river. The mud-flats lying between these two mouths are studded over with extensive fishing-stakes of an ingenious description, into which the shoals of fish, and the Hydrophids that follow them, have their course directed by long lines of palisades terminating towards the sea in a large chamber from which they fail to escape. At low water, from a platform, the fishermen visit the chambers, and ladle out the contents by means of hand-nets. In this way I obtained nine species of Hydrophids, whereas although I had spent some hours almost daily in the sea among the islands, I did not observe a single species of this genus in any of the localities I visited. It is therefore probable that the species obtained at Mergui are more or less estuarine in their habits, and do not select thoroughly marine situations for their feeding-grounds. The nine species were the following, viz.: *H. Jerdoni*, *H. robusta*, *H. latifasciata*, *H. cyanocincta*, *H. gracilis*, *H. stricticollis*, *H. Jayakari*, *H. Hardwickii*, and *Enhydrina valakadyn*. The only two of those species hitherto recorded from Mergui are *H. Jerdoni* and *H. latifasciata*; but besides the nine, *H. nigrocincta*, *H. striatus*, and *H. trachyceps** occur in the strong tide-way of the harbour. *H. Jayakari* is a recently described species from near Muscat†.

Chelone mydas is found among the islands; but the only one

* It is possible that this species described by Theobald may prove to be *H. cyanocincta*.

† Boulenger, Ann. & Mag. Nat. Hist. vol. xx. Dec. 1887, p. 408.

observed by me was a small specimen that had been captured by the Selungs for food.

The only Batrachian worthy of note is the frog, *Rana Doriæ*, recently described by Boulenger from North Tenasserim, and of which I obtained twenty specimens on King and Elphinstone Islands; so that it is probably widely distributed over the province of Tenasserim.

MAMMALIA.

Order PRIMATES.

Family Cercopithecidæ.

Semnopithecus obscurus, *Reid.*

1 adult ♂, Elphinstone Island; 2 adults and 1 young ♀, Mergui.

Common in the forests about Mergui and on the islands of the Archipelago, in large parties, including individuals of all ages.

Macacus cynomolgus, *Schreber.*

1 adult ♂, caught in the fishing-stakes in Mergui harbour.

This species occurs on the Mergui coast and in the forest skirting the banks of tidal streams, where it may be observed at low water on the muddy banks, wandering either alone or in small scattered parties, inserting its arm into holes and burrows in the mud in search of the Crustacea which form part of its food, and which it pulls out and devours. I also saw it in similar situations on the islands near the mainland.

Order PROSIMIÆ.

Family Nycticebidæ.

Nycticebus tardigradus, *Linn.*

1 adult ♀, King Island.

This belongs to the small and dark variety that occurs in Eastern Bengal (Chittagong), and ranges through Arakan southwards to the extremity of the Malayan peninsula and to some of the neighbouring islands.

Order CHIROPTERA.

Family Pteropodidæ.

Pteropus edulis, *Geoffroy*.

1 adult ♂, Taing, King Island.

Every evening at sunset numerous large bats, sometimes in great flocks, appeared over the mangosteen, dorian, and areca-palm orchards of the village of Taing, on King Island. The natives asserted that they came from a low-lying densely wooded islet between King Island and Mergui, on the trees of which they hung during the daytime in an immense multitude. The expanded wings of the male measured 5 feet across within a few tenths of an inch. A large *Pteropus* observed by me at Sullivan Island is also probably this species.

It has been found on the Andaman and Nicobar Islands; but this is seemingly the first time that it has been recorded from the province of Tenasserim; it has, however, been found at Klang in the Straits of Malacca*.

Family Vespertilionidæ.

Vesperugo pachypus, *Temm.*

3 ♂ and 3 ♀, found in the hollow of an old tree, Taing, King Island.

Vespertilio muricola, *Hodgson.*

7 ♂ and 11 ♀, Yimiki, King Island, and 4 ♂ and 7 ♀, Taing, King Island.

The specimens from Taing were found between the leaves of plantain trees.

Family Emballonuridæ.

Emballonura semicaudata, *Peale.*

8 ♂ and 6 ♀, Sullivan Island; from a small cave in a cliff on the shore, where it occurred in great numbers.

Until quite recently this species was known only from the Polynesian subregion and Sarawak†; but its presence at Pulo

* Thomas, Proc. Zool. Soc. Lond. 1886, p. 73.

† Dobson, Brit. Assoc. Rep. 1880, p. 193.

Nias has been noticed during the present year by the Marquis Doria*.

Order CARNIVORA.

Family Felidæ.

Felis tigris, *Linn.*

1 adult ♀, Taing, King Island.

Tip of nose to vent 5 feet 4·30 inches; length of tail 2 feet 4·50 inches.

Family Viverridæ.

Paradoxurus hermaphroditus, *Pallas*; *Blanford, Fauna of Brit. Ind. &c., Mammalia* (1888), p. 108.

1 ♀ and a ♂ and ♀, King Island†.

One of these females had the following dimensions in life :—

	inches.
Tip of nose to vent	22
Length of tail	18
„ „ hind foot	3
Tip of nose to eye	1·70
Eye to ear	1·30

This individual was so dark-coloured, that when describing it immediately after death it was entered in my notes as black; but since then (1882) the fur has assumed a distinct brownish tinge.

The penis of this species is densely covered with small recurved spines.

Arctogale leucotis, *Blyth*; *Blanford, l. c.* p. 115.

1 ♂, King Island.

The dimensions of the living animal were as follows:—

	inches.
Tip of nose to vent	19
Length of tail	21
„ „ hind foot	3·25
Tip of nose to eye	1·70
Eye to ear	1·30

* Annali del Mus. Civ. di Storia Nat. di Genova, 1889.

† These are the specimens mentioned by Mr. Blanford, Proc. Zool. Soc. Lond. 1885, p. 791.

The general colour was fulvous grey. A feeble line down the back, the muzzle, a spot behind the ear, the feet, and the tip of the tail were brown.

I also observed it on Owen and Sullivan Islands.

Order INSECTIVORA.

Family TUPAIIDÆ.

TUPAIA FERRUGINEA, *Raffles*; *Blanford, Fauna of Brit. Ind.* (1888), p. 210.

1 ♂, Mergui; 4 King Island; and 1 Elphinstone Island.

Order RODENTIA.

Family SCIURIDÆ.

PTEROMYS ORAL, *Tickell*; *Anderson*, *An. Zool. Res.* 1878, p. 279.

1 ♂ adult, Mergui; 1 juv., Sullivan Island (January).

The adult closely resembles an example (B.M. Register, No. 84. 7. 30. 1) of *P. oral* from the Nilgiris in the British Museum, and another in the same collection (Reg. No. 45. 8. 12. 8) from Travancore, and a third (Reg. No. 65. 5. 20. 2) from an elevation of 4500 to 5000 feet on the Anamallies, but differs from them in the trifling detail of having the latter half of its tail nearly white instead of black. In the British Museum there is a specimen (Reg. No. 85. 8. 1. 125) obtained by Mr. Davison at Kankaryit in Tenasserim* corresponding to *P. cineraceus*, Blyth; and another† (Reg. No. 88. 8. 1. 124) collected by the same naturalist at Wimpong Thatone, also in Tenasserim, that is intermediate in its coloration between the Mergui and the young individual from Sullivan Island. In the island of Ceylon also, individuals are found resembling the richly coloured variety occurring on the continent, and others that might be referred to *P. cineraceus*. The specimen (77. 3. 14. 11) in the British Museum is an example of the former, and the skin (77. 3. 14. 9) of the latter. Moreover, flying-squirrels of this species well tinged with grey, and in which the chestnut colour of the upper parts is almost absent, are found in the Madras Presidency.

* Thomas, Proc. Zool. Soc. 1886, p. 67.

† Thomas, ibid.

Sciurus caniceps, *Gray*.

2 adult ♂ (January), 1 adult ♀ (January), and 1 ♀ (March), Mergui; 1 adult ♀ (February), King Island; 1 adult ♂ and 2 adult ♀ (March), Elphinstone Island; and 1 ♂ (January), Sullivan Island.

These specimens agree with the squirrels from Mergui described by Blyth as exhibiting "merely a faint mark of ferruginous, and this chiefly on the sides of the neck and body"*.

Sciurus bicolor, *Sparrm.*

1 ♂, Mergui; 2 King Island; and 1 ♂, Elphinstone Island.

Sciurus Berdmorei, *Blyth.*

1 ♂ and 1 ♀ (January), King Island.

Measurements of the adult female :—

	inches.
Tip of nose to vent	8·20
Length of tail	5·20
,, ,, hind foot	1·80
Nose to eye	1
Eye to ear	0·50

General colour reddish brown above, punctulated with yellow; under surface pale yellow, but more or less white on the mesial line and on the chin, but brighter yellow on the front margins of the thighs. The eyelids yellowish white. Two yellowish bands along the sides, the lower band being the broader, and separated from its fellow by a broad brownish-black band, the upper pale line being similarly bordered above. A mesial black band on the back. The tail bushy; the hairs black at the bases, succeeded by two alternate yellow and black bands, the terminal black band more or less tipped with white.

Family Muridæ.

Mus rufescens, *Gray*.

2 Mergui, and 4 King Island.

This rat is very common at Mergui; the native craft, which I hired to take me among the islands, and on which I lived for nearly three months, was infested by it to an intolerable extent.

* Journ. As. Soc. Beng. vol. xxiv. (1855), p. 475.

Mus concolor, *Blyth.*

7 ♂ and 5 ♀, Mergui; and 1 ♂, King Island

This is the common house-mouse at Mergui and in the village of Taing, King Island.

Mus (Nesokia) bengalensis, *Gray.*

7, Mergui.

Common in the gardens and in the houses.

Theobald appears to have been the first to point out the presence of this rat in Burma*.

Family Spalacidæ.

Rhizomys erythrogenys, *Anderson.*

1 ♂ and 1 ♀, Mergui (January).

These specimens exactly resemble the types from the hill-tracts of the Salween river, in British territory, obtained in the month of June.

Family Hystricidæ.

Atherura fasciculata, *Shaw.*

1 ♂, 1 ♀, King Island.

Order UNGULATA.

Family Suidæ.

Sus scrofa, *Linn.*

3 ♀, King Island.

The wild pig of the Archipelago is in all likelihood identical with the race found on the mainland, which Blyth, in 1863 †, considered to be distinct from the race inhabiting India. This point, however, has yet to be decided, as the three foregoing specimens are unfortunately comparatively young animals, and moreover all of one sex.

This species is the most numerous and widely spread mammal in the Archipelago.

Family Tragulidæ.

Tragulus Kanchil, *Raffles.*

1 ♀ and juv., Mergui; 2 ♂ and 2 ♀, King Island; 1 ♂ and 1 ♀, Elphinstone Island.

* Proc. As. Soc. Beng. 1866, p. 240.

† Cat. Mam. Mus. As. Soc. 1863, p. 141.

Order EDENTATA.

Family MANIDIDÆ.

MANIS JAVANICA, *Desm.*
1 King Island.

REPTILIA.

Order EMYDOSAURIA.

Family CROCODILIDÆ.

CROCODILUS POROSUS, *Schneider.*
1 Mergui.

Order CHELONIA.

Family TESTUDINIDÆ.

CYCLEMYS DHOR, *Gray*; *Boulenger, Cat. Chel. &c. B. M.* 1889, p. 130.

3 from a freshwater stream, Tibu, King Island.

These examples of this species illustrate what takes place in the formation of the hinge between the hyo- and the hypoplastra. In one specimen, measuring 5·31 inches in length, the abdominal plates, in their anterior thirds, almost completely overlap the suture between these bones, the position of which, however, can be detected by the presence of a transverse groove or depression running across the plates; whereas in the other two specimens, measuring respectively 7·28 inches and 7·48 inches in length, a portion of the abdominal plates has become cut across by the functional activity of the joint, and exists as a little plate between the pectorals and abdominals.

Family TRIONYCHIDÆ.

TRIONYX SUBPLANUS, *Geoff.*
3 young specimens, freshwater streams, Tibu, King Island.

Family CHELONIDÆ.

CHELONE MYDAS, *Linn.*
1 Ross Island.

Order LACERTILIA.

Family Geckonidæ.

Hemidactylus frenatus, *Schlegel.*
5 Mergui, and 6 Taing, King Island.

Hemidactylus Garnotii, *Dum. & Bibr.*
3 Taing, King Island.

Gehyra mutilata, *Wiegm.*
1 Mergui; 1 King Island; and 1 Sullivan Island.
The specimen from the last-mentioned locality was found on rocks by the sea-shore.

Gecko verticillatus, *Laur.*
10 Mergui.
Common in the Archipelago.

Family Agamidæ.

Draco tæniopterus, *Günther.*
3 Mergui; 19 King Island; and 1 Elphinstone Island.

Draco maculatus, *Gray.*
3 Mergui.

Acanthosaura armata, *Gray.*
1 Sullivan Island.
Found on swampy low-lying land on which *Nipa fructicans* was growing.

Acanthosaura crucigera, *Boulenger.*
1 female, Yimiki, King Island.
Near a stream in an old clearing in the forest.

Calotes versicolor, *Daud.*
17 Mergui; and 1 Yimiki, King Island.

Calotes Emma, *Gray.*
3 Mergui; 13 Taing, King Island; 5 Elphinstone Island; and 3 Sullivan Island.

Family Varanidæ.

Varanus salvator, *Laur.*
2 Sullivan Island; 1 King Island; 1 Elphinstone Island.
One of these specimens was captured from my boat, in the hollow stem of an old mangrove-tree up which the tide had risen

3 or 4 feet. The Selungs assert that this lizard devours their dead, as they do not bury, but expose their deceased relatives and friends on platforms in the recesses of the forest; and one man informed me that he had seen as many as fifteen lizards engaged on a ghastly meal of this kind.

Varanus nebulosus, *Gray*.
1 King Island.

Family Scincidæ.

Mabuia multifasciata, *Kuhl*.
2 Mergui; 6 Taing and Yimiki, King Island; and 1 Sullivan Island.

This lizard, although only one specimen was obtained, was common in a swamp on Sullivan Island, at the mouth of a small freshwater stream covered with little eminences on which *Nipa fructicans* was growing. Among the palms, that curious crustacean *Thalassina anomala* had thrown up the great mud mounds that occur over its underground chambers. They were strewn with the fallen leaves of the palm, and were more or less riddled with holes made by the crustacean, the eminences being converted into islets at high tide. In this locality this skink lay basking in the early morning sun, and when disturbed retreated either under the decaying vegetation or into the holes on the slopes of the mounds.

Lygosoma maculatum, *Blyth*.
6 Mergui; 12 Taing, Thapo, and Yimiki, King Island; 9 Elphinstone Island; and 1 Sullivan Island.

Common in the northern part of the Archipelago, but seemingly rare in the south. The specimen procured at Sullivan Island was found in the partially dry bed of a freshwater stream.

Lygosoma olivaceum, *Gray*.
1 Taing, King Island.

Lygosoma albopunctatum, *Gray*.
1 Mergui; 1 Elphinstone Island; and 1 Sullivan Island.

Order OPHIDIA.

Family Xenopeltidæ.

Xenopeltis unicolor, *Reinw*.
1 Mergui.

Family Oligodontidæ.

Simotes bicatenatus, *Günther*.
1 Rangoon.

Simotes trinotatus, *Dum. & Bibr.*
1 Tavoy.

Family Colubridæ.

Compsosoma radiatum, *Reinw.*
3 Mergui.

Compsosoma melanurum, *Schlegel.*
1 Elphinstone Island.

Ptyas Korros, *Reinw.*
1 Mergui.

Tropidonotus subminiatus, *Reinw.*
3 Mergui.

Tropidonotus junceus, *Cantor.*
1 Yimiki, King Island; 4 Sullivan Island, at 1300 feet.

Tropidonotus nigrocinctus, *Blyth.*
1 King Island.

Tropidonotus trianguligerus, *Reinw.*
3 Taing, King Island.

Stoliczka, in 1871, described a snake from the hills between Prome and Pegu under the name of *T. bellulus* *. The description, however, was "taken from a rather young specimen measuring only 16½ inches;" the coloration and several points in its structure resembled Schlegel's figure of *T. trianguligerus*, but differed from it in "the much more elongated shape of the vertical, larger occipitals, only one anterior temporal, generally smaller and narrower scales, and by the yellow and black bars at the side of the body being differently shaped." In the foregoing specimens the postoculars vary from 3 to 4, and the temporals from 2+3 to 1+3. In view of the uncertainty which Stoliczka expressed regarding *T. bellulus*, it is desirable that it should be compared with undoubted examples of *T. trianguligerus*.

* Journ. As. Soc. Beng. vol. xl. pt. ii. p 432, pl. xxvi. fig. 2.

Tropidonotus chrysargus, *Schlegel.*

3 Minthantoung, near Mergui; 2 Elphinstone Island.

These snakes have been compared with a specimen in the British Museum identified as this species, and have been found to agree with it. Up till now, Perak has been the most northern known limit of the species on record.

Tropidonotus punctulatus, *Günther.*

1 Mergui.

Hitherto recorded only from Pegu.

Family Homalopsidæ.

Cerberus rhynchops, *Schneider.*

2 Mergui.

Found in the fishing-stakes along with Hydrophids.

In one specimen the nasals on the right side are so confluent that the nostrils appear to be situated almost in the centre of a single shield.

Hypsirhina enhydris, *Schneider.*

2 Taing, King Island.

These are referable to the variety *trilineata*, Gray.

Hipistes hydrinus, *Cantor.*

1 Mergui; 1 King Island.

Both from the sea, but near freshwater streams.

Family Psammophidæ.

Psammodynastes pulverulentus, *Boie.*

1 Mergui; 1 King Island.

Family Dendrophidæ.

Dendrophis caudolineata, *Gray.*

1 Mergui.

Chrysopelea ornata, *Shaw.*

Common at Mergui, but not observed on the islands.

Family Dryiophidæ.

Tragops prasinus, *Reinw.*

3 Mergui; 1 Kisseraing Island; 3 Elphinstone Island.

Family Lycodontidæ.

Lycodon aulicus, *Linn.*
2 Mergui; 1 Sullivan Island.

Family Dipsadidæ.

Dipsas carinata, *Reinw.*
1 Sullivan Island.
Recorded from Java and Cochin China.

Family Pythonidæ.

Python reticulatus, *Schneider.*
1 King Island; 1 Sullivan Island.

Family Elapidæ.

Naja tripudians, *Linn.*
Common at Mergui, King, and Kisseraing Islands.
It belongs to the variety in which the hood has an oval mark with a dark centre.

Ophiophagus elaps, *Schlegel.*
1 King Island.
On my way across King Island, from Kabeng-khyoung to the west coast, a Karen had laid out in front of his house for my inspection a specimen of this snake he had killed in the morning. I measured it, and found it to be 14 feet 6 inches in length, which is probably the largest measurement on record of a poisonous snake.

Family Hydrophidæ.

Hydrophis Jerdoni, *Günther.*
3 from the fishing-stakes at Mergui; 1 caught at sea, seven miles from land.

Hydrophis robusta, *Günther, Rept. Brit. India,* 1864, p. 364.—Hydrophis Bishopii, *Murray, Vert. Zool. of Sind,* 1884, p. 391, pl. xii.
2 from the fishing-stakes at Mergui.
One of these specimens measures 5 feet 5·50 inches in length, and is marked with forty-six narrow black rings. With this exception and the greater number of ventrals (333), this specimen agrees in every other detail with the types of the species in the British Museum.

Hydrophis cyanocincta, *Daud.*

7 from the fishing-stakes at Mergui.

Hydrophis gracilis, *Shaw*, *Günther*, *l. c.* p. 373.—H. Guentheri, *Murray*, *l. c.* p. 396, pl. xiii.

1 from the fishing-stakes at Mergui.

This species is easily recognized from the other non-imbricate scaled forms with long narrow necks, by its two large temporals along the side of the occipital and by its divided ventrals. The little shields in this specimen number 283, and are strongly tubercular. There are twenty-one rows of scales around the neck.

Hydrophis Jayakari, *Boulenger*, *Ann. & Mag. Nat. Hist.* ser. 5, vol. xx. (Dec. 1887), p. 408.

1 from the fishing-stakes at Mergui.

This species is allied to *H. ornata*, Gray, but is quite distinct from it.

It is an addition to the Hydrophids of the Mergui coast. The single type, in the British Museum, as already stated, was obtained near Muscat, Arabia.

Hydrophis Hardwickii, *Gray.*

13 from the fishing-stakes at Mergui.

The scales round the neck vary from 27 to 30 ; and the longitudinal series from the throat to the vent vary from 135 to 197. Two specimens have two postoculars, and three have two postoculars on one side and one on the other. Eight rows of the ventral scales, in two of the specimens, are strongly spined, each scale bearing a powerful spine about $\frac{1}{10}$ of an inch in length ; and in three specimens the other body-scales are sharply spined, and the head finely tubercular. All these specimens are males. A female has only feeble tubercles on the ventral scales, while the scales external to them are still less feebly tubercular. They have been compared with the types in the British Museum.

Enhydrina valakadyn, *Boie.*

18 from the fishing-stakes at Mergui.

Family Viperidæ.

Bothrops gramineus, *Shaw.*

1 Kisseraing Island, and 1 Elphinstone Island.

These specimens were found in dense shade, lying on rocks by the sides of waterfalls.

Besides the last-mentioned *Bothrops*, I obtained on Kisseraing and Elphinstone Islands two specimens of another species of this genus which I hesitate to name until they have been compared with the types of certain species in the India Museum, Calcutta. They seem to be allied to *B. porphyraceus* and *B. cantoris*, Blyth. I have recently received from Perak another example of the same form.

BATRACHIA.

Order ECAUDATA.

Family Ranidæ.

Oxyglossus lima, *Tschudi*.
1 Mergui.

Oxyglossus lævis, *Peters*.
1 Elphinstone Island.

Rana macrodon, *Kuhl*.
4 Taing, King Island.

Rana gracilis, *Wiegm*.
28 Mergui and King Island.

Rana erythræa, *Schlegel*.
1 Taing, King Island.

Rana Doriæ, *Boulenger*, *Ann. del Mus. Civ. di St. Nat. di Genova*, 2 ser. vol. v. 1887, p. 482, pl. xxv. fig. 1.

Four frogs in the British Museum received from Mr. Theobald, and therefore probably from Pegu and Tenasserim, were referred by Mr. Boulenger with some doubt to *Rana modesta**. In the beginning of 1887 I showed the foregoing frogs from King Island and Elphinstone Island to Mr. Boulenger, who at once recognized their similarity to Theobald's four specimens, and expressed the opinion that they seemed to indicate the existence of a hitherto unrecognized species closely allied to *R. modesta*. Subsequent to this the Reptiles and Batrachians collected by M. L. Fea in Northern Tenasserim were placed by the Marquis Doria in Mr. Boulenger's hands for description. Among the frogs there

* Cat. Batr. Ecaud. p. 25, specs. *d–g*.

were still more extensive materials justifying the elevation of Theobald's doubtful specimens to a distinct species; and the new form was accordingly described and named *R. Doriæ*. It differs from *R. modesta* "in the blunter snout, the lesser difference in length between the first and second fingers, the longer metatarsal tubercle (it does not measure half the length of the inner toe in *R. modesta*), and the absence of vocal sacs."

Rhachophorus maculatus, *Gray*.
2 King Island.

Family Engystomatidæ.

Microhyla ornata, *Dum. & Bibr.*
7 Zediwon and Minthantoung, near Mergui.

Family Bufonidæ.

Bufo melanostictus, *Schneider*.
Common at Mergui and King Island.

Bufo asper, *Gravenh.*
18 Taing, King Island.

Bufo galeritus, *Günther*.
1 Tavoy; 1 Elphinstone Island.

These are young specimens; but in their general characters they are so closely allied to this species that I am disposed to regard them as examples of it. Their immaturity, however, renders it difficult to determine them accurately.

Family Pelobatidæ.

Leptobrachium Hasseltii, *Tschudi*.
1 Sullivan Island.
Found under stones in a stream.

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END OF THE TWENTY-FIRST VOLUME.

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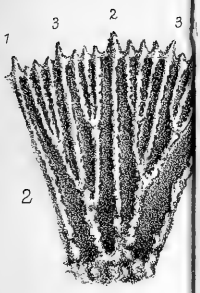
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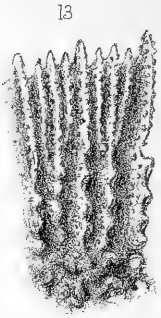
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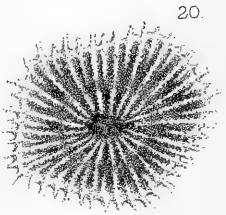
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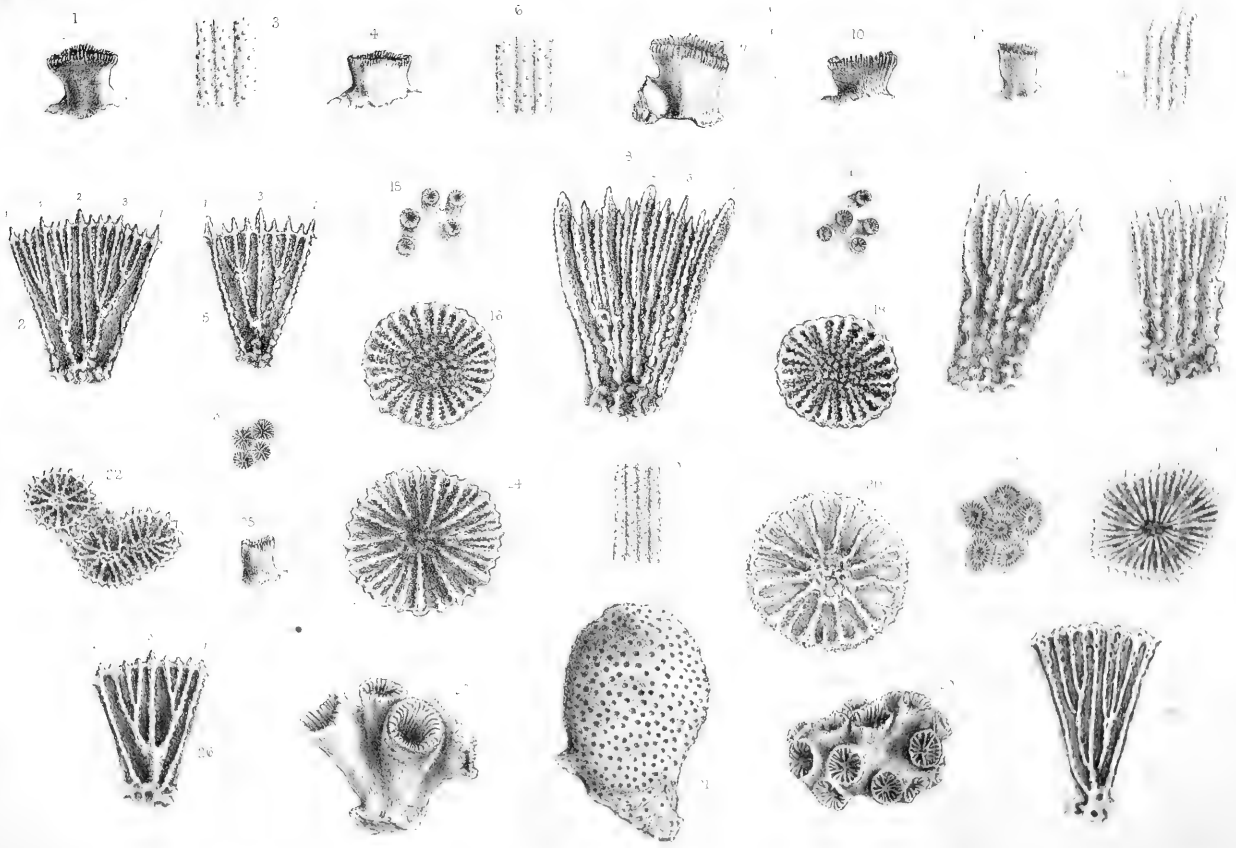


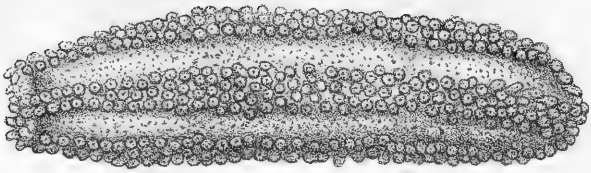
P.M.Duncan. del.

A.S.Ewart del et lith.

Mintern Bros. imp.

MADREPORARIA FROM MERGUI.

Fig. 1.



x 1½

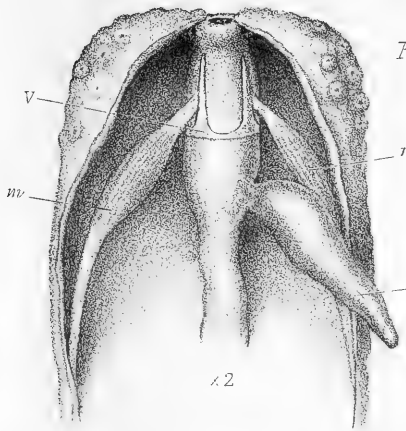


Fig. 2.

Fig. 3a.

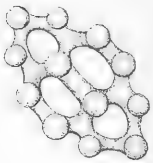


Fig. 3b

x 450

Fig. 3c.

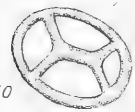


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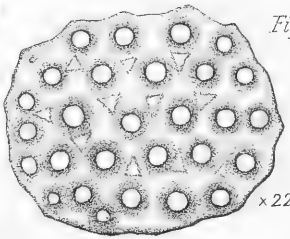
Fig. 4.



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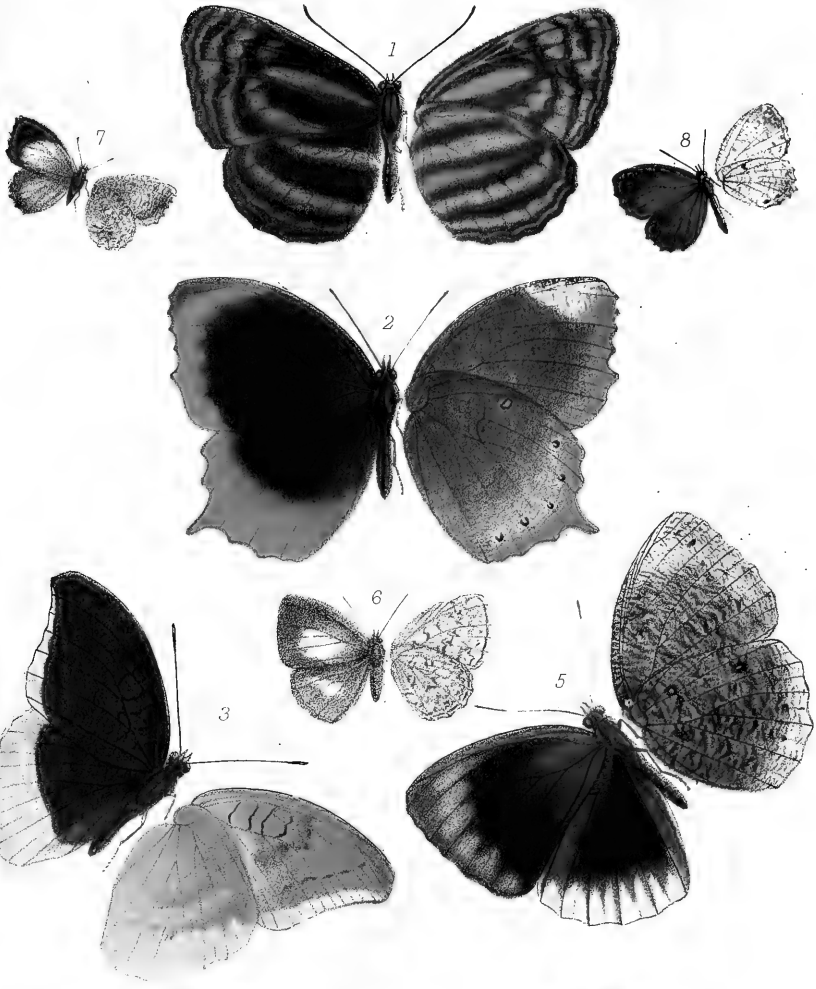
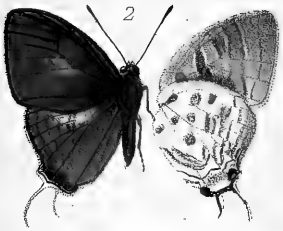
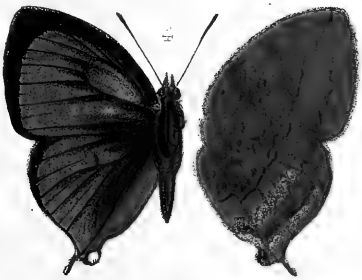
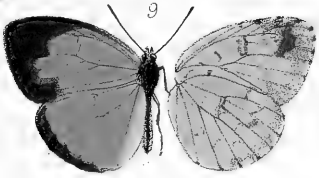


H. Knight. Chromo-lith. West, Newman imp.

LEPIDOPTERA, MERGUI ARCHIPELAGO.







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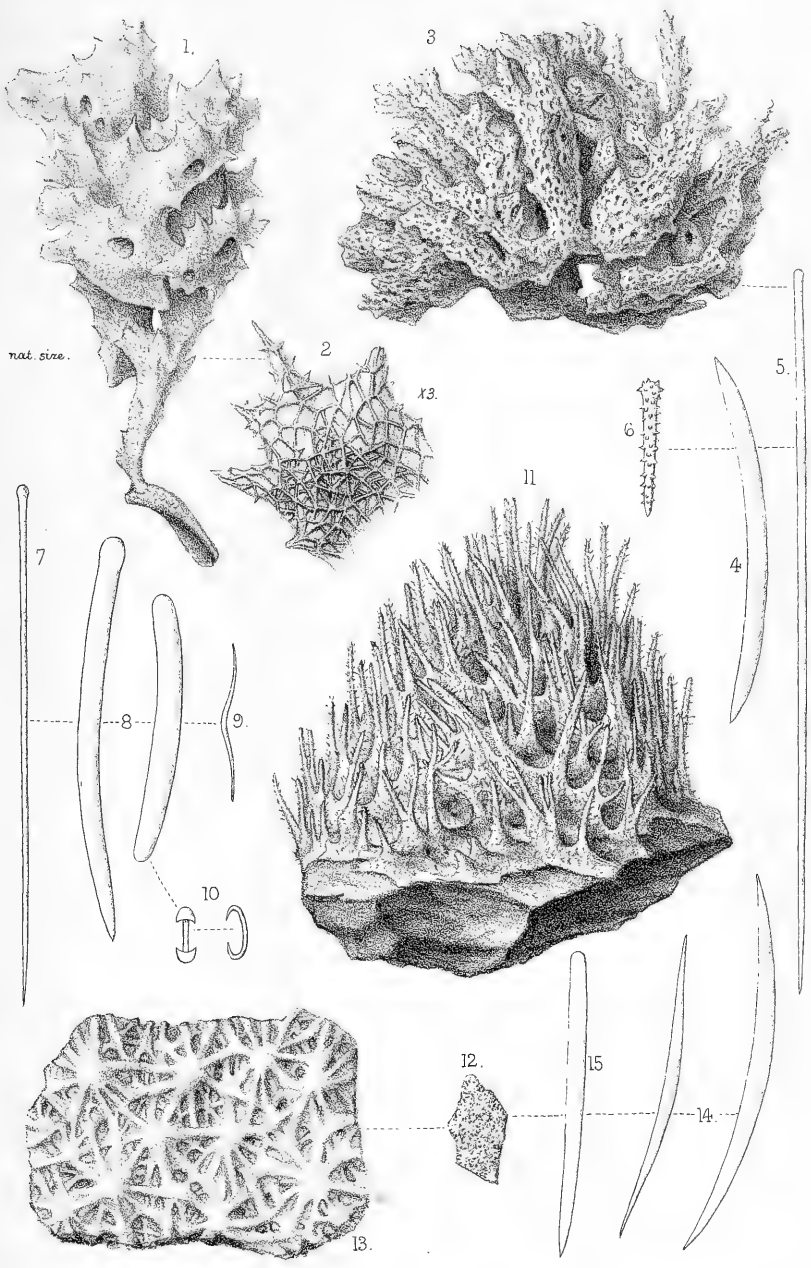

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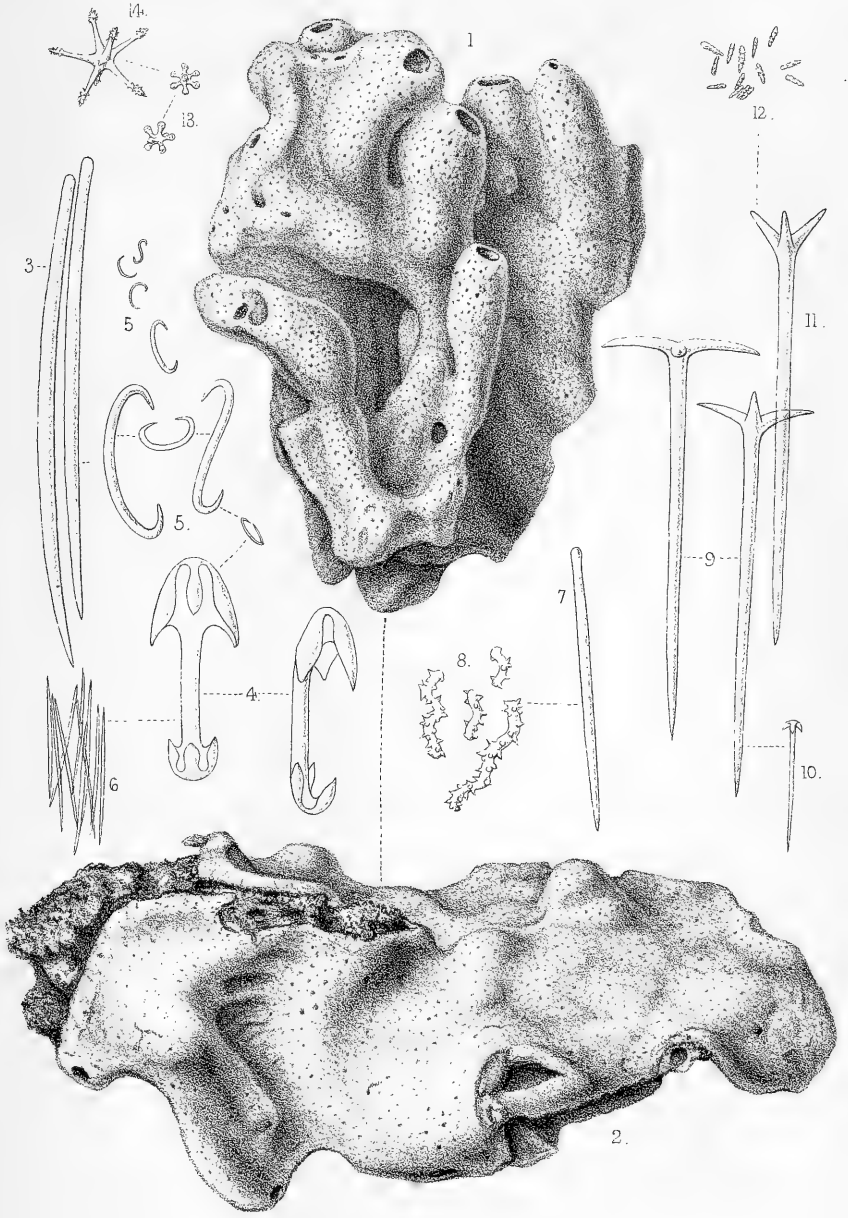

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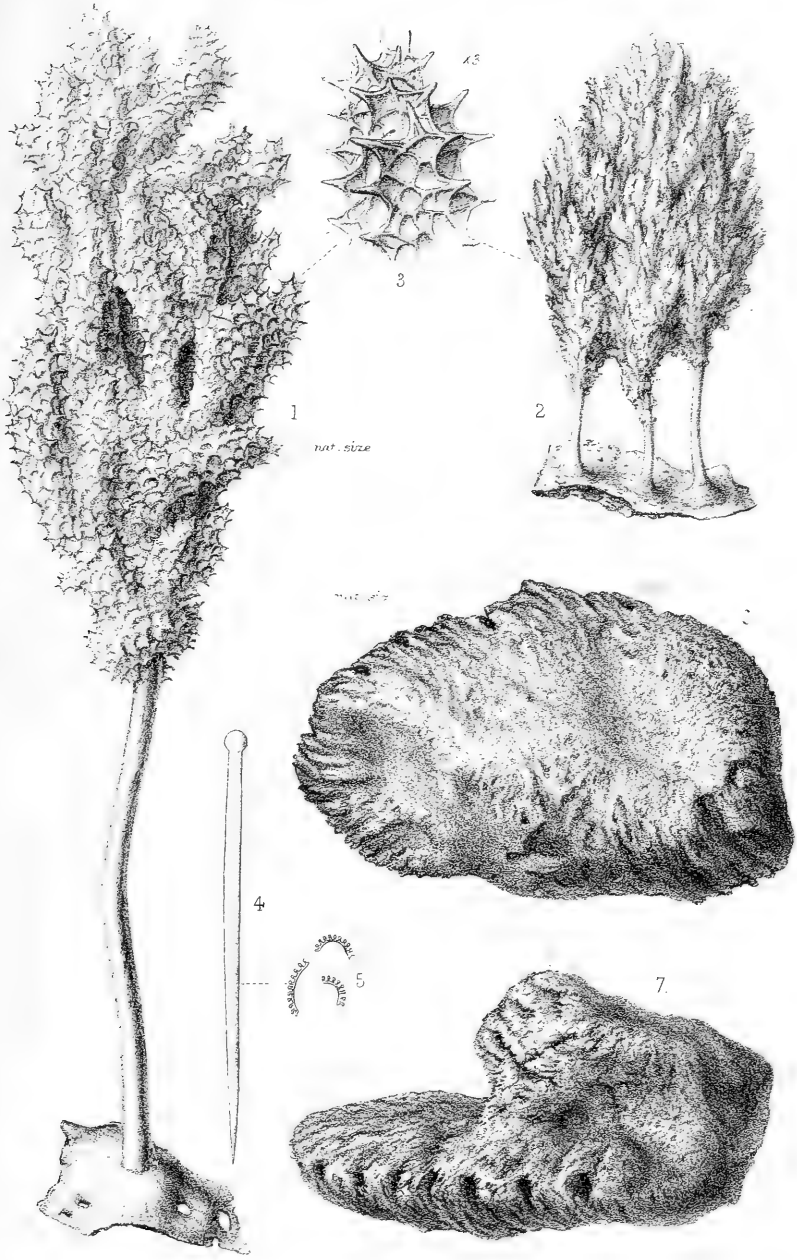

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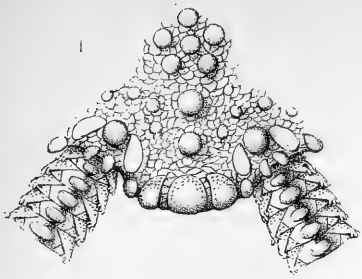

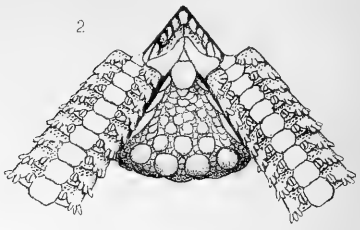

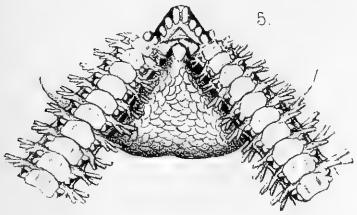

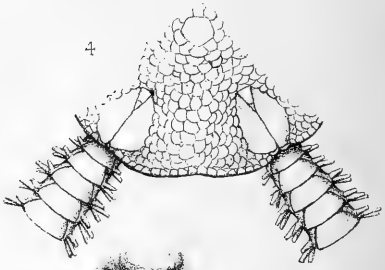

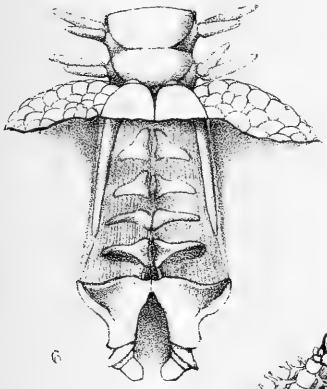

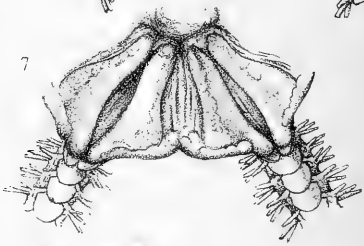

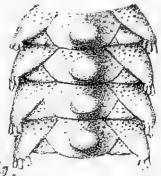

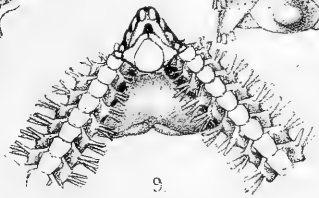

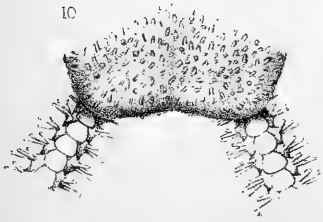

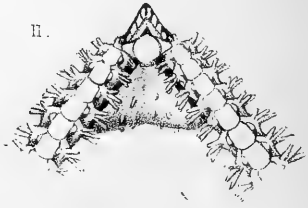

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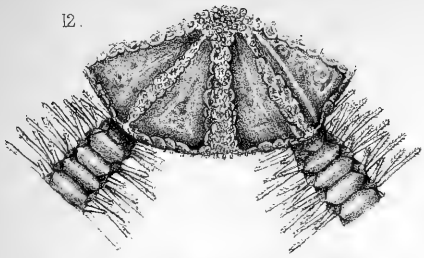

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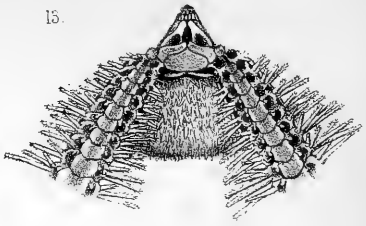

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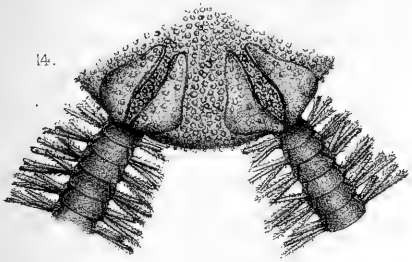

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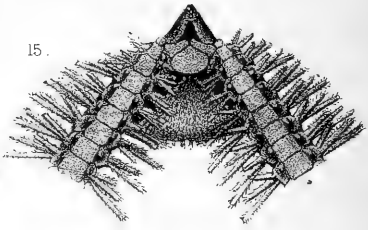

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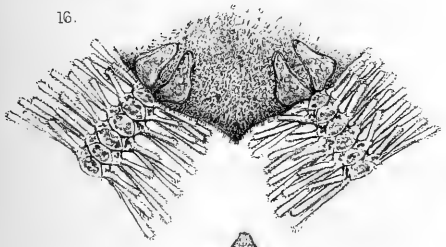

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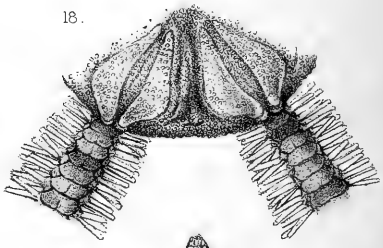

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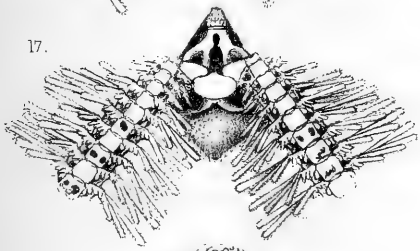

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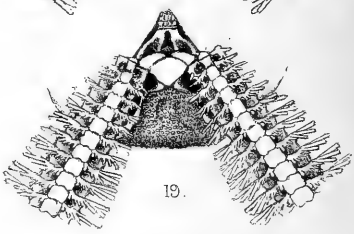

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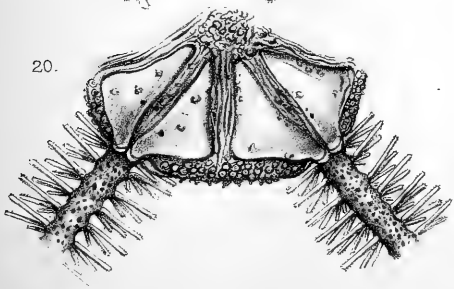

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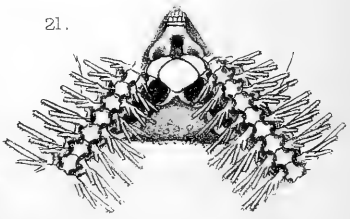

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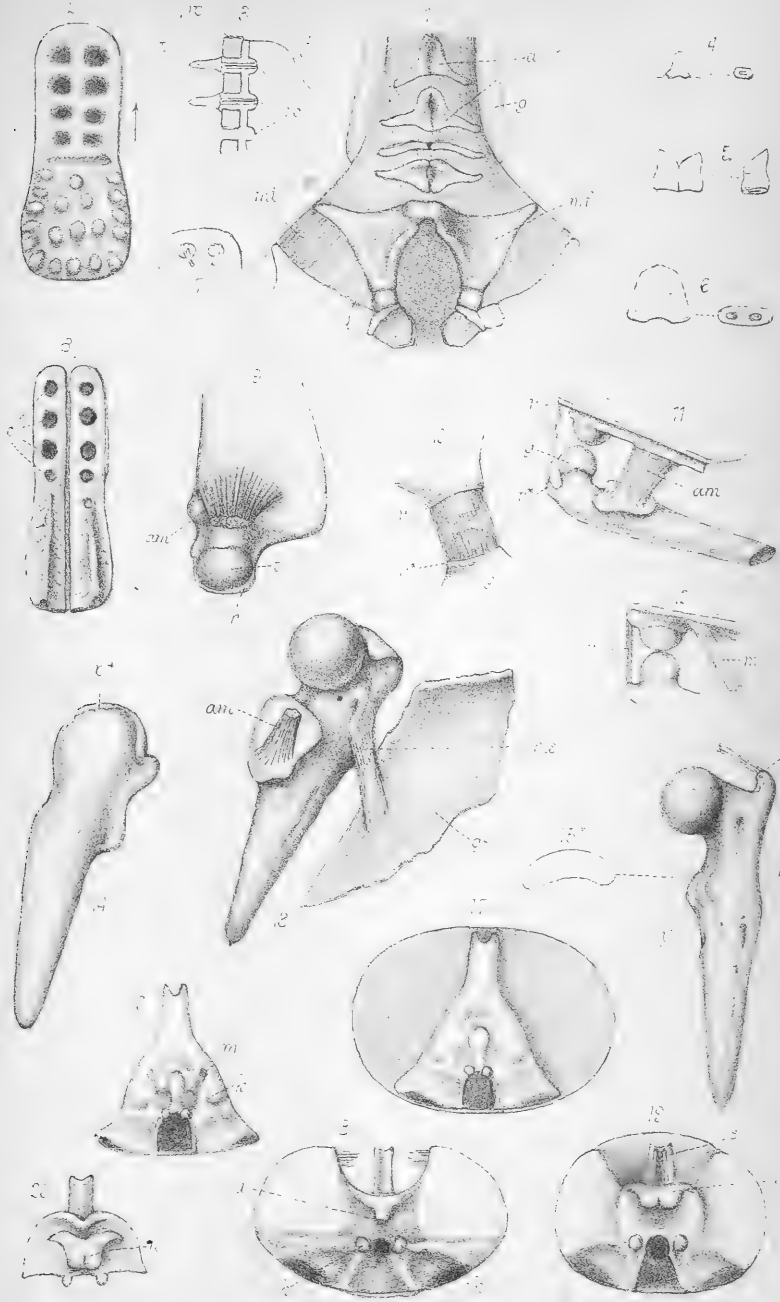

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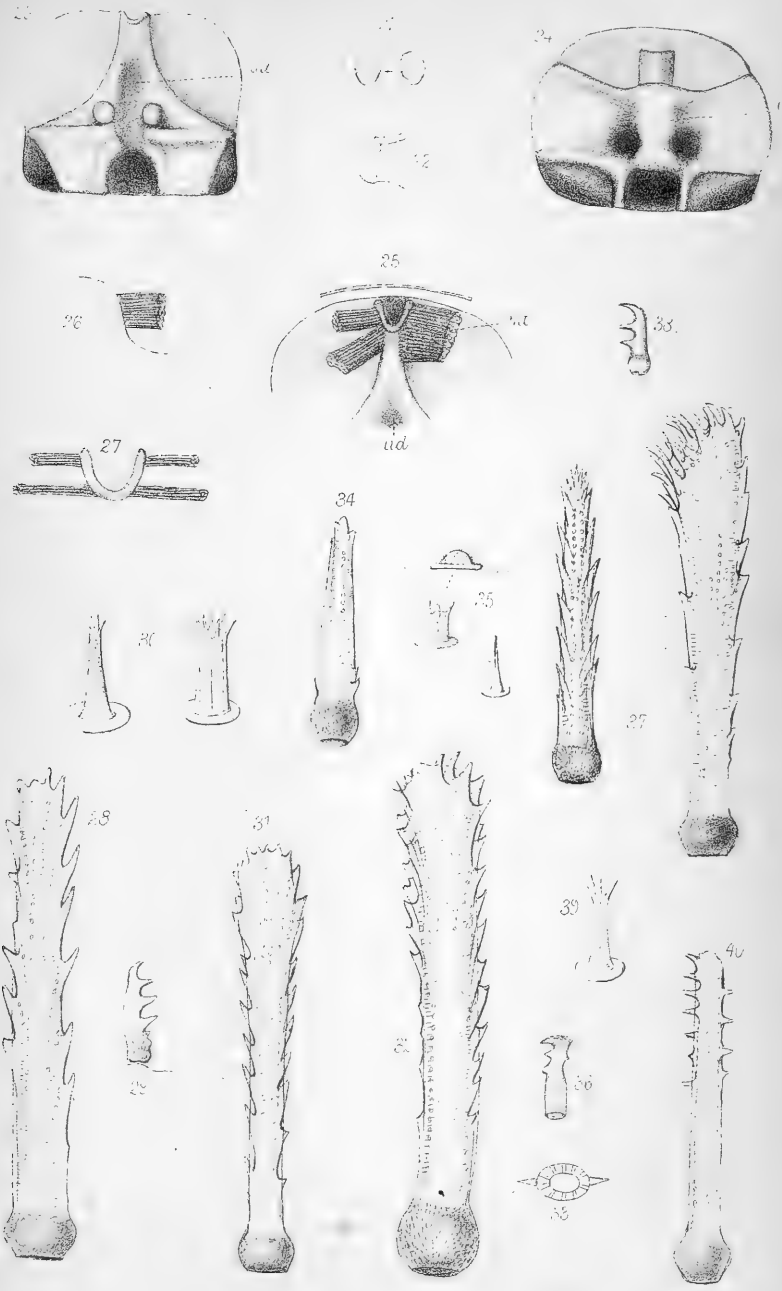
P. M. Duncan dir.

Mintern imp.

STRUCTURE OF OPHIURIDÆ



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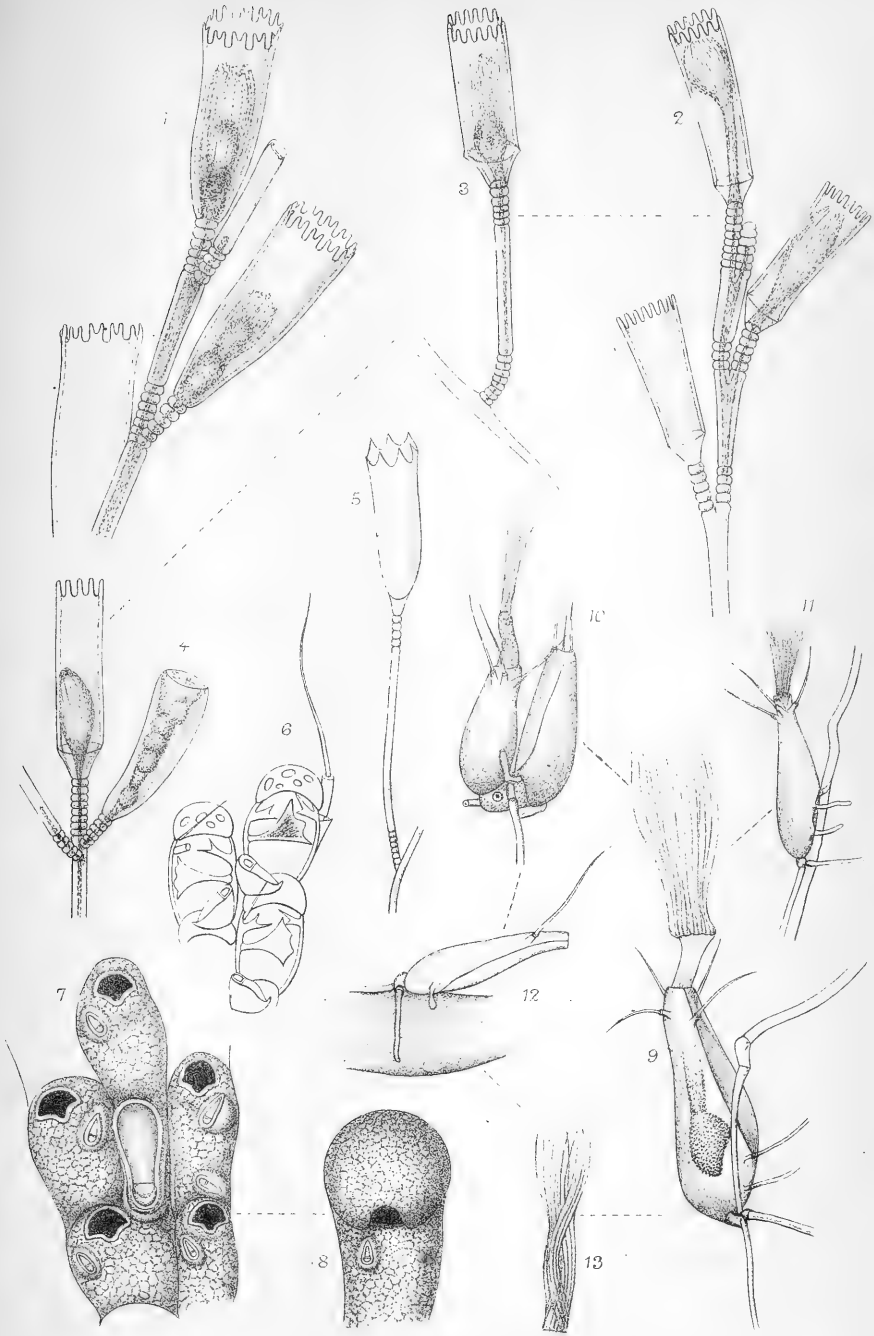

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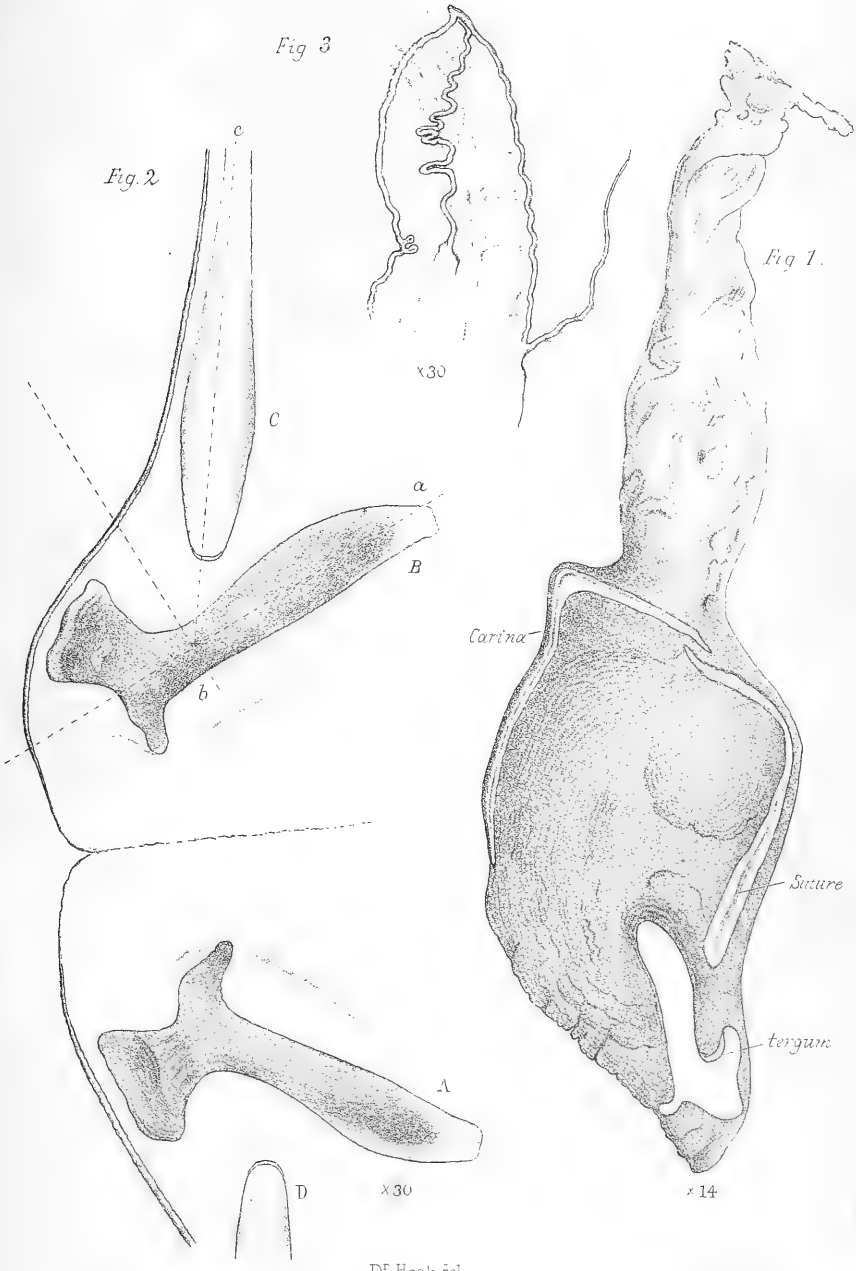
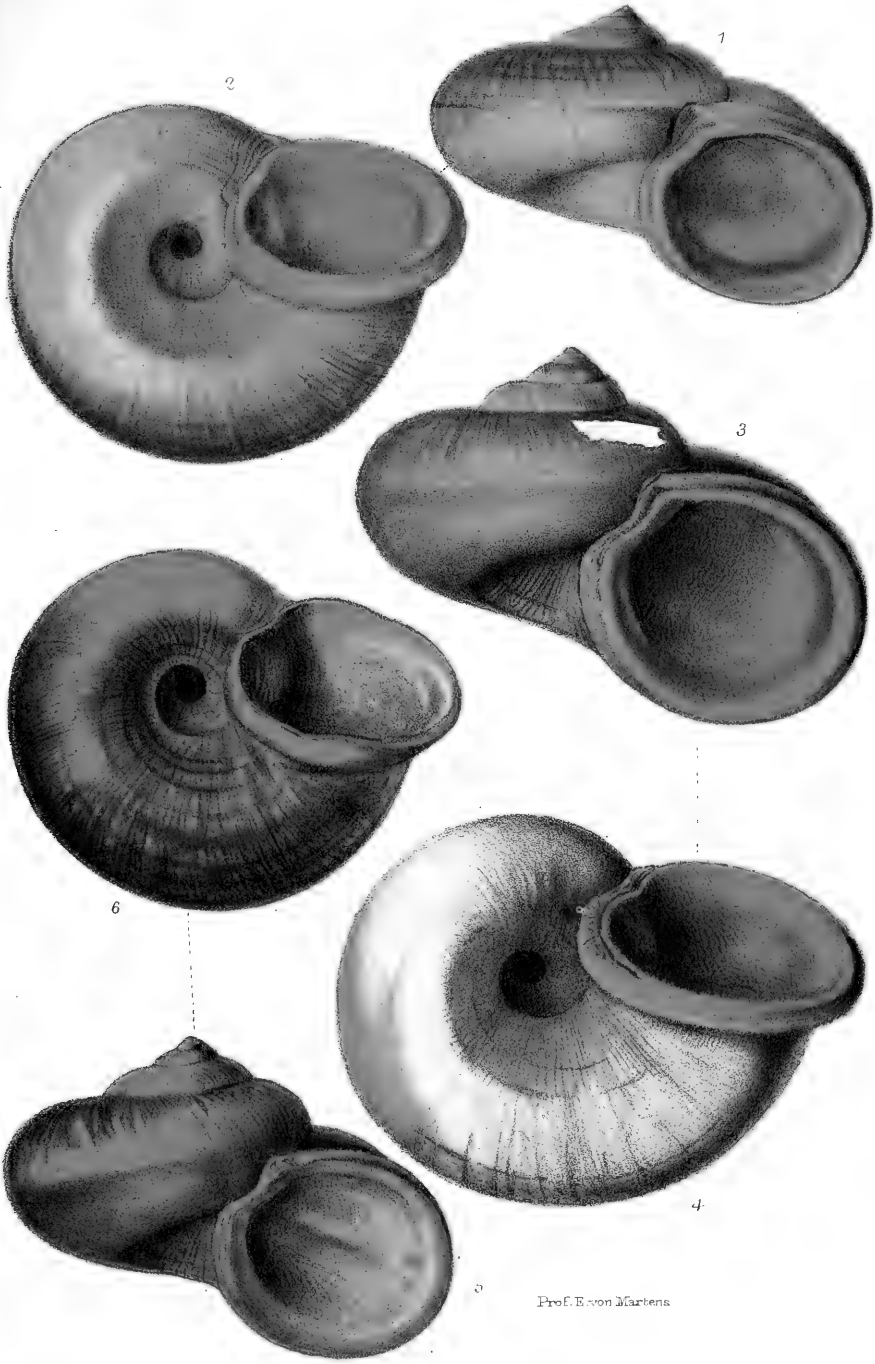
Hollick lith HYDROZOA & POLYZOA OF MERGUI ARCHIPELAGO. West,Newman imp.



Hammond lith.

Dr Hoek del.

DICHELASPIS PELLUCIDA. *Darwin*

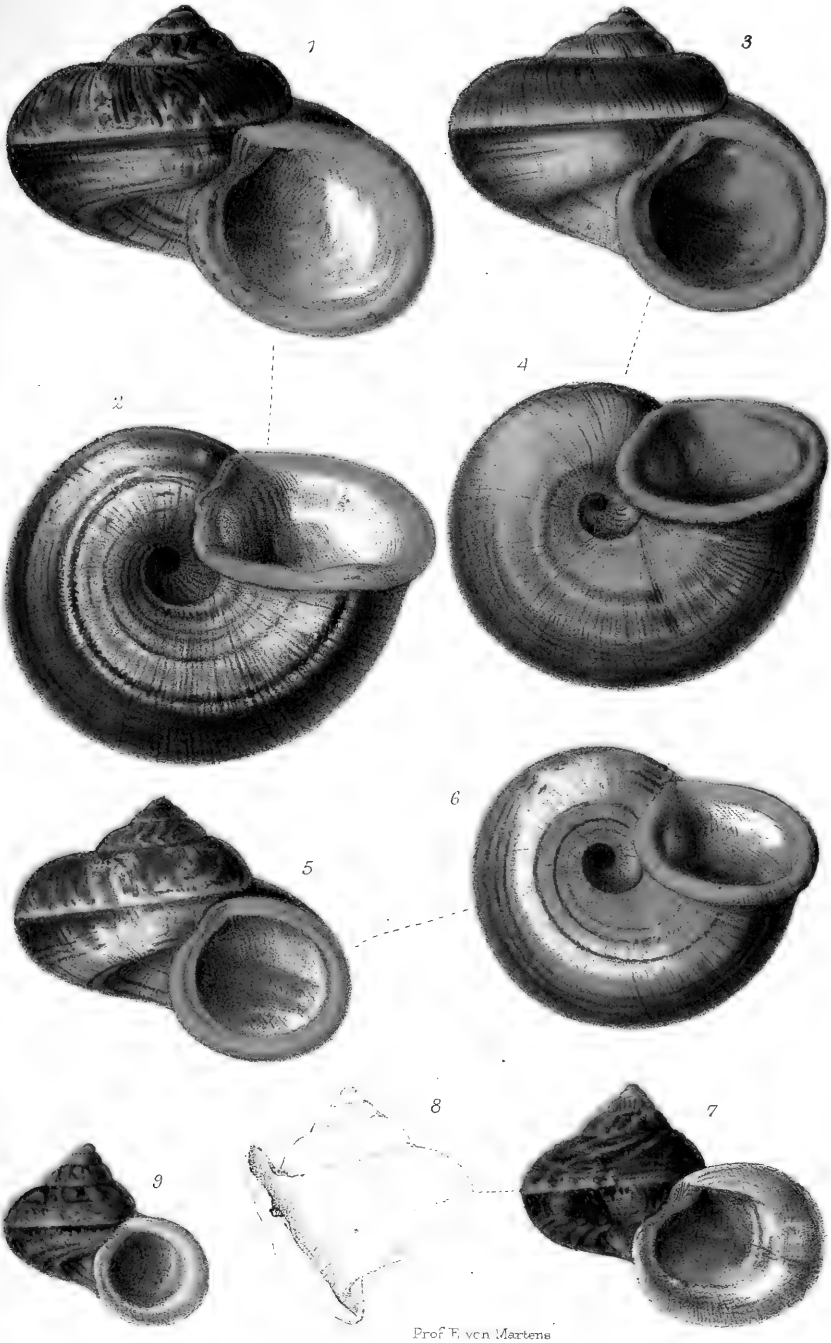


Prof. E. von Martens

E. Duval. del.

West, Newman, Chromo lith.

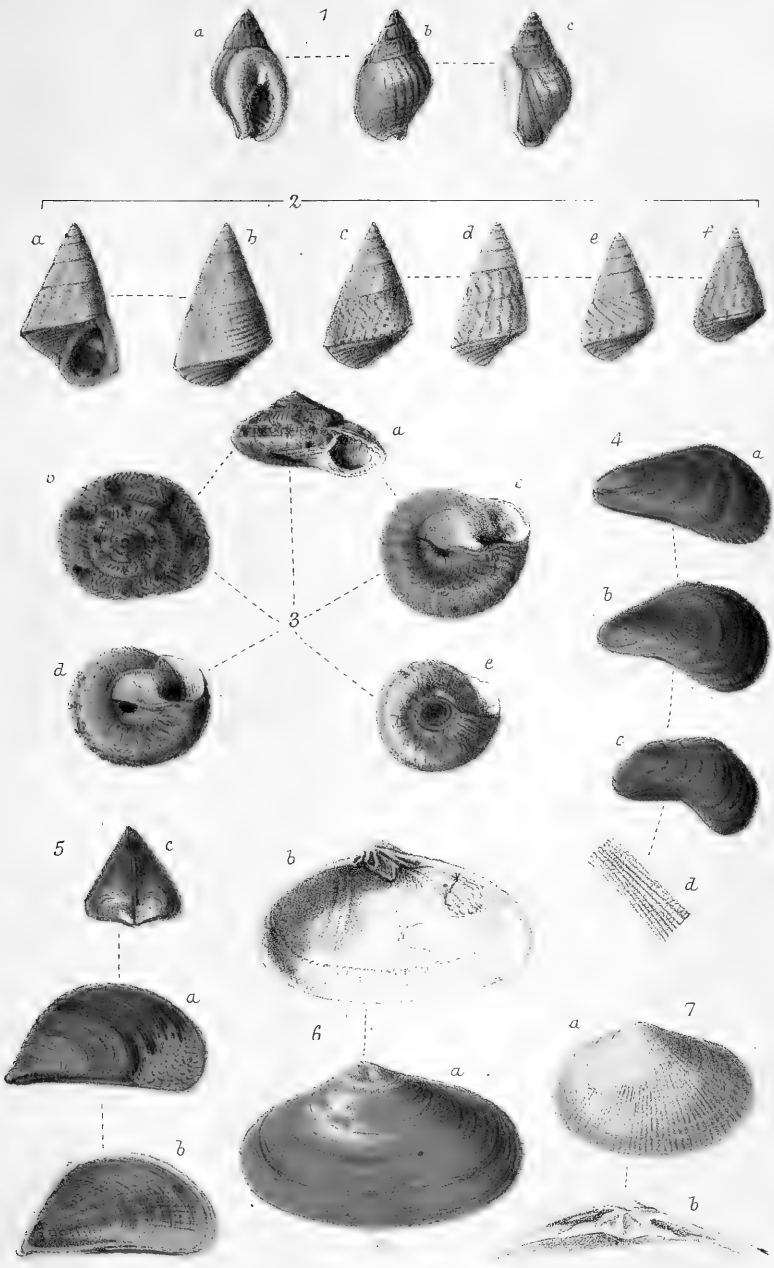
CYCLOPHORUS AURANTIACUS *vars.*



Prof. E. von Martens

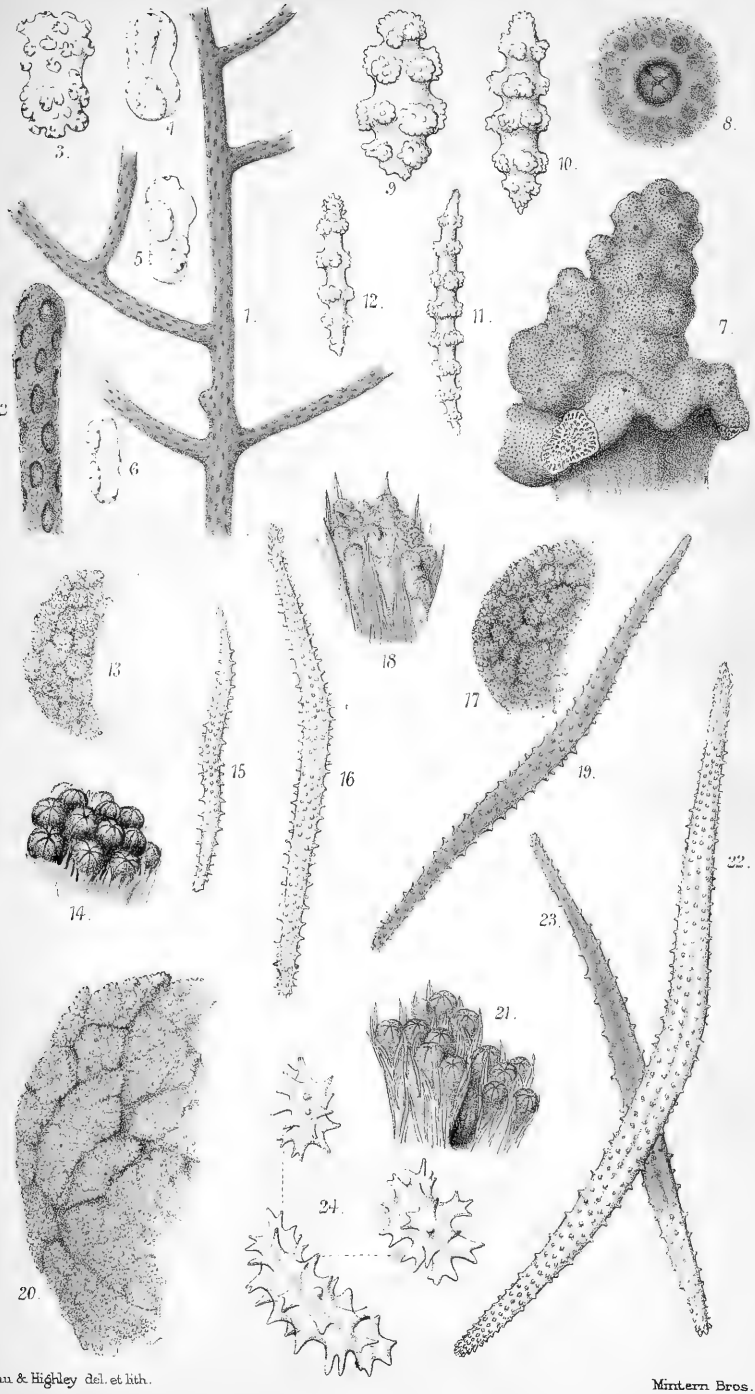
E. Durand del. West, Newman, Chromo-lith.

1–6 CYCLOPHORUS AURANTIACUS *vars*
7, 8. C. EXPANSUS 9. C. ZEBRINUS *var.* AMBIGUUS



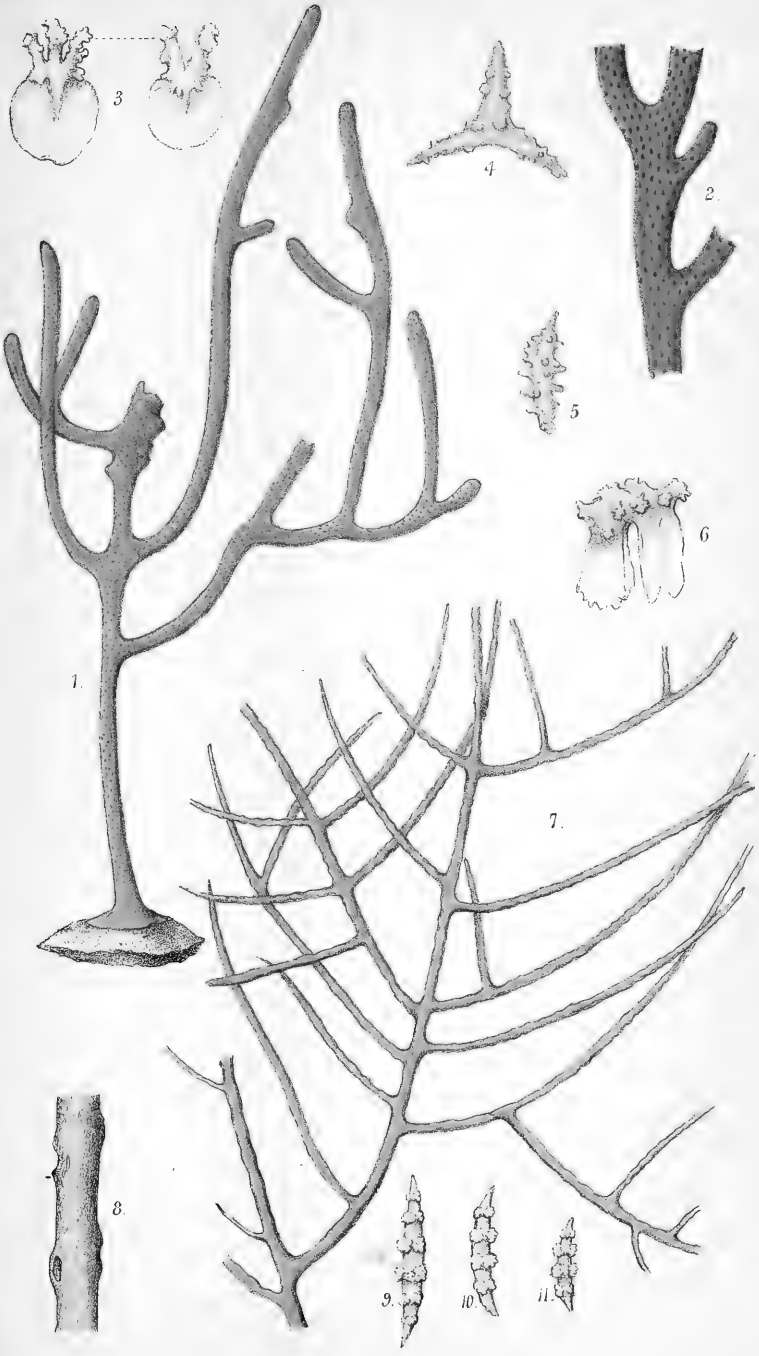
F. Duval, del. Prof. E. von Martens. West, Newman, Garrow-Hill.

1 a–c, NASSA THERSITES *var.* 2 a–f, LITTORINA RUBROPICTA.
3 a–c, ISANDA PULCHELLA. 4 a–d, MYTILUS CURVATUS. 5 a–c, MYTILUS ANDERSONI.
6 a–b MESODESMA ÆQUILATERUM. 7 a–b LUTRARIA NICOBARICA.



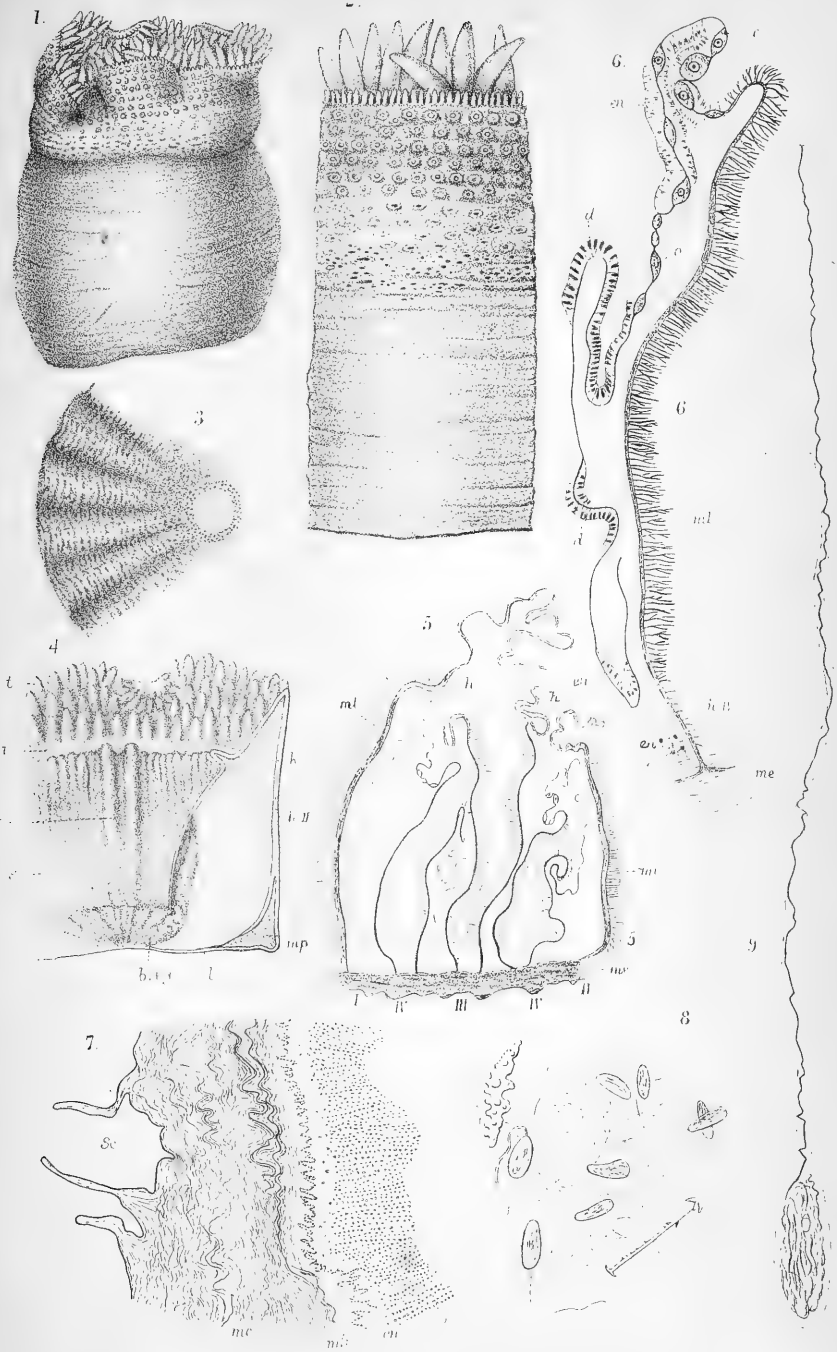
Berjeau & Highley del. et lith. Mintern Bros. imp.

ALCYONIDÆ & GORGONIIDÆ.



Berjeau & Highley del. et lith. Mintern Bros. imp.

GORGONIIDÆ & MELITHÆIDÆ



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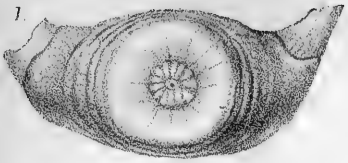
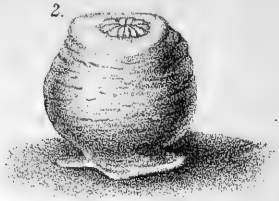
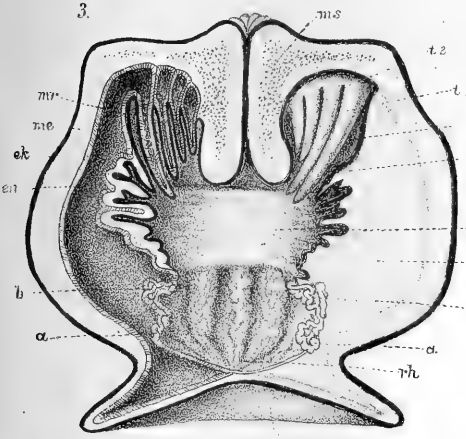
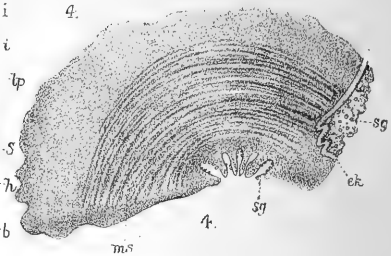
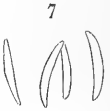
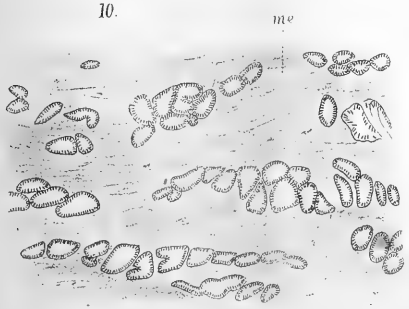


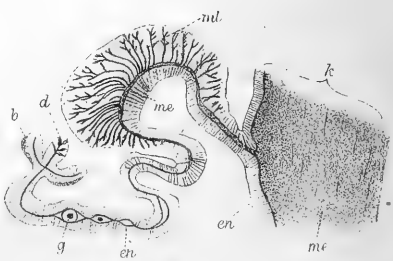




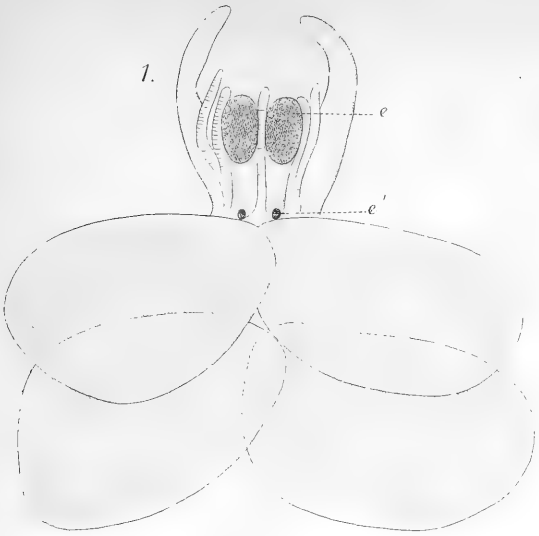


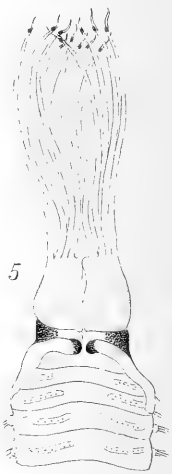






HORMATHIA ANDERSONI, sp.n





FEBeddard del.

Carter lith.

ANNELIDS FROM MERGUI.

Mintern imp.

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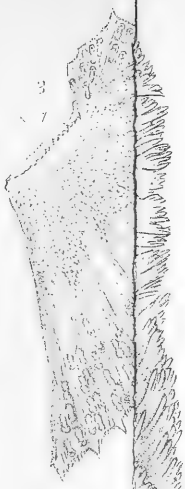

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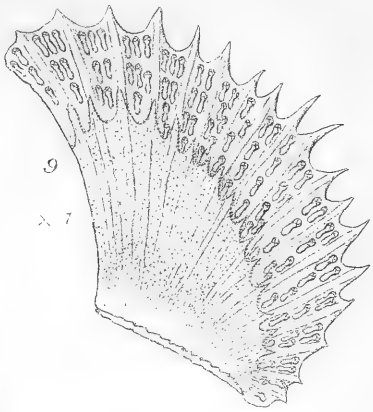

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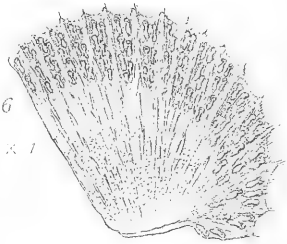

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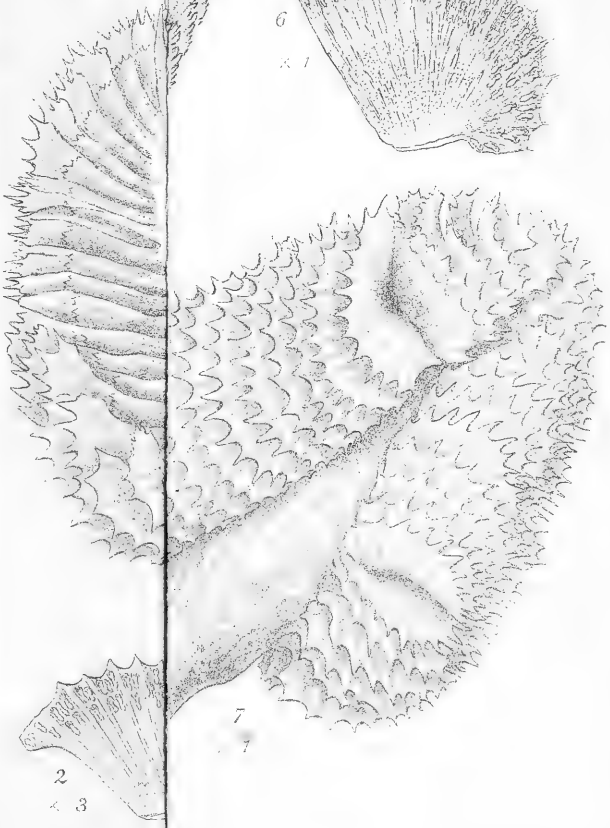


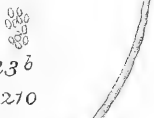
7
× 1

2
× 3

10
× 4/5

21 × 4

13
× 4/5



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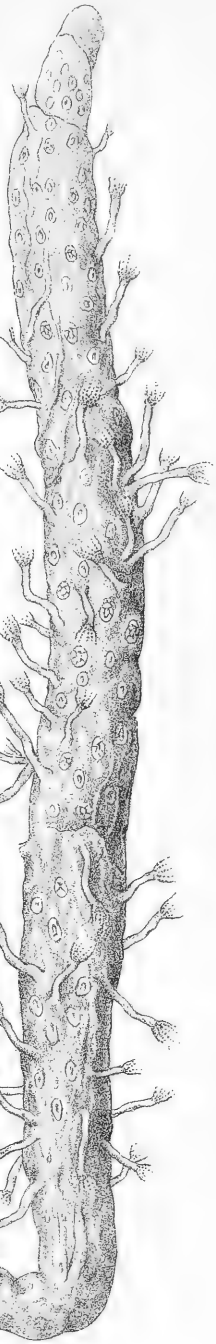

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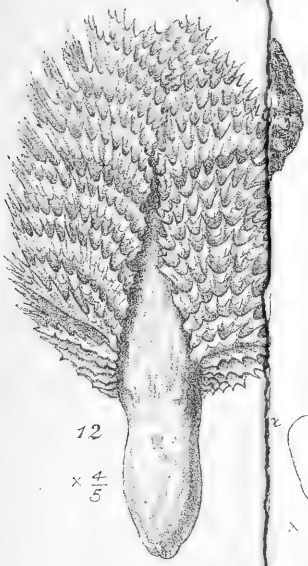
× 1

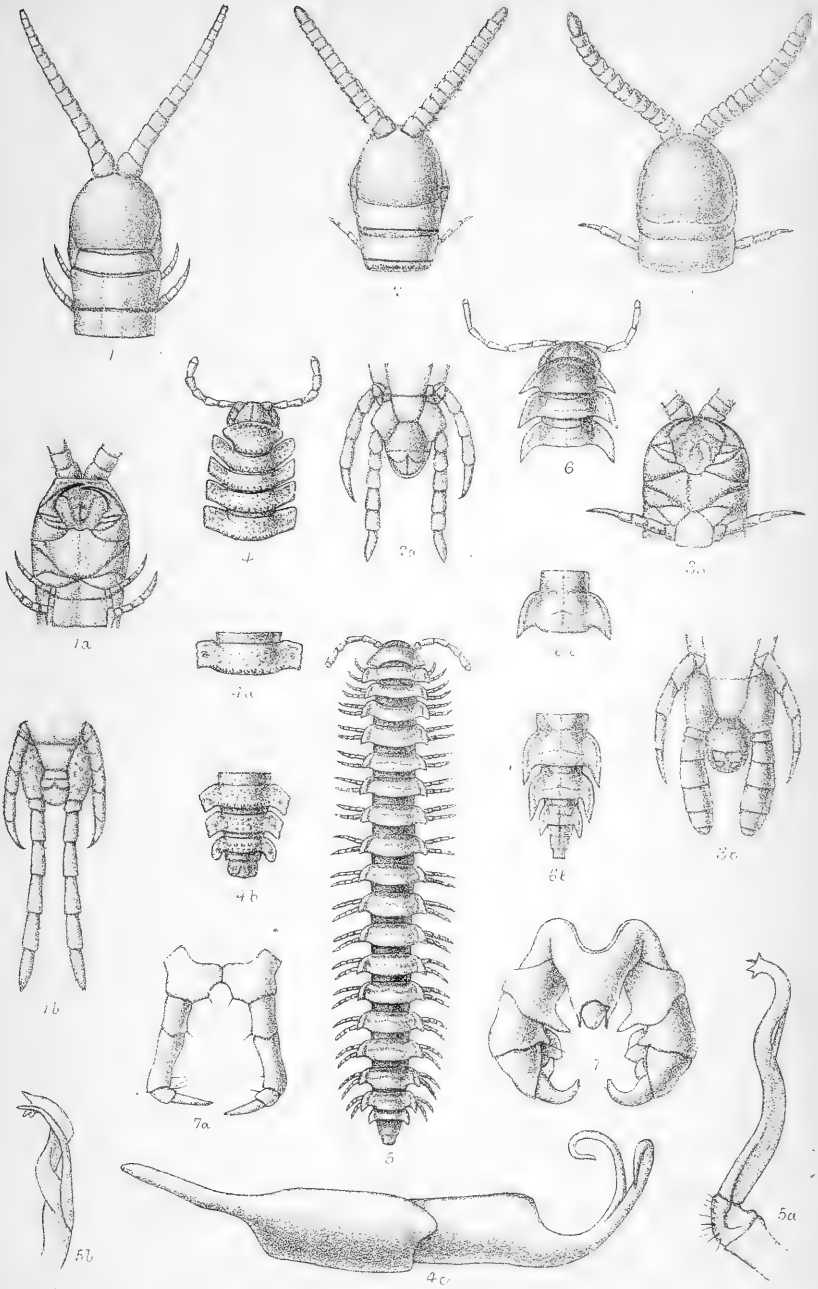


12
× 4/5

× 210

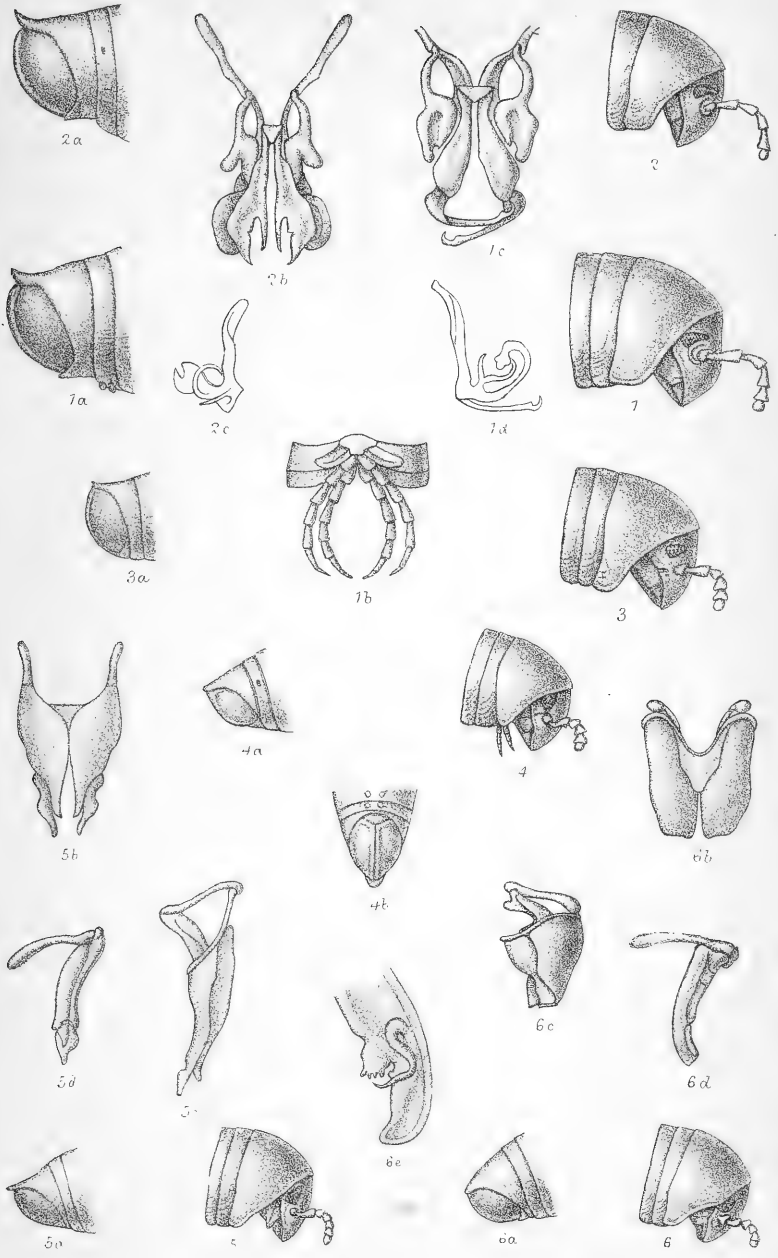
A.H.M. and G.H.F. del.

Hammond. lith Hanhart imp.



Berjeau & Highley lith. West, Newman & Co. imp.

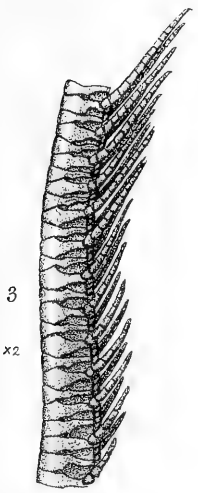
MYRIOPODA OF THE MERGUI ARCHIPELAGO.



R. I. P. del. Berjeau & Highley lith. West, Newman & Co. imp.

MYRIOPODA OF THE MERGUI ARCHIPELAGO.

Carpenter.

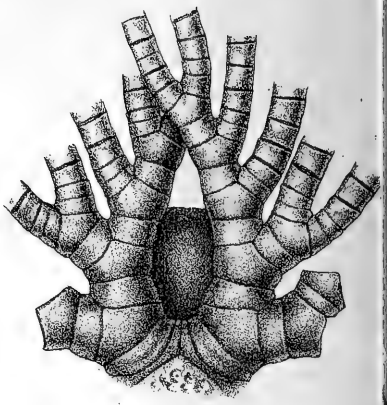


3

×2

×2

2



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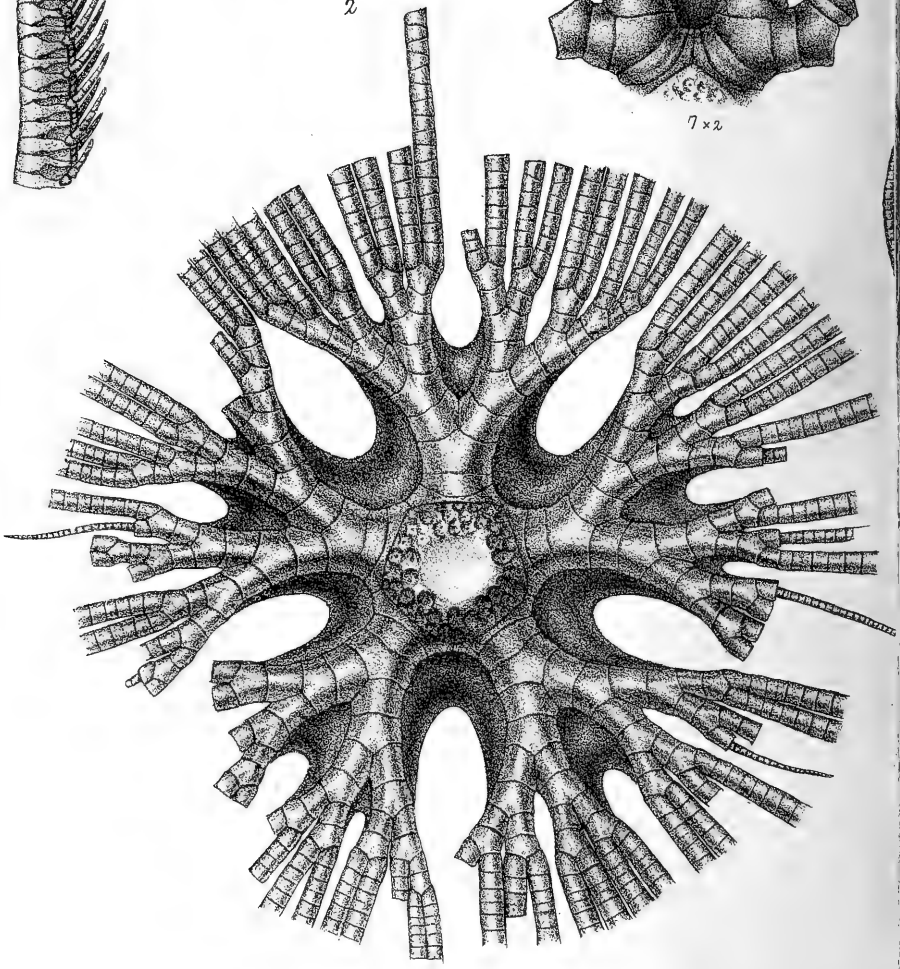
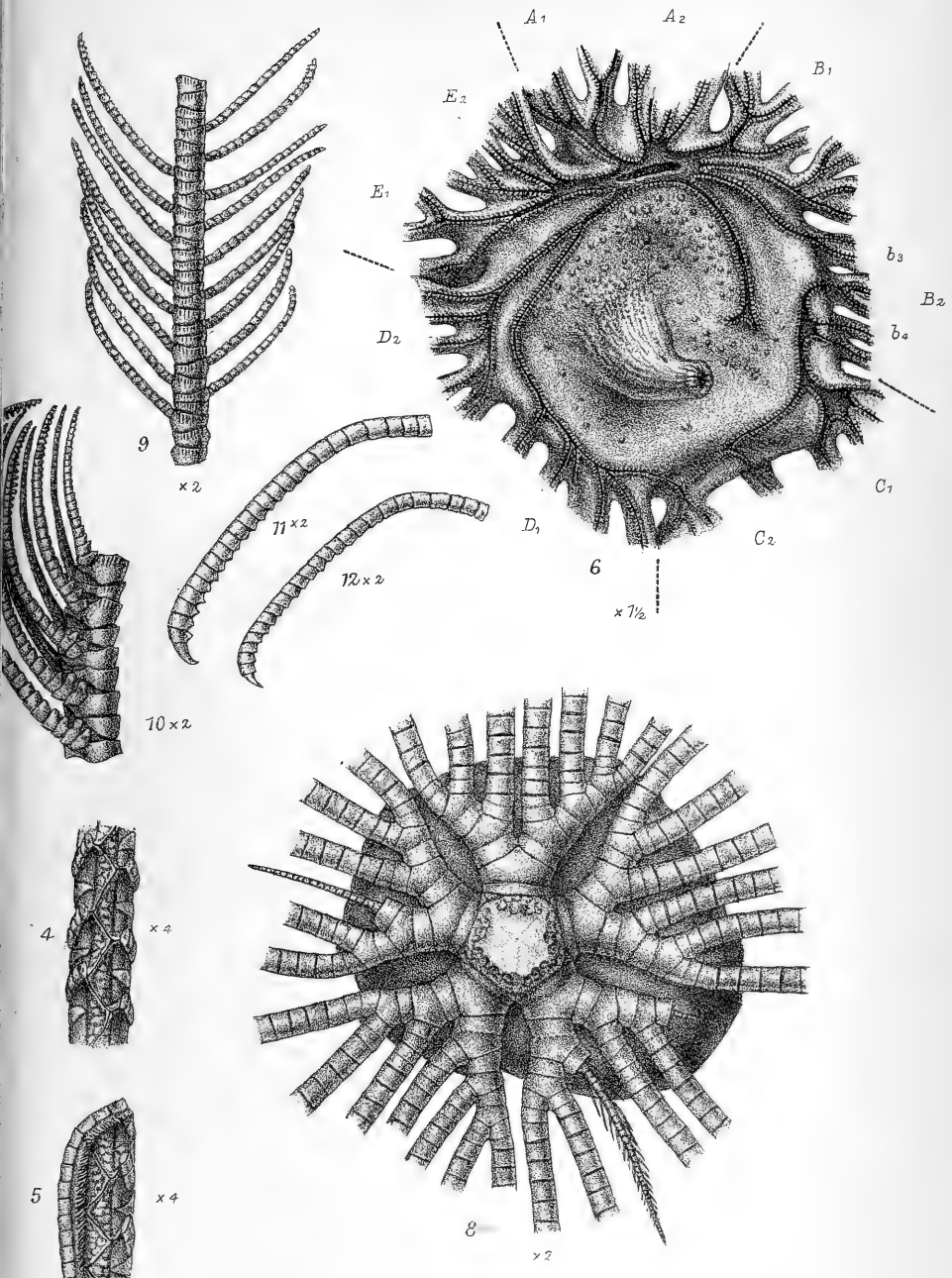


1 × 2

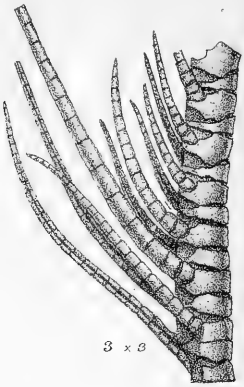
Berjeau & Highley, del et lith.

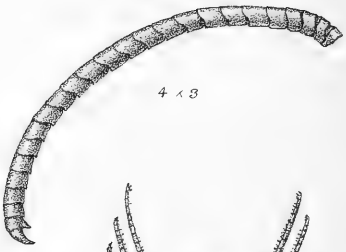
1–5, ANTEDON A
6–10, ACTINOMET

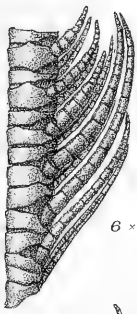


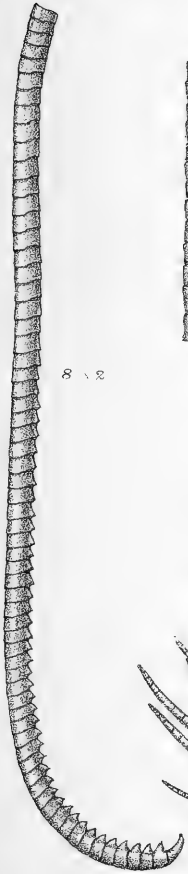
West Newman & Co imp

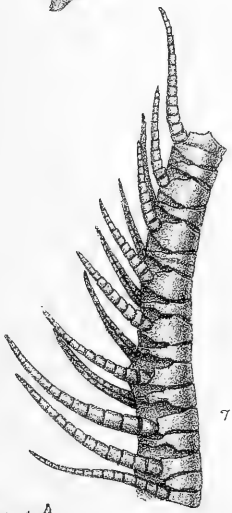
ERSONI, Sp. nv.
NOTATA, Sp. nv.

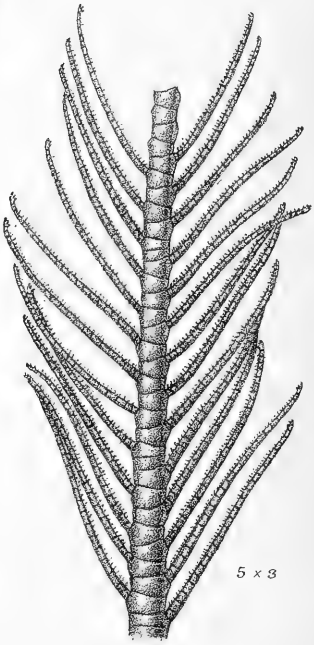












Berjeau & Highley del. et lith. West, Newman & Co. imp.

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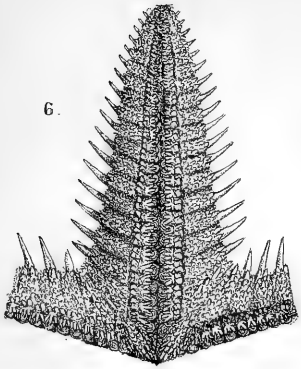

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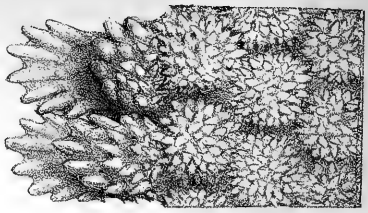

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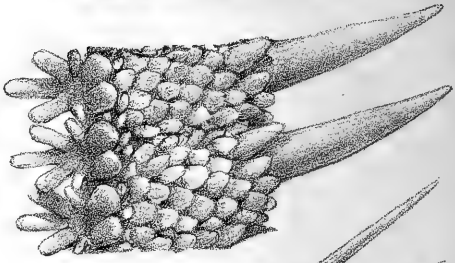

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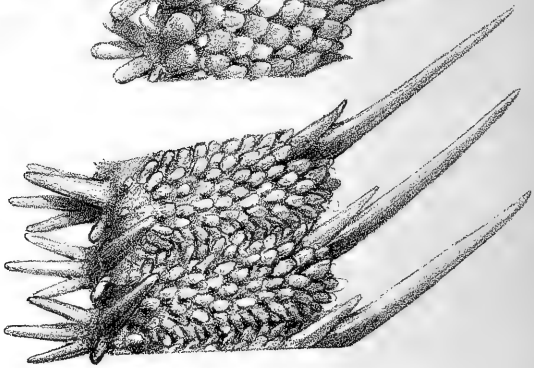

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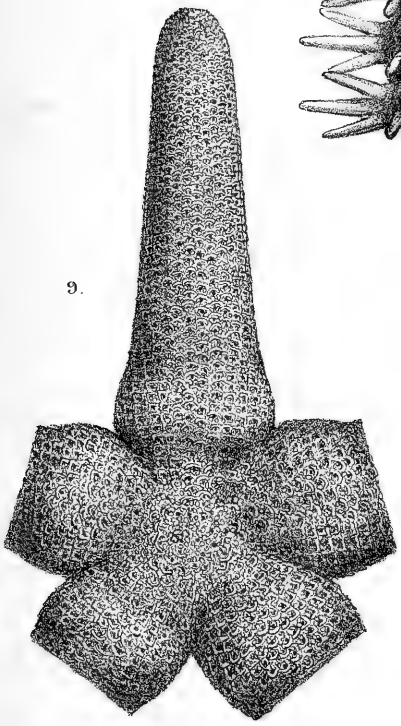

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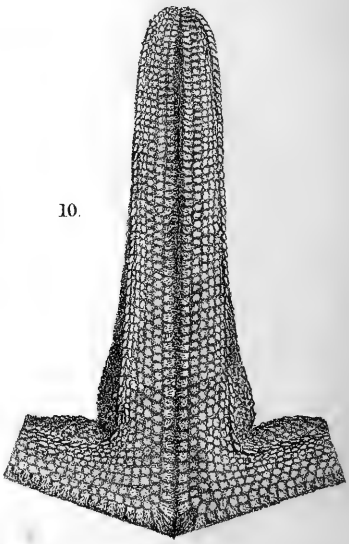

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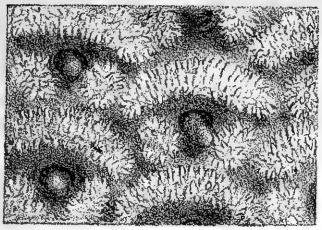

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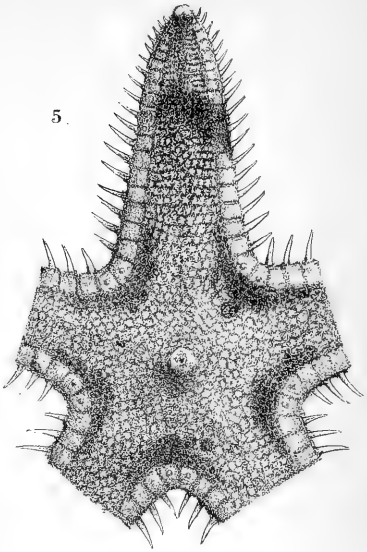

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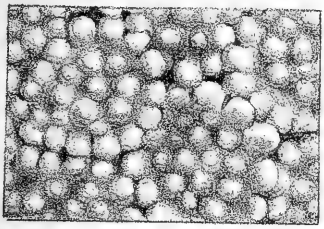

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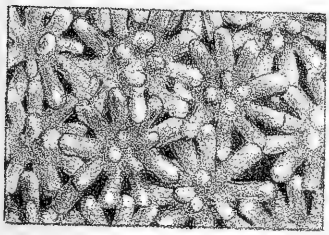

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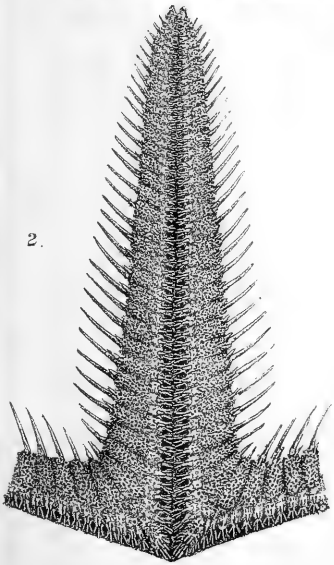

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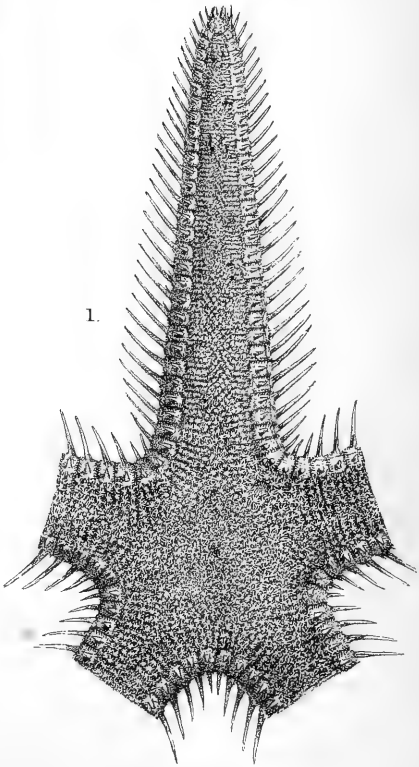

Mintern Bros. imp.