

ECHINODERMATA

(OTHER THAN ASTEROIDEA)

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WITH NINE TEXT-FIGURES AND ONE PLATE

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INTRODUCTION.

THE collection of echinoderms made by the Great Barrier Reef Expedition seems to be very representative of the area where it was obtained. As sent to me, it lacks the sea-stars, a report on which is being prepared by my friend and colleague, Mr. Arthur A. Livingstone, of the Australian Museum.

The collection examined by me contains more than five hundred specimens, representing 117 species and varieties and 66 genera. While only four species and one variety require description as new, the additions to the Australian fauna and the extensions of geographical range are of very real importance, so that it can fairly be said that the work of the Great Barrier Reef Expedition has added much to our knowledge of Australian echinoderms. Six genera and 14 species are here listed for the first time from that region, while five additional species were not known hitherto from Queensland. But it should be noted that five of the six genera were taken only in the deep-water dredgings at St. XV, 210 fms. Very little such dredging has been done off the Queensland coast, and hence it is not surprising that these hauls should have proved so remunerative. Further analysis of the collection will be found in the introductory paragraph, under each of the four classes.

CRINOIDEA.

The collection of crinoids contains 56 specimens of 18 species, representing 11 genera, all comatulids. None of the species is new to science, but two, *Comatella nigra* and *Iconometra anisa*, have not previously been reported from south of the Murray Islands. Only a dozen species were taken in the Low Isles neighbourhood, the other six coming from the vicinity of Lizard Island. The best collecting would seem to have been in the latter region, where at St. XIV half a dozen species were taken, of which three were not found at Low Isles.

My friend, Mr. Austin Hobart Clark, of the United States National Museum, the recognized authority on crinoids, has been most kind in examining some of the perplexing specimens and giving me the benefit of his wide experience and expert knowledge. It is a pleasure to thank him here for his generous help.

Comatella nigra (Carpenter).

Actinometra nigra, P. H. Carpenter, 1888, Voy. "Challenger," XXVI, pt. 60, Crinoidea, 2, p. 304.
Comatella nigra, A. H. Clark, 1908, Smithson. Misc. Coll. LII, p. 207.

There are five specimens, much alike in size, colour and number of arms, from St. XIV, 19 fms. In life they were "purple, distal ends of arms yellow." In alcohol they are uniformly deep purple, 200–225 mm. in diameter and have about 43 arms; cirri 16–18, with 26–29 segments. The occurrence of *nigra* near Lizard Island extends the known range of the species a little to the south.

Comatula pectinata (Linnaeus).

Asterias pectinata, Linnaeus, 1758, Syst. Nat. ed. X, p. 663.
Comatula pectinata, A. H. Clark, 1908, Proc. U.S. Nat. Mus. XXXIII, p. 685.

There are eight specimens of this common species. One is a fine individual from St. XXII, 13½ fms., while three notable specimens with arms 150 mm. long or more were taken at St. IX, 12–14 fms. These three were, in life, "red with white markings." Two specimens from St. XII, taken with *Amphimetra jaquinoti*, were also red and white. The other two specimens are from St. XIV, 19 fms. It is interesting that no specimens of the small, perhaps depauperate form of *pectinata*, known as *purpurea*, were taken by the Expedition, for that form is very common at the Murray Islands (where typical *pectinata* is rare), and has been taken as far south as Port Denison. Judging from the "Key Chart of Low Isles," one would certainly expect to find *purpurea* at several places, especially on the western side.

Comatula rotalaria, Lamarck.

Lamarck, 1816, Anim. s. Vert. II, p. 534.

There is a single specimen with 20 arms well over 150 mm. long. There are no cirri, and the dorsal apex is perfectly smooth, but the oral surface of the disk is covered with

projecting, fleshy, tubercle-like prominences, which are wanting in the specimens of *solaris* from the same place, St. XIV, 19 fms.

Comatula solaris, Lamarek.

Lamarek, 1816, Anim. s. Vert. II, p. 533.

There are five specimens of this fine species, of which four were taken at St. XIV, 19 fms., and one at St. IX, 12–14 fms. The cirri are few, with only 15 or 16 segments. The arms are 125–150 mm. long and range from moderately to very stout ($4\frac{1}{2}$ mm. wide). The colour is very diverse, no two of the specimens being alike; one is uniformly dark purple, another is dirty brown with pinnules yellow, another “yellow with pinnules brown, edged with white,” and another “grey, white striped” (a white longitudinal stripe on dorsal side of arm).

Comantheria alternans (Carpenter).

Actinometra alternans, P. H. Carpenter, 1881, Notes Leyden Mus. III, p. 208.

Comantheria alternans A. H. Clark, 1911, Notes Leyden Mus. XXXIII, p. 176.

Two large comatulids from St. IX, 12–14 fms., with about 43 arms, 150–170 mm. long, seem nearer to this species than to any other, but they are certainly not typical specimens. They might be referred equally well to *C. polycnemis*, A. H. Clark, but as that species is not known from south of the Kei Islands, it seems better to call them *alternans*. The disks are very large, the discarded visceral mass measuring 34 by 22 mm. The II Br. series are 4 (3 + 4), or rarely 2; III Br. series, 2; IV Br. series, when present, 2; but there are altogether only three or four IV Br. series visible. Cirri are wanting in one specimen; in the other, 5 or 6 weak ones are present, but all are broken; they have segments 4, 5 and 6 markedly longer than wide, cylindrical and smooth, and are obviously different from those of *briareus*. The general appearance of these specimens is stouter than that of *briareus*, and resembles closely that of *alternans* from the Murray Islands. The colour is uniformly bright brown, except for being more yellow at distal points.

Comanthus timorensis (J. Müller).

Alecto timorensis, J. Müller, 1841, Mber. K. Preuss. Akad. Wiss. p. 186.

Actinometra annulata, Bell, 1882, Proc. Zool. Soc. Lond. p. 535, pl. xxxv.

Comanthus timorensis, A. H. Clark, 1931, Bull. U.S. Nat. Mus. LXXXII, I, pt. 3, p. 159 (603), pl. lxiv, fig. 181; pl. lxxv, fig. 204; pl. lxxvi, fig. 205; pl. lxxvii, figs. 206, 207.

There are only four specimens of this common Australian comatulid in the collection. They are very much alike, about 200 mm. across in life, and of a deep olive-brown colour. All are from Anchorage Reefs, Low Isles.

Comanthus bennetti (J. Müller).

Alecto bennetti, J. Müller, 1841, Mber. K. Preuss. Akad. Wiss. p. 187.

Comanthus bennetti, A. H. Clark, 1909, Vidensk. Medd. naturh. Foren. Kjöb. p. 147.

There is a single young individual in the collection from St. XVII, 19 fms. The more mature of the 30 arms are 90–100 mm. long; 10 of the arms, in five pairs, are very young. There are 18 cirri with 21–27 segments, not very unlike those of an adult. The colour is a dull olive-brown, in some areas with a distinctly bluish cast; the longer arms have a broad, longitudinal whitish band on the distal third. The cirri are yellow and the very young arms are cream-yellow.

Comanthus parvicirra (J. Müller).

Alecto parvicirra, J. Müller, 1841. Mber. K. Preuss. Akad. Wiss. p. 185.

Comanthus parvicirra, A. H. Clark, 1908, Smithson. Misc. Coll. LII, p. 203.

To this widespread, common, but imperfectly understood comatulid I am referring fourteen specimens, several of which are really too young for specific determination, but most probably belong here. At present we do not know how to distinguish young *parvicirra* from young *timorensis*. Several of the specimens are so damaged that the number of arms cannot be determined. In the remainder, the number ranges from 14 to 23. More than half of the specimens have no cirri, while the others have from 3 to 6 weak and insignificant ones. The colour is variable, but is usually light; in one case "dominantly grey with white stripes," in others "light brown," or again handsomely cross-banded, light and dark. Ten of the specimens are from St. XIV, 19 fms., two are from St. XVI, 20 fms., one is from St. XVII, 19 fms., and one from St. XXII, 13½ fms.

Comanthus samoana, A. H. Clark.

A. H. Clark, 1909, Proc. U.S. Nat. Mus. XXXVII, p. 30.

There is a single *Comanthus*, which is evidently of this species. It is about 150 mm. in diameter, dark olive-brown, with 21 arms and 14 short, rather stout cirri.

Zygometra microdiscus (Bell).

Antedon microdiscus, Bell, 1884, Rep. Zool. Coll. "Alert," p. 163, pl. xv.

Zygometra microdiscus, A. H. Clark, 1909, Zool. Anz. XXXIV, p. 367.

A small comatulid from St. XXIII, 8 fms., has perplexed me very much. It is in poor condition, with many arms and nearly all the cirri broken or missing. The arms are about 60 mm. long, with all division series 4 (3 + 4); III Br. series present on one arm. The colour is deep reddish-purple. Mr. Austin H. Clark, the well-known authority on crinoids, thinks this individual may best be regarded as a "dwarf *Zygometra microdiscus*."

Zygometra punctata, A. H. Clark.

A. H. Clark, 1912, Proc. Biol. Soc. Wash. XXV, p. 24.

There are three specimens of this interesting and somewhat puzzling species; one, with arms 75–80 mm. long, has a label, "G.B.R.E. Sept. 6, 1928, 11.30 a.m. North of island, about 9 fms. Rectangular dredge. Yellow with black markings. Bottom mud";

a second with 21 arms of about the same length has a label. "*Comanthus* sp. Low Id." and is dull buff, spotted or, distally on the arms, banded with purple; the third, with only 11 arms, the single II Br. series 2. the cirri with about 20 segments, several of which are long, the colour "dark and pale brown" is from St. XVI, 20 fms., and is doubtfully referred to this species.

Heterometra crenulata (Carpenter).

Antedon crenulata, P. H. Carpenter, 1882, J. Linn. Soc. Zool. XVI, p. 507.

Heterometra crenulata, A. H. Clark, 1918, "Siboga" Exped., The Unstalked Crinoids, XLIIb, p. (77), 78.

The single specimen of this species has arms about 80 mm. long and its label reads, "Crinoid. Greyish-brown. St. IV. Dredge. 70% alcohol."

Heterometra nematodon (Hartlaub).

Antedon nematodon, Hartlaub, 1890, Nachr. Ges. wiss. Göttingen, Mai. p. 185.

Heterometra nematodon, A. H. Clark, 1911, Mem. Aust. Mus. IV, 15, p. 768.

A small comatulid, about 125 mm. across, with 37 arms and 18 cirri, having 40 segments, seems to be of this species. The colour is fawn, darker orally. The label reads: "St. XIII. 7 March 29. Dark brown with white patches. Dredge. Alcohol."

Amphimetra jacquinoti (J. Müller).

Comatula jacquinoti, J. Müller, 1846, Mber. K. Preuss. Akad. Wiss, p. 178.

Amphimetra jacquinoti, A. H. Clark, 1918, "Siboga" Exped., The Unstalked Crinoids, XLIIb, p. 85.

There are four specimens of this species in the collection, two being taken at St. XII, one at St. XIII, and one "north of island, about 9 fms." The smallest has the arms slender and only 70–80 mm. long, there are but 27 or 28 segments in the cirri, and twelve in P_2 ; the colour is very pale reddish, almost white dorsally. This specimen answers well on the whole to the description of *A. pinniformis* (P. H. C.) and I am inclined to think that supposed species is really based on young specimens of *jacquinoti*. The other specimens are larger and stouter, with arms 100–125 mm. long. They are reddish-white dorsally, and more or less deep red orally; in one case the whole specimen is uniformly dull red, but it may have been stained in the alcohol. One specimen is said to have been "purple and yellow" in life; apparently the purple has become red, and the yellow whitish, as the result of preservation.

Lamprometra gyges (Bell).

Antedon gyges, Bell, 1884, Rep. Zool. Coll. "Alert," p. 160, pl. xii, figs. B, a, b.

Lamprometra gyges, A. H. Clark, 1913, Proc. Biol. Soc. Wash. XXVI, p. 144.

A single adult specimen, more or less broken, but in fair condition, with arms 60–75 mm. long, and of a deep red-purple colour, has the labels: "G.B.R.E. General Survey, 24/4/29, A4," and "*Dichrometra tenera* (Hartlaub), 1 spec. H. L. Clark, St. XVII."

This is apparently a specimen seen by me in Sydney in November, 1929, and given Hartlaub's name, which is a synonym of *gyges*. Obviously one of the labels is wrong as to locality, and I believe the specimen came from A4.

Oligometra carpenteri (Bell).

Antedon carpenteri, Bell, 1884, Rep. Zool. Coll. "Alert," p. 157, pl. x, figs. A, a-c.

Oligometra carpenteri, A. H. Clark, 1908, Proc. Biol. Soc. Wash. XXI, p. 126.

This characteristic species of northern Australia is represented in the collection by a single small adult, light brown, arms faintly banded (distally) or striped (proximally), from St. XIV, 19 fms.

Iconometra anisa (H. L. Clark).

Oligometra anisa, H. L. Clark, 1915, Pap. Dept. Mar. Biol. Carn. Instn. VIII, p. 105.

Iconometra anisa, A. H. Clark, 1929, J. Linn. Soc. Zool., XXXVI, p. 643.

There are two small dark-coloured specimens of this species in the collection taken at St. XIX, 10 fms. As *anisa* was known previously only from the Murray Islands, it is interesting to record this slight extension of its range.

Colobometra perspinosa (Carpenter).

Antedon perspinosa, P. H. Carpenter, 1881, Notes Leyden Mus. III, p. 178.

Colobometra perspinosa, A. H. Clark, 1909, Proc. Biol. Soc. Wash. XXII, p. 6.

An interesting comatulid taken in "Penguin Channel, 16 fms. Mud. 21/12/28," in only fair condition, seems to be best referred to this species, but the 18 cirri have only 40-48 segments and the whole animal is less spiny than usual. It is thus nearer to the East Indian species *vepetrum*, but as I doubt whether *vepetrum* is valid, it seems best to call this specimen *perspinosa*, the species previously known from the east coast of Australia.

OPHIUROIDEA.

The collection of 162 brittle-stars is of very great interest, as it includes one species and one variety (*Ophiocoma delicata*, *Ophiarthrum elegans* var. *unicolor*) here described for the first time and three genera not hitherto known from Australia (*Ophiomitra*, *Ophiurodon*, *Cryptopelta*). There are also two species now recorded from Australia for the first time (*Ophiocnida echinata*, *Ophiomastix bispinosa*) and two others never before reported from Queensland (*Ophiomyxa australis*, *Amphioplus lobatus*). It is interesting to note that these two species are both from the south. About one-third of the 28 forms in the collection are therefore additions to the Queensland marine fauna, and this fact again emphasizes the great richness of that fauna, which is still imperfectly known. Eight of the forms are Ophiocomids and six are Ophiodermatids, so that half of the brittle-stars collected belong to those two families. Dredging in deep water at St. XV, 210 fms., yielded the genera *Ophiomitra* and *Ophiurodon* here recorded for the first time from Australia, but no other Ophiurans were taken there.

Ophiomyxa, australis, Lütken.

Lütken, 1869, K. Danske Selsk. Vidensk. Skr. (5), VIII, hft. 2, p. 99. [Reprinted, *Addimenta ad Hist. Ophiuridarum*, pt. 3, p. 99.]

This widely distributed brittle-star has not previously been found on the Australian coast north of New South Wales, nor was it found at Low Isles, so its occurrence at Sts. XIV, XVI and XVII in some numbers (26 specimens) is really quite remarkable. But as it is found in Fiji and is known also from Southern Japan, its occurrence near Lizard Island is not inexplicable.

Euryale asperum, Lamarck.

Lamarck, 1816, *Anim. s. Vert.* II, p. 538.

A single small specimen, only 13 mm. across the disk, represents this common species. It is dark reddish-brown in colour and was taken at St. XII, 10–15½ fms.

Ophiomitra dives, Koehler.

Koehler, 1922, *Bull. U.S. Nat. Mus. C.*, V, p. 107, pl. x, figs. 1–4; pl. xciv, fig. 2.

A single brittle-star, 14 mm. across the disk, taken at St. XV, 210 fms., represents this species, hitherto known only from a single station in the Philippine Islands. The Australian specimen is smaller and lighter coloured than Koehler's types. It is dry and probably more or less bleached, but there is still a reddish tinge, and the dark longitudinal line on the upper surface of the arms is very evident. There are some trifling differences in the under arm-plates, but otherwise the resemblance to the Philippine specimens is striking.

Ophiurodon cupidum (Koehler).

Ophioconis cupida, Koehler, 1905, "Siboga" Exped., XLVb, *Ophiures littorales*, pt. 2, p. 15, pl. i, figs. 19, 20.
Ophiurodon cupida, Matsumoto, 1915, *Proc. Acad. Nat. Sci. Philad.*, LXXVII, p. 84.

A brittle-star, taken at St. XV, 210 fms., with all the arms broken off close to the badly damaged disk, which is 7 mm. across, is undoubtedly an *Ophiurodon*, a genus new to the Queensland coast, but it is impossible to say positively what the species is. In my opinion it is nearest to the East Indian species *cupidum*, and it may for the present rest under that name.

Amphioplus lobatus (Ljungman).

Amphipholis lobata, Ljungman, 1867, *Öfvers. K. K. Vet.-Akad. Förh.* XXIII, p. 315.
Amphioplus lobatus, H. L. Clark, 1915, *Mem. Harv. Mus. Comp. Zoöl.* XXV, p. 258.

This species was originally described from a specimen only 6 mm. across the disk taken by Kinberg on the coast of New South Wales, near Sydney. So far as I know it has not been met with since. In the present collection are two brittle-stars, clearly *Amphioplus*, taken at St. XXV, 20–25 fms., which correspond so well to Ljungman's brief Latin description that I do not feel warranted in separating them as a different species.

One has the disk 8 mm. across and the arms are about 60 mm. long ; the other is slightly smaller and lacks the disk. In the characters of the oral shields, arm-spines, arm-plates, adoral plates and oral papillae, the smaller specimen corresponds very closely to Ljungman's description, but the larger one has the lower armplates more nearly square and the oral shields are much elongated, about twice as long as wide. In both specimens there are six arm-spines on the proximal part of the arm, but distal to the eighth-tenth joint there are but five ; beginning about the thirty-fifth segment there are distally but four. The next to the lowest spine is the longest and stoutest, but the lowest is nearly, and sometimes quite, its equal ; where there are six spines the four uppermost are more slender than the two lowest. The scaling of the disk dorsally is coarse but rather even, about 25-30 to a square millimetre ; on the interbrachial areas below it is much finer. The infra-dental oral papilla is thick and not scale-like ; of the other three, the middle one is largest and most scale-like. The radial shields are straight, with distal ends slightly thickened, but very little wider than the proximal, fully $2\frac{1}{2}$ times as long as wide. Both specimens are nearly white in colour, but the disk is distinctly pearl grey.

Ophiocnida echinata (Ljungman).

Ophiophragmus echinatus, Ljungman, 1867, Öfvers. K. K. Vet.-Akad. Förh. XXIII, p. 316.

Ophiocnida echinata?, Lyman, 1874, Bull. Mus. Comp. Zoöl. Harv. III, p. 230, pl. iv, figs. 22, 23.

A single small specimen (disk 4 mm. across, arms 50-60 mm. long) of this species was taken at St. XXV, 20-25 fms. The disk is pale grey and the arms are nearly white with about 15 cross-bands of dull light brown, irregularly placed, but usually well spaced. Compared with a specimen of about the same size from the Philippines, the banded arms give it a noticeably different appearance, but I do not think the difference is of any real significance. The species has not been taken previously south of the East Indies.

Ophiactis savignyi (Müller and Troschel).

Ophiolepis savignyi, Müller & Troschel, 1842, Syst. Asteriden, p. 95.

Ophiactis-savignyi, Ljungman, 1867, Öfvers. K. K. Vet.-Akad. Förh. XXIII, p. 323.

Eleven specimens of this tropicopolitan species were taken at the following places : One 5-armed adult, with disk 6 mm. across and arms 20 mm. long, in 4 fms., $\frac{1}{4}$ mile south of Cape Kimberly ; five young 6-armed ones, Gen. Survey, 6.iv.29, Mangrove Park, and one similar specimen, 24.iv.29, Mangrove Park ; three young ones from St. X, 14-17 fms., 22.ii.29, and one from St. XXV, 20-25 fms.

Ophiothrix longipeda (Lamarck).

Ophiura longipeda, Lamarck, 1816, Anim. s. Vert. II, p. 544.

Ophiothrix longipeda, Müller & Troschel, 1842, Syst. Asteriden, p. 113.

This common but as yet ill-defined species was taken at the following places : Two at Low Isles ; one at St. IX, 12-14 fms. ; one at St. XII, 10-15 $\frac{1}{2}$ fms. ; one, young with disk only 6 mm. across, at St. XXIII, 8 fms. ; and one, not typical, and referred to *longipeda* with some doubt, at St. XIX, 10 fms.

Ophiothrix martensi australis, H. L. Clark.

H. L. Clark, 1921, Pap. Dept. Mar. Biol. Carn. Instn. X, p. 111, pl. xv, fig. 4.

A single fine specimen, 12 mm. across the disk, was taken with the trawl at St. XVII, 19 fms.

Ophiothrix nereidina (Lamarck).

Ophiura nereidina, Lamarck, 1816, Anim. s. Vert. II, p. 544.

Ophiothrix nereidina, Müller and Troschel, 1842, Syt. Ast. p. 115.

This beautiful brittle-star was taken in some numbers near Lizard Island, but apparently was not found at Low Isles. There are five specimens, 6–9 mm. across the disk, from St. XIV, 19 fms.; five, 5–10 mm. across, from St. XVI, 20 fms.; and eight, 6–9 mm. across, from St. XVII, 19 fms.

Ophiothrix stelligera, Lyman.

Lyman, 1874, Bull. Mus. Comp. Zoöl. Harv. III, p. 237, pl. iii, figs. 15–20.

This species is represented by only four specimens, and one of these, taken at St. XXV, 20–25 fms., is only 3 mm. across the disk and somewhat decalcified, so that its identity is not beyond question. A small adult, taken at St. XVI, 20 fms., is labelled "red ophiuroid from red sponge"; both colour and habitat are characteristic of *stelligera*. The other two specimens are large adults, 8 mm. across the disk; one, from St. XVII, 19 fms., is pale brown, the other, from "off North Anchorage, low tide, 9 fms., 17.x.28," is deep, dull blue-violet; in both specimens the longitudinal white stripe on the upper side of the arm, so characteristic of the species, is very evident.

Ophiothrix striolata, Grube.

Grube, 1868, Jber. Schles. ges. vaterl. Kult. XLV, p. 45.

A single specimen of this species, 5 mm. across the disk, but with arms over 50 mm. long, was taken at Linden Bank, Sts. II and III, 28 fms., 24.xi.28.

Ophionereis semoni (Döderlein).

Ophiotriton semoni, Döderlein, 1896, Denkschr. Med.-naturw. Ges. Jena, VIII, p. 288, pl. xv, figs. 8, 8a.

Ophionereis semoni, Koehler, 1905, "Siboga" Exped. XLVb, Ophiures littorales, pt. 2, p. 54.

A very small brittle-star, 3 mm. across the disk, from St. XXII, 13½ fms., extends the known range of this species on the Queensland coast a little to the south.

Ophiocoma brevipes, Peters, var. *variegata*, E. A. Smith.

Ophiocoma brevipes, Peters, 1851, Mber. K. Preuss. Akad. wiss. Berlin, p. 465.

Ophiocoma variegata, E. A. Smith, 1876, Ann. Mag. Nat. Hist. (4), XVIII, p. 39.

Ophiocoma brevipes, var. *variegata*, H. L. Clark, 1921, Pap. Dept. Mar. Biol. Carn. Instn. X, p. 130.

There is a single *Ophiocoma* in the collection which represents this protean variety. It is a very fine example, 23 mm. across the disk, of forma *dentata*, Lütken, and was taken at Gen. Survey, A4, 24.iv.29.

Ophiocoma delicata, sp. nov.

(Plate I, figs. 1-3.)

Disk 9 mm. in diameter ; arms five, slender, somewhat flattened, about 60 mm. long and only $1\frac{1}{2}$ mm. wide basally. Disk distinctly pentagonal, very flat, closely covered both above and on the interbrachial areas below with a coat of very small granules, none of which are at all elongated or spiniform ; on the upper surface of the disk there are 100 or more granules to a square mm., but adorally they are larger, and near the oral shields there are, in a similar area, about 60-70. No indication of radial shields. Upper arm-plates distally triangular, but with a very rounded distal margin, much longer than wide, well separated from each other ; at the middle of the arm they are fully in contact, the proximal angle being more or less truncated ; basally they are a little wider (1.2 mm.) than long (1 mm.), nearly square, with distal corners rounded, in contact for their full proximal width. Oral shields triangular with angles rounded, about as wide as long (1.3 mm.) ; madreporite with proximal angle more rounded than in the other plates, but not essentially different. Adoral plates long and narrow, not meeting either proximally or distally, widest distal to middle. Oral papillae 5 or 6 on each side, the inner ones spiniform, the distal wider and flatter. Tooth-papillae few and small (1 or 2 to 4 or 5), not forming a well-defined cluster below the column of 5 (or possibly 6) narrow, blunt and rounded teeth. First under arm-plate small (about .8 mm. wide) diamond-shape, wider than long, with proximal and distal angles rounded or truncate ; second much larger, a trifle longer than wide, rounded pentagonal, with distal margin convex and lateral margins slightly concave ; succeeding plates similar, but larger and relatively wider, about a millimetre each way, at first broadly in contact, but rapidly becoming much less so ; distally the plates become hexagonal, well separated from each other and very much longer than wide. Side arm-plates relatively rather large, especially distally ; each carries 4 basally (distally only 3) long, slender, acuminate arm-spines, of which the uppermost and lowest are more or less nearly equal, and are distinctly the longest, sometimes equalling two full arm-segments in length ; the spines are fragile, but not hollow, and are never stout or clavate. Tentacle-scales 2, thin and flat, the outermost distinctly the widest, and overlying the base of the lowest arm-spine. Colour (dried specimen) : Disk, pale brown with forty or more dark brown spots, rounded, oval, or elongated, each of which is margined with white ; interbrachial areas below, similar ; upper arm-plates and proximal half of side arm-plates rather dark purplish-brown, with distal margin and distal part of lateral margins of upper plates and distal half of side-plates nearly white ; distally the whole upper plate becomes white, and the arms are then cross-banded with equal areas of brown and white ; the basal and the distal under arm-plates are white, but all of the large ones beyond the small basal ones have only the marginal portions light, the central area being purple brown ; area about mouth nearly white, but each oral shield has two (in one case only one) large purplish-brown spots, irregularly placed ; arm-spines nearly white, but each one has a more or less evident (generally faint) longitudinal, narrow dusky line, or a series of minute spots, on its upper side.

The specimen upon which the above description is based was taken with the dredge at St. XVII, 19 fms. Owing to the granulation of the disk and the two tentacle-scales, I was at first inclined to call it a colour variety of *brevipes* var. *variegata*, but comparison with many specimens of that form satisfied me, it could not properly be so treated. It differs from all specimens of *brevipes* in the shape and proportion of disk and arms, in the character of the arm-plates and spines and in the way in which the outer tentacle scale overlies the base of the lowest arm-spine, unlike any known *Ophiocoma*. The very scanty development of tooth-papillae made me suspicious that this brittle-star might be an ophiodermatid rather than an ophiocomid, but all of its characters except those of teeth and tooth-papillae are so obviously those of an *Ophiocoma*, I think it must be referred to that genus. As it is much more slender and fragile than any other species of the genus, the name *delicata* seems appropriate.

I regard as a young individual of this species a small and rather badly damaged brittle-star, with the disk only 4.5 mm. across and all the arms broken. The appearance and coloration of the arms is like that of the distal part of the arms in the large specimen. The colour of disk and oral shields is also like that of the adult, but there are very few granules anywhere on the disk (which may be due to youth, as is the case in *Ophiocoma riisei*), and there are apparently no tooth-papillae (which may also be a youthful condition). This little specimen is too young to show even its family characters clearly, but I have no doubt it is a youthful specimen of *delicata*. It was taken at St. XIV, 19 fms.

Ophiocoma scolopendrina (Lamarck).

Ophiura scolopendrina, Lamarck, 1816, Anim. s. Vert. II, p. 544.

Ophiocoma scolopendrina, Müller and Troschel, 1842, Syst. Asteriden, p. 101.

There are sixteen specimens of this very common species from the following places: Three Isles, 6.v.29. Low Isles. The Middle Moat, 21 and 22.ii.29. Gen. Survey, C1, 8.iii.29. Gen. Survey, Low Isles. Gen. Survey, 20.iii.29. Three Isles, 5.v.29.

Ophiomastix annulosa (Lamarck).

Ophiura annulosa, Lamarck, 1816, Anim. s. Vert. II, p. 543.

Ophiomastix annulosa, Müller and Troschel, 1842, Syst. Ast. p. 107.

One specimen from the south-west reef of Mer, Murray Islands: two others are presumably from the same place. A fourth specimen is from "Ribbon Reef, seaward sloping zone. 4.vi.29." Apparently the species does not reach as far south as Low Isles.

Ophiomastix bispinosa, H. L. Clark.

H. L. Clark, 1917, Bull. Mus. Comp. Zoöl. Harv. LXI, p. 442, pl. ii, figs. 1, 2.

An *Ophiomastix*, 15 mm. across the disk, with arms about 90 mm. long, from St. XIV, 19 fms., apparently represents the adult of this species, hitherto known only from a single young individual, 5 mm. across the disk, taken at Makemo in the Paumotus. Its occurrence on the Australian coast is most interesting. The dull olive-brown colour (dry) with

the distal portion of the arms banded (at intervals of 4-6 segments) with a dirty whitish, and many of the arm-spines faintly annulated, is very similar to that of the holotype. The single, almost circular tentacle-scale is a striking feature, while the form of the oral shields (widest distal to middle) and the shape of the upper and under arm-plates (on the distal part of the arms, of course) are suggestive of the original specimen. Proximally the arm-plates, both above and below, are wider than long and more or less in contact. The arm-spines are usually 3, but proximally there are often 4 (with the uppermost much the longest and heaviest, though it is scarcely claviform), and occasionally only 2; distally there are never 4, but frequently only 2. The disk covering shows a marked difference from that of the holotype, in that the spinules are very numerous and rather uniformly short and sharp; more numerous and smaller near the margins of the disk than at the centre. This difference between the Australian and Makemo specimens is probably due to the youthfulness of the latter.

Ophiarthrum elegans, Peters.

Peters, 1851, Mber. K.-Preuss. Akad. Wiss. p. 463.

There are eleven specimens of this common and very widespread brittle-star from the following places: Gen. Survey, between Anchorage Reefs and Tripneustes Spit, 11.iv.29. Gen. Survey, F9, 4.iv.29. Gen. Survey, B2. Gen. Survey, B3. There are also two remarkable specimens, one from St. XIV, 19 fms., and one from St. XVII, 19 fms., which I am strongly tempted to consider representatives of an undescribed species, but have decided to call simply *O. elegans* var. *unicolor*, var. nov. These specimens have the entire disk above and below uniformly brown; in the smaller specimen (disk 12 mm. across) the shade is dark, but in the larger (16 mm.) it is a light greyish brown. The arms, about 5 times the disk diameter, are somewhat indistinctly banded, because at intervals of from 2 to 5 segments the upper arm-plate (or two consecutive plates) and the adjoining parts of the side arm-plates are dull cream-colour. The arm-spines are noticeably long, slender, and more or less evidently flattened; the uppermost is often nearly or quite equal to three arm-segments. There are dusky spots and bands on the arm-spines and a sprinkling of very fine blackish dots on the upper surface of the arms as in typical *elegans*. Owing to the slender arm-spines and the colour, these specimens appear quite unlike *elegans*, but a specimen in the M.C.Z. from New Guinea resembles them in both these respects, and yet has the margin of the disk and markings on the interbrachial areas of the lower surface distinctly light as in the usual form. This specimen is such a connecting link between *elegans* and *unicolor* that I am compelled to regard the latter as merely a variety of the former.

Ophiarthrum pictum (Müller and Troschel).

Ophiocoma picta, Müller and Troschel, 1842, Syst. Asteriden, p. 102.

Ophiarthrum pictum, Lyman, 1874, Bull. Mus. Comp. Zoöl. Harv. III, p. 225, pl. vii, figs. 2-4.

This beautiful brittle-star seems to be common at Low Isles, as there are seven specimens from the following places: Gen. Survey, Mangrove Park, 6.xi.29; the Western Moat on *Hippopus*, 13.xi.28. There are also some arm-fragments from "The Fungia Moat, among dead colonies of branched *Porites*, 6.iv.29." A small specimen

14 mm. across the disk was dredged at St. XVI, 20 mm. Several specimens are very fine, one, 31 mm. across the disk, particularly so; this is the largest specimen of *pictum* I have yet seen, and in life was about 35 mm. across the disk, and had arms more than 200, probably more than 250 mm. long.

Ophiarachna incrassata (Lamarck).

Ophiura incrassata, Lamarck, 1816, Anim. s. Vert. II, p. 542.

Ophiarachna incrassata, Müller and Troschel, 1842, Syst. Asteriden, p. 104.

This magnificent species is represented by three specimens, 43–45 mm. across the disk, of which one is from Low Isles, and the other two have no labels.

Pectinura yoldii (Lütken).

Ophiopeza yoldii, Lütken, 1856, Vidensk. Medd. naturh. Foren. Kjöb. p. 9.

Pectinura yoldii, H. L. Clark, 1909, Bull. Mus. Comp. Zoöl. Harv. LII, p. 119.

A single specimen, 17 mm. across the disk, from St. XXI, 10 fms., represents this species.

Ophiochasma stellatum (Ljungman).

Ophiarachna stellata, Ljungman, 1867, Öfvers. K. K. Vet.-Akad. Förh. XXIII, p. 305.

Ophiochasma stellata, H. L. Clark, 1909, Bull. Mus. Comp. Zoöl. Harv. LII, p. 121.

Four specimens of this species were taken at Stations XXII, XXIII, XXIV, in 8–16½ fms.

Ophiarachnella gorgonia (Müller and Troschel).

Ophiarachna gorgonia, Müller and Troschel, 1842, Syst. Asteriden, p. 105.

Ophiarachnella gorgonia, H. L. Clark, 1909, Bull. Mus. Comp. Zoöl. Harv. LII, p. 123.

There is a single specimen from Gen. Survey, the Thalamita Flat, 21.iv.29.

Ophiarachnella infernalis (Müller and Troschel).

Ophiarachna infernalis, Müller and Troschel, 1842, Syst. Asteriden, p. 105.

Ophiarachnella infernalis, H. L. Clark, 1909, Bull. Mus. Comp. Zoöl. Harv. LII, p. 124.

There are 23 specimens of this common species in the collection, ranging in disk diameter from 4 to 12 mm. Only one was taken at Low Isles; Gen. Survey, the Thalamita Flat, 21.iv.29. The others are from Sts. XIV, XVI, XVII, XIX and XXIII, in 8–20 fms.

Cryptopelta granulifera, H. L. Clark.

H. L. Clark, 1909, Bull. Mus. Comp. Zoöl. Harv. LII, p. 131.

There are two brittle-stars in the present collection which appear to be adults of this species, hitherto known only from the small holotype taken at Mauritius. The smaller individual has the disk 10 mm. across, the arms 45–50 mm. long, and 7 arm-spines at base

of arm, but the number soon drops to 6, and beyond the middle of the arm there are only 5. The disk is very light (dirty cream-colour), the arms olive grey, banded with a dark shade covering 7 or 8 segments, and then a light shade for about 4; the base of the arms is of the light shade; the lower surface is uniformly whitish, or about the mouth, yellowish. This specimen was taken at St. XVII, 19 fms. At St. XIV, 19 fms. the larger specimen (12–13 mm. across the disk, arms 60–65 mm. long) was collected. It has 8 arm-spines at very base of arms, then 7 and then, from middle of arm on, only 6; at tip of arm there are but 5. The disk is light reddish-brown; arms greyer and less distinctly banded than in smaller specimen; lower surface fawn-colour, darkest on disk. In both specimens the first upper arm-plate is much wider than long, not at all circular as in the younger holotype. The flattening of the arms is marked, especially distally. The skin of the disk in these dry specimens is much wrinkled, which would indicate that in life the disk is somewhat soft and swollen.

The discovery of *Cryptopelta* near Lizard Island adds a new genus to the fauna of Australia, and is hence of very great interest. Koehler has described (1922, Bull. U.S. Nat. Mus., C, vol. v, p. 350) a species of *Cryptopelta* from the Philippines, which he calls *tecta*, closely resembling *granulifera*, but differing in having the first four or five of the basal under arm-plates covered by the fine granulation of the lower surface of the animal. In the Australian specimens these plates are perfectly bare and free from granules, so that they are apparently the Mauritian rather than the Philippine species.

Ophiolepis superba, H. L. Clark.

Ophiura annulosa, Blainville, 1834, Man. d'Act. p. 244, pl. xxiv, figs. 1–4 (*non* Lamarck, 1816).

Ophiolepis superba, H. L. Clark, 1915, Spolia Zeylan. X, p. 89.

This handsome brittle-star is apparently common at the Low Isles, for there are ten specimens in the collection, with disks from 17 to 32 mm. across. They are labelled: Gen. Survey, the Thalamita Flat; Gen. Survey, A4, 10.iv.29. The only one which calls for any comment is an individual 25 mm. across the disk, the arms ranging from 25 to 75 mm. The colours are very dull, more or less tinged with olive, and I am uncertain whether this is artificial or not. The scaling of the disk is smoother than in the other specimens and has a peculiar appearance, so that I am inclined to think the peculiar colouring may be natural and due to some unusual feature of the environment.

ECHINOIDEA.

The collection of sea-urchins contains 154 specimens, representing 28 species of 23 genera, which is a very fair proportion of the Echini known from Queensland. Two genera (*Micropyga*, *Pericosmus*) are added to the fauna of Australia, and three additional species (*Nudechinus multicolor*, *Laganum dyscritum*, *Metalia spatagus*) are new to the continent; of these the *Laganum* is new to science. The genus *Gymnechinus*, represented by the species *epistichus*, is also now definitely added to the Australian fauna, for while this species was supposed when described to occur in Australian waters, it is now for the first time reported from a definite locality. Dredging in deep water at St. XV, 210 fms. yielded the most extraordinary specimens, both *Micropyga* and *Pericosmus* occurring there.

Prionocidaris bispinosa (Lamarck).

Cidarites bispinosa, Lamarck, 1816, Anim. s. Vert. III, p. 57.

Prionocidaris bispinosa (Lamarck) var. *aruana*, Döderlein, 1911, Abh. Senckenb. Naturf. Ges. XXXIV, p. 240.

This cidarid, so common on the northern coasts of Australia, was taken at only three places; at St. XXII, 13½ fms., an adult specimen, 40 mm. in diameter, the biggest spines less than 60 mm. long, and a young one, about half as large, were dredged; at St. XIV, 19 fms., a young one only 9 mm. in diameter was taken; and "north-east of Low Isles, about 8 fms., mud bottom, with stones, Sept. 1928," a young one, 20 mm. in diameter, with spines 35 mm. long was collected. None of these specimens calls for any special comment.

Prionocidaris verticillata (Lamarck).

Cidarites verticillata, Lamarck, 1816, Anim. s. Vert. III, p. 56.

Prionocidaris verticillata, Döderlein, 1911, Abh. Senckenb. Naturf. Ges. XXXIV, p. 243.

A particularly fine specimen of this striking sea-urchin was taken on the Low Isles reef, 6.vi.29; it is 30 mm. in diameter and the longest primaries are 27 mm. long, each with 3 of the characteristic whorls. The colour is less green than usual, but the oral primaries and the tips of the aboral ones are evidently greenish; shafts of upper primaries between whorls, rose-reddish; secondaries light, greenish-yellow with a dusky greenish blotch near tip and with a distinctly reddish or orange cast, especially at tip.

I cannot follow Mortensen in putting this species in a genus by itself, nor can I admit that if this were done, the name *Plococidaris* might be used; that name is an unquestionable synonym of *Prionocidaris*.

Centrechinus savignyi (Michelin).

Diadema savignyi, Michelin, 1845, Mag. Zool. (2), VII, p. 15.

Centrechinus savignyi, H. L. Clark, 1921, Pap. Dept. Mar. Biol. Carn. Instn. X, pp. v and 145, pl. xvii, figs 1, 2.

Four very young specimens of *Centrechinus*, 6–20 mm. in diameter, taken in the "General Survey, Low Isles," are to be referred to this species, as they show no white anywhere, and the very light-coloured spines are banded with purplish-red, much brighter than the brown of *setosus*. The smallest specimen bears the additional label "A4 24.iv.29."

Centrechinus setosus (Leske).

Echinometra setosa, Leske, 1778, Addit. ad Klein nat. disposit. Echin. p. 36.

Centrechinus setosus, Jackson, 1912, Mem. Boston Soc. Nat. Hist. vii, p. 28 (*partim*). H. L. Clark, 1921, Pap. Dept. Mar. Biol. Carn. Instn. X, pp. v and 146, pl. xvii, figs. 3, 4.

This species also occurs at the Low Isles, but there is only a single specimen in the present collection. It is 18 mm. in diameter, with spines 36 mm. long; the latter are handsomely banded with wood-brown and white.

Echinothrix calamaris (Pallas).

Echinus calamaris, Pallas, 1774, Spic. Zool. I, fasc. 10, p. 31, pl. ii, figs. 4-7.

Echinothrix calamaris, Peters, 1853, Mber. K. Preuss. Akad. p. 484.

There are two adult specimens, one from Low Isles, and the other from "Outer Barrier, Yonge Reef, Inner Moat, 5.vi.29." Both have the interambulacral primaries fragile, hollow, black and white banded as is normal for *calamaris*, but the Low Isles specimen has the ambulacral primaries bright brown as in *E. diadema* and not the usual yellowish-green of *calamaris*.

Micropyga tuberculata, A. Agassiz.

A. Agassiz, 1879, Proc. Amer. Acad. Arts Sci. XIV, p. 200.

Dredging at St. XV, 210 fms., yielded a fine specimen of *Micropyga*, a genus new to Australia. It is 70 mm. in diameter, light reddish-purple (bright when wet) in colour, and has numerous club-shaped primary spines just below the ambitus. Comparison with cotypes of *tuberculata* from Cebu, P. I., shows it to belong to that species, but the tuberculation is surprisingly like that of *M. nigra*, as shown in the published figures of that species (H. L. Clark, 1925, Cat. Recent Ech. Brit. Mus., pl. iv). The question naturally rises whether the supposed differences in tuberculation between *nigra* and *tuberculata* have any validity; if not, is *nigra* entitled to any recognition as a species, or is it only a colour form?

Stomopneustes variolaris (Lamarck).

Echinus variolaris, Lamarck, 1816, Anim. s. Vert. III, p. 47.

Stomopneustes variolaris, Agassiz, 1841, Mon. d'Ech., Observ. Progrès Réens. Hist. Nat. Ech. p. 7.

Two specimens were taken at Low Isles; one is an adult, about 53 mm. in diameter, with short, stumpy primaries, the longest 30 mm. in length by 3 mm. in thickness, abruptly pointed, appearing as though they had been broken off and then the tip had regenerated; the other specimen, "Gen. Survey, 7.iii.29," is a young one, only 22 mm. in diameter.

Temnopleurus toreumaticus (Leske).

Cidaris toreumatica, Leske, 1778, Addit. ad Klein nat. disposit. Echin. p. 155, pt. x, figs. D, E.

Temnopleurus toreumaticus, Agassiz, 1841, Mon. d'Ech., Observ. Progrès Réens. Hist. Nat. Ech. p. 7.

At St. IX, 12-14 fms., a very fine specimen of this handsome urchin was taken. It is 32 mm. in diameter and the longest primaries are 23 mm. The test is very light olive, the primaries olive banded near tip with a lighter shade; many of the small primaries, especially orally, are banded their whole length; secondary and miliary spines very light, often nearly white, the larger ones faintly banded. The primary spines are notably slender and acuminate.

Salmacis belli, Döderlein.

Salmacis sphaeroides, var. *belli*, Döderlein, 1903, Denkschr. med.-naturw. Ges. Jena, VIII, p. 718.

Salmacis belli, Mortensen, 1904, K. Danske Vidensk. Selsk. Skr. (7), I, p. 68.

A good specimen of this lovely species was taken at St. XII, 10–15½ fms. It is 74 mm. h.d. by 43 mm. v.d. Most of the spines above the ambitus are broken or wanting, but orally and especially about the peristome they are still present. The test is a very light reddish-fawn colour, while the spines are green at base, becoming rose-red distally; at ambitus and below, the tips are crossed by one or two broad whitish bands; these are most marked on the oral primaries with their conspicuously wide and flattened tips, 1.5–2 mm. across.

Salmacis sphaeroides (Linnaeus).

Echinus sphaeroides Linnaeus, 1758, Syst. Nat. ed. X, p. 664.

Salmacis sphaeroides. Lovén, 1887, Bih. svensk. Vetensk. Akad. Handl. XIII, Afd. IV, No. 5, p. 69, pl. ii, figs. 1–3.

There are two specimens from St. XIX, 10 fms., one from Batt Reef, and one from Low Isles. The two latter and one from St. XIX are typical dark-coloured specimens, 60–80 mm. in diameter, but the second specimen from St. XIX, which is 75 mm. h.d. and 50 mm. v.d., has a peculiar appearance which may possibly be artificial. The test is pale grey violet, but this seems to be a superficial layer which rubs off easily, leaving the usual variegated light and dark green; spines almost white (a very pale reddish-lavender) banded, distally at least, with deep crimson.

Salmacis virgulata alexandri, Bell.

Salmacis virgulata, Agassiz and Desor, 1846, Ann. Sci. Nat. VI, p. 359.

Salmacis alexandri, Bell, 1884, Rep. Zool. Coll. "Alert," p. 118.

Salmacis virgulata alexandri, Döderlein, 1914, Michaelsen and Hartmeyer, Fauna Südwest-Austral. IV, p. 454.

At St. XIX, 10 fms., along with the preceding *Salmacis*, one typical specimen of this Australian subspecies was taken. It is 52 mm. h.d. by 35 mm. v.d.; the actinal spines are bright red violet, green at base, with sharply defined white tips; adapically the green becomes more and more dominant, until at the periproct the small spines are wholly green.

Temnotrema decorum, Döderlein.

Döderlein, 1914, Michaelsen and Hartmeyer, Fauna Südwest-Austral. IV, p. 459.

Although this lovely little urchin was not taken at the Low Isles, there are three specimens in the collection, two from St. XIX, 10 fms., and one from St. XXIII, 8 fms. They are all adult, ranging from 23 by 15 mm. to 26 by 18. They are light grey or greyish-olive, with the spines white or nearly so, many more or less green basally, each provided with one or two vermilion-red bands, which may be very distinct (orally) or very faint (adapically). This species has not previously been taken on the Queensland coast south of Torres Strait.

Tripneustes gratilla (Linnaeus).

Echinus gratilla, Linnaeus, 1758, Syst. Nat. ed. X, p. 664.

Tripneustes gratilla, Lovén, 1887, Bih. svensk. Vetensk. Akad. Handl. XIII, Afd. IV, No. 5, p. 77.

The single specimen of this common species is 93 mm. in diameter, with the test dark purple and the spines more or less nearly white.

Nudechinus darnleyensis (Tenison-Woods).

Echinus darnleyensis Tenison-Woods, 1878, Proc. Linn. Soc. N.S.W. II, p. 165.

Nudechinus darnleyensis H. L. Clark, 1912, Mem. Harv. Mus. Comp. Zoöl. XXXIV, p. 277.

A very small urchin, 4.5 mm. h.d., taken at St. XXI, 10 fms., seems to be undoubtedly the young of this species, which is known only from Northern Queensland. The primary spines are violet with white tips.

Nudechinus multicolor (Yoshiwara).

Echinus multicolor Yoshiwara, 1898, Ann. Zoöl. Jap. II, p. 60.

Nudechinus multicolor H. L. Clark, 1912, Mem. Harv. Mus. Comp. Zoöl. XXXIV, p. 276.

There are two small specimens of *Nudechinus* in the collection which are certainly not *darnleyensis*, but answer well to descriptions of *multicolor*, so that although they are too young for certain identification, I refer them with little hesitation to this Japanese species. The geographical problem involved is like that of *Temnotrema sculptum*, a species first described from Japan, but now known from Northern Australia also. Yoshiwara's type came from Akune, Satsuma Province, in Southern Japan, so the species is probably a warm-water form, with a considerable distribution in the East Indian region.

The smaller of the specimens before me is only 5 mm. in diameter, and was taken at Low Isles, "Gen. Survey, between Anchorage Reefs and Tripneustes Spit, 11.iv.29." The larger is 8 mm. h.d. by 4.5 mm. v.d., and comes from "Three Isles, Gen. Survey, May 5, 1929." In both specimens the test is variegated with white, light green and dark green, while the spines are ringed with 2 or 3 (rarely 4) narrow, not sharply defined, dusky bands; in the smaller specimen these bands have a faint violet tinge, which in the larger is more definitely violet (or possibly reddish) in colour. In the larger specimen ocular I is insert, but ocular V is scarcely so; the younger specimen has not been cleaned for observation, but apparently all oculars are exsert.

Gymnechinus epistichus, H. L. Clark.

H. L. Clark, 1912, Mem. Harv. Mus. Comp. Zoöl. XXXIV, p. 289, pl. xciii, figs. 22, 23; pl. cii, figs. 4, 5.

The taking of three specimens of this rare and little-known urchin, in the vicinity of Lizard Island, is most interesting, as it was hitherto known only from the types in the M.C.Z. Of these, the holotype is from the Philippine Islands, but the two paratypes are labelled Australia, and were apparently sent to A. Agassiz by Tenison-Woods as specimens of his *Echinus darnleyensis*, as they bear the label, in Mr. Agassiz's handwriting, "*Echinus darnleyanus*. Wood. Australia." Mortensen, long ago, suggested that Woods had confused more than one species under his new name, the types of which he recorded as from Cape Grenville and Darnley Island. The present specimens thus extend the known range of the species very considerably to the south.

At St. XVII, 19 fms., a very fine individual, 30 mm. h.d. by 15 mm. v.d., was taken, the largest specimen yet known. The abactinal system is similar to that of the type, except that the genital pores are drawn out distally as a deep furrow nearly or quite to the margin of the plate. The other two specimens, 22 × 11 mm. and 25 × 14, were taken at St. XIX, 10 fms., and resemble the type-specimens in all essential particulars. All three of the specimens have the colours brighter than in the rather dingy types; all large spines are light dull orange, fading to nearly white at base and at tip; the orange is more or less tinged with purple, especially distally, where some spines are distinctly violet; small spines and pedicellariae are white; pedicels brown (dry); test light, but grey apically, with a strong violet tinge in the largest specimen; apical system itself, greenish-white.

Echinostrephus molare (de Blainville).

Echinus molaris, de Blainville, 1825, Dict. Sci. Nat. XXXVII, p. 88.

Echinostrephus molare, A. Agassiz, 1872, Illust. Cat. Mus. Comp. Zoöl. Harv. VII; Rev. Ech. pt. 1, p. 119.

There are four small typical specimens, about 15 mm. in diameter, and very dark coloured, taken "6.vi.29: Yonge Reef, outer moat. Boring Sticklie & *Diadema*." This species has not hitherto been taken on the Queensland coast south of Torres Strait.

Parasalenia gratiosa, A. Agassiz.

A. Agassiz, 1863, Bull. Mus. Comp. Zoöl. Harv. I, p. 22.

This is so interesting a sea-urchin that it is desirable to give details about each of the four specimens in the present collection. Three of them have only a label, which indicates that they were collected at Low Isles. The smallest is 16 mm. long, 11 mm. wide, and about 6 mm. high; test black or very deep brown, spines dark olive-grey, with milled rings white, as usual; oculars all exsert; genitals all broadly in contact with periproct; a single tubercle is present on the inner margin of each of genitals 1, 3 and 5; no other tubercles on abactinal system; periproctal plates 4, the one touching genitals 2, 3 and 4 largest. A second specimen is a trifle larger and has the same colour, but the abactinal system is very different; there are no tubercles present, except a very small one, on the inner margin of genital 4; ocular II is broadly insert, and genital 3 is completely shut off from contact with the periproct by genitals 2 and 4 being broadly in contact with each other; the periproct has 4 normal plates as usual, very nearly equal in size. The largest specimen is 26 mm. long, 20 mm. wide, and 11 mm. high. In colour it is like the other two, but again we find a characteristic abactinal system; all oculars are exsert, and all genitals are in contact with the periproct; on the inner margin of each genital is a single rather large tubercle; there are *six* periproctal plates, five are subequal, triangular and form a symmetrical group around the anus; the sixth plate is very small, pentagonal, and lies between genitals 2, 3 and 4, and two of the typical periproctal plates.

The fourth and most perplexing specimen was taken at St. XVII, 19 fms., and bears a striking superficial resemblance to a young *Echinometra*. It is 11.5 mm. long by 8.5 mm. wide, and nearly 5 mm. high; the colour is reddish-grey, darkest on abactinal system, where the genital plates are definitely reddish; spines pale reddish with white milled rings; at ambitus and orally, the primaries (at least near their tip) are faintly or more or less

distinctly (especially close to peristome) banded with dusky reddish; oculars all fully exert; genitals all in contact with periproct; no tubercles anywhere on abactinal system; periproctal plates 7, of which 5 subequal ones form a circle in contact with genital plates, while 2 smaller ones lie side by side within that circle. This little specimen might well be referred to *Parasalenia pöhlii*, but I have lost faith in the validity of that species. The resemblance to a young *Echinometra mathaei* is also striking, as already said, for young *Echinometras* of this size have only 3 or 4 pairs of pore-pairs in an arc, and only a few plates on the periproct. The sum total of all the characters, however, leaves no doubt that this particular specimen is a *Parasalenia*.

Echinometra mathaei (de Blainville).

Echinus mathaei, de Blainville, 1825, Dict. Sci. Nat. XXXVII, p. 94.

Echinometra mathaei, de Blainville, 1830, Dict. Sci. Nat. LX, p. 206.

Of this widely distributed and very common sea-urchin there are ten specimens, ranging from about 25 to nearly 50 mm. in length. Several are of the common reddish colour, but the majority are the more conspicuous grey, greenish or violet forms with the primary spines white-tipped. The following localities are represented: Gen. Survey; Gen. Survey, the Middle Moat, etc.; Gen. Survey, Western Moat; Yonge Reef, outer moat; the Mangrove Park; F9.

Laganum depressum, Agassiz.

Agassiz, 1841, Mon. d'Éch.: Monogr. des Scutelles, p. 110, pl. xxiii, figs. 1-7.

There are ten specimens of this common species, of which two are dead tests, with worm-tubes on them, from between Anchorage Reefs and Mangrove Park, 10.iv.29. Of the others, the largest are two tests, 60 × 50, and 67 × 55 mm.; they are bare, pale yellowish, with thick margins, especially anteriorly. Three much smaller specimens, 32-45 mm. long, light grey-brown with a yellow-green cast, were taken at St. XXIV, 16½ fms. Dredging at Linden Bank, 28 fms., Sts. II and III, 24.xi.28, yielded three very young specimens, 18-23 mm. long, of a light silvery grey-brown colour.

Laganum dyscritum,* sp. nov.

(Plate I, figs. 5-9.)

Test distinctly pentagonal, rather thick, especially around margin, very slightly elevated at centre, but distinctly depressed proximal to margin, in the area occupied by the distal part of the petals; length, 40 mm.; greatest breadth, 38 mm., across the anterior pair of petals; about 6.5 mm. high at centre; 5 mm. thick at margin; petaloid area, 27 mm. long by 26 mm. wide. Genital pores 5. Petals rather wide, with convex sides and blunt ends which are not closed. Peristome just a trifle anterior to centre of lower surface. Periproct small, about 2½ mm. long by rather more than 3 mm. wide; its centre is 5 mm. from the posterior end of the test. Spines numerous and long, those on the oral surface, nearly or quite 2 mm.; owing to the slenderness of the spines and their

* δύσκριτος = hard to determine.

great number, the covering of the test is remarkably like fur. Colour brown with a purplish tinge dorsally, duller and more grey orally: the spines singly are nearly white, with a faint reddish tinge.

The specimen from which the above description is taken (the holotype) is the largest of nineteen specimens from Low Isles. There are fifteen additional specimens from "off west of Low Isles, mud and gravel, 15.xi.28," ten more from "Agassiz trawling off north anchorage, Low Isles, 9 fms., 17.x.28," and a single specimen from St. IX, 12-14 fms. This last-mentioned specimen and one of those from Low Isles have a noticeable yellow-green cast to their dull brownish colouring, but they are not otherwise peculiar.

This species is closely allied to *depressum*, and I was at first inclined to consider these specimens merely a form of that species, but careful study and comparison with typical examples of *depressum* from various localities has satisfied me that it is better to recognize this Low Isles *Laganum* under a distinct name. As young specimens, and adult individuals retaining youthful characters (*i. e.* arrested variants, to adopt Jackson's very useful terminology), will probably be hard to distinguish from *depressum*, I have selected a specific name indicating that probability. Typical adult specimens of the two species are easily distinguished by several characters. Adult specimens of *depressum* have the width of the test .80-.85 of the length, and the distance of the periproct from the margin is about .20 of the test length; in *dyscritum* the width of the test is .90-.95 of the length, and the distance of the periproct from the margin is about .12 of the test length. In *depressum* the margin of the test is often not swollen and relatively is always less so than in *dyscritum*. The petals are smaller, and the petaloid area is noticeably less extensive in *depressum*. When the specimens are well preserved (and presumably, when living), *dyscritum* has the spines so long, slender and numerous, its covering is very much softer and more like a coat of fur than is that of *depressum*. Finally, I have never seen specimens of *depressum* of the dull purplish-brown colour of typical *dyscritum*, but individuals of the new species approach *depressum* in this respect.

Peronella orbicularis (Leske).

Echinodiscus orbicularis, Leske, 1778, Addit. ad Klein nat. disposit. Echin. p. 144, pl. xlv, figs. 6, 7.
Peronella orbicularis, A. Agassiz, 1872, Illust. Cat. Mus. Comp. Zoöl. VII, Rev. Ech. pt. 1, p. 149.

Four young specimens of a *Peronella* were taken at the following stations: XIV, 19 fms.; XXI, 10 fms.; XXII, 13½ fms.; XXV, 20-25 fms. These specimens range from 13 × 10 to 32 × 28 mm., and were all living when collected. They show some diversity of colour, ranging from reddish-brown to a dull yellowish-green. None of them are at all "orbicular," but they are not otherwise peculiar.

Pericosmus macronesius, Koehler.

(Plate I, fig. 4.)

Koehler, 1914, Ech. Indian Mus. VIII, 1, Spatangides, p. 133, pl. xii, figs. 1-5.

The addition of this notable genus to the fauna of Australia is of exceptional interest because of its rarity, and our very imperfect knowledge of its distribution and relationships.

A single specimen was taken at St. XV, 210 fms. It is in perfect condition and answers admirably to Koehler's detailed description. It resembles his two specimens in size and proportions, measuring 61 mm. in length, 57 in width and 37 in height; the apex is 27 mm. from the anterior edge of the test, and the anterior margin of the peristome is only 10 mm. from the same point; the posterior pair of petals are 17 mm. long and the anterior pair are 22 mm.; all are 4 mm. wide; the peristome is 10 mm. wide by 5 mm. long, while the periproct is 9 mm. wide by 7 mm. high. The colour is a bright purple, but the individual spines which clothe the test quite thickly are a pale lavender when one is looked at by itself.

As Koehler's specimens lacked spines and pedicellariae, it is worthy of note that both are very abundant in the present individual. Dorsally the spines are very slender, slightly thickened at the tips, distinctly curved and more than 2 mm. long; orally they are longer and stouter and more pointed, many exceeding 5 mm. in length; at the posterior end of the test just below the marginal fasciole they form two tufts, neither conspicuous nor well-defined, yet sufficiently evident to warrant mention. The pedicellariae are found everywhere, but are particularly abundant orally. Ophicephalous pedicellariae with short wide valves, somewhat like those of *Brissopsis*, crowd the ventral ambulacra where they reach their largest size; the stalks are a millimetre long, while the valves are nearly half as much. All the rest of the pedicellariae seem to be rostrate or possibly tridentate; no sharp line can be drawn between the various forms, but the smallest are most nearly the tridentate type; the larger ones resemble the two forms figured by Koehler for *Faorina*; most of them have the valves long, very slender and strongly arched, ranging in length from less than half to more than a whole millimetre, commonly exceeding the stalk; the other form, much less common but by no means rare, has the valves much wider and stouter, especially at the tip, and about .75–.90 mm. long. No globiferous pedicellariae were noted. On the whole the resemblance of the pedicellariae to those of *Faorina* is sufficient to warrant belief in the rather close relationship of the two genera. On the other hand, they are rather convincing proof that, as suggested when the species was first described, *Pericosmus abatooides*, H. L. Clark, is not properly congeneric with *P. macronesius*; it is probably related to *Abatus*, and will ultimately have to be made the type of a new genus.

Hypselaster fragilis (A. Agassiz and Clark).

Periaster fragilis, A. Agassiz and Clark, 1907, Bull. Mus. Comp. Zoöl. Harv. LI, p. 138.

Hypselaster fragilis, H. L. Clark, 1917, Mem. Mus. Comp. Zoöl. Harv. XLVI, p. 189, pl. cxlviii, figs. 5-8.

A small spatangoid, 22 mm. long, 18 mm. wide and 16 mm. high at the posterior apex, was dredged at St. XXI, 10 fms. It is dirty whitish with a markedly rose-reddish tinge and shows two (and only two) large genital pores. There seems to be no doubt that it is a young specimen of the species first taken by the "Challenger" in Torres Strait (unless Juke's specimen taken in 1846 at Cape York is really the same species), but first described by Agassiz and myself as *Periaster fragilis* from a young specimen taken at a depth of 391 fms. in Japanese waters. Finding the species near Lizard Island is therefore of very great interest.

Schizaster lacunosus (Linnaeus).

Echinus lacunosus, Linnaeus, 1758, Syst. Nat. ed. X, p. 665.

Schizaster lacunosus, Lovén, 1887, Bih. svensk. Vetensk. Akad. Handl. XIII, Afd. IV, No. 5, p. 168.

There are two small specimens dredged at St. XXIII, 8 fms., which call for no comment, except that they extend the known range of the species considerably to the southward.

Brissopsis luzonica (Gray).

Kleinia luzonica, Gray, 1851, Ann. Mag. Nat. Hist. (2) VII, p. 133.

Brissopsis luzonica, A. Agassiz, 1872, Illust. Cat. Mus. Comp. Zoöl. Harv. VII, Rev. Ech. pt. 1, p. 95.

A single small *Brissopsis*, 23 mm. long by 18 mm. wide, with a well-marked anal fasciole, was taken at St. VI, 114 fms., and is best referred to this widespread species, extending somewhat the southern limit of the known range.

Metalia spatagus (Linnaeus).

Echinus spatagus, Linnaeus, 1758, Syst. Nat. ed. X, p. 665.

Metalia spatagus, Lovén, 1887, Bih. svensk. Vetensk. Akad. Handl. XIII, Afd. IV, No. 5, p. 162.

Three specimens of this *Metalia* are of great interest because of their very large size, and the fact that the species has not hitherto been recorded from Australia. They have no locality labels but are supposed to be from Low Isles. The first two are about 102 mm. long, 86 mm. wide and 50 mm. high: one is a perfectly bare and bleached test, the other is nearly bare and somewhat broken, but is not bleached. The third is the largest recorded specimen yet recorded, measuring $110 \times 93 \times 52$ mm.; it still has many spines present on the dorsal surface, and is not at all bleached.

Metalia sternalis (Lamarck).

Spatangus sternalis, Lamarck, 1816, Anim. s. Vert. III, p. 31.

Brissus sternalis, Gray, 1855, Cat. Recent Echinida, pt. 1, p. 51.

There are only two small specimens of this common species, already known from the Queensland coast. They are bare, bleached specimens labelled "*Brissus* sp., Low Id. Off Port Douglas, Queensland." They are $37 \times 32\frac{1}{2}$ mm. and $49\frac{1}{2} \times 46$ mm., but even in the smaller, the confluence of the posterior petals has begun.

Maretia ovata (Leske).

Spatangus ovatus, Leske, 1778, Addit. ad Klein nat. disposit. Echin. p. 188, pl. xlix, figs. 12, 13.

Maretia ovata, Hamann, 1903, Bronn's Thierreich, II, abt. 3, p. 1397.

There are thirty specimens of this common spatangoid, ranging in size from 28×25 to 48×40 mm. Most of them are of the usual cream colour, with the petals, and often some conspicuous dorsal interradial blotches, dark brown, purplish or dusky; a few specimens show little indication of the darker shades. They are from the following places:

Off north-east of Low Isles, about 8 fms., mud bottom with stones, Sept., 1928 ; off west of Low Isles, mud and gravel, 15.xi.28 ; Sts. VIII, 11 fms. ; XIX, 10 fms. ; XXV, 20-25 fms.

Lovenia elongata (Gray).

Spatangus elongatus, Gray, 1845, Eyre, Journ. Exped. Centr. Australia, I, p. 436, pl. vi, fig. 2.

Lovenia elongata, Gray, 1851, Ann. Mag. Nat. Hist. (2), VII, p. 131.

Three small specimens all from Low Isles represent this species, already well known from Australia. One is from "north-east of Low Isles, about 8 fms. mud bottom with stones," and one is from "west of Low Isles, mud and gravel"; these two were taken with *Maretia*. The largest specimen, not yet half grown, is 40 × 30 mm.; it is labelled "*Breynia australiae*. Low Id." Oddly enough the common and characteristic Australian spatangoid *Breynia* is not represented in the present collection.

HOLOTHURIOIDEA.

Although the collection of holothurians contains only 159 specimens, they represent no fewer than 43 species, of 14 genera. It is undoubtedly the most interesting and important of the four echinoderm groups which I have examined, as it includes not only two new species, but five species and one genus new to Australia and three other species new to Queensland. The new species (*Thyone perforata*, *Phyllophorus trapezus*) both belong to perplexing genera, but are, I believe, very well characterized. The genus and species new to Australia (*Mesothuria parva*) belongs to one of the deep-water groups that is not characteristic of any particular geographical area, and its occurrence therefore at St. XV is not unexpected. Of the other species new to Australia, three belong to the heterogeneous assemblage still included under *Holothuria* (*H. albiventer*, *fuscio-olivacea* and *pleuripus*) and the fourth is a *Pentacta* (*P. jagorii*) of uncertain status. The three species new to Queensland (*Phyllophorus holothurioides*, *Pseudocucumis intercedens* *Pentacta coerulea*) have all been reported in recent years from the north-western coast of Australia. Of the 43 species in the collection, 26 were taken in the immediate vicinity of the Low Isles; 9 species were taken at St. XVII and 9 at St. XIX, both of these places being near Lizard Island.

Opheodesoma sp. ?

There are two fragments of a synaptid from St. XVII, 19 fms., very dark grey in colour with big, white patches made up of spicules. These show that the specimen is an *Opheodesoma*, but as the head end is wanting, it would be unwise, if not impossible, to assign it to any particular species; it is quite probably *grisea*.

Polyplectana kefersteinii (Selenka).

Synapta kefersteinii, Selenka, 1867, Z. wiss. Zool. XVII, p. 360, pl. xx, figs. 120-121.

Polyplectana kefersteinii, H. L. Clark, 1908, Smithson. Contr. Knowl. XXXV, Apodous Holothurians, pp. 16, 22, 77, pl. iv, figs. 20-22.

A couple of fragments without a head and in poor condition seem to represent this species. There is no locality label save "Probably from Low Isles."

Synapta maculata (Chamisso and Eysenhardt).

Holothuria maculata, Chamisso and Eysenhardt, 1821, Nov. Acta Leop. Carol. X, pt. 2, p. 352.

Synapta maculata, Jäger, 1833, De Holothuriis, p. 15.

There are two typical specimens of this well-known form, each with 15 tentacles; one, 425 mm. long and 30 mm. in diameter, is labelled simply "Low Isles"; the other, 900 mm. long, but only 15-20 mm. in diameter, is labelled "G.B.R.E."

Synaptula recta (Semper).

Synapta recta, Semper 1863, Reisen im Archipel, der Philippinen, I. Holothurien, p. 14.

Synaptula recta, H. L. Clark, 1908, Smithson. Contr. Knowl. XXXV, Apodous Holothurians, p. 84.

This species is represented by two specimens, neither of which is, however, typical. One is a light-coloured individual bearing the label "Mangrove Park, 17.iv.29," which has the calcareous particles and other features of *recta*, but possesses 15 equal tentacles; it is 70 mm. long and about 4 mm. in diameter: the tentacles are notably long, 7 mm., and the colour is uniformly pale brown; it seems better to consider this specimen a somewhat aberrant *recta*, than make it the type of a new species; I cannot consider it as either *reciprocans* or *rosea*, the only 15-tentacled species in the genus. The other specimen is about the same size, but of a darker colour, and is in two wretched fragments; there are apparently 12 tentacles, but it is hard to decide whether they are equal or not. This individual was dredged at St. XIII, 16½ fms.

Polycheira rufescens (Brandt).

Chrodota rufescens, Brandt, 1835, Rec. Actes Acad. Imp. Sci. St. Pétersb. p. 259. [Reprinted as Prodr. Deser. Anim. p. 59.]

Polycheira rufescens, H. L. Clark, 1908, Smithson. Contr. Knowl. XXXV, Apodous Holothurians, p. 120.

There are 15 specimens of this holothurian in the collection, but they call for little comment, except that the occurrence at Low Isles is a considerable southern extension of the known range. Most of these individuals are small, the largest measuring 95 mm. in length and 15 in diameter. They are of different shades of brown, and show great diversity in the number of wheel papillae. They were collected at the following places: Snapper Island, Gen. Survey, 7.iii.29; Gen. Survey, Inner Rampart, 20.iii.29; RD and R16, 22.iii.29; Tripneustes Spit, 21.iii.29.

Thyone papuensis, Théel.

Thyone fusus, var. *papuensis*, Théel, 1886, Voy. "Challenger," XIV, pt. 39, Holothurioidea, 2, p. 92, pl. viii, fig. 1.

Thyone papuensis, H. L. Clark, 1921, Pap. Dept. Mar. Biol. Carn. Instn. X, p. 167.

There are three Thyones which I am referring to this species, but my study of them has led me to the conviction that the group of species related to *fusus*, as shown by the calcareous particles, is sadly in need of revision. The specimens at hand are as follows: St. XIX, 10 fms., a small individual, less than 20 mm. long, but 7 mm. in diameter,

with very numerous pedicels ventrally, but dorsally with few pedicels, 15–20 of which are situated on wart-like elevations, which might be called papillae; these papillae form a series on each side of the dorsal surface, and tend to give the body a more or less quadrangular form. The calcareous ring and particles in the body-wall correspond well with Théel's description of what he found in *papuensis*. From "off north of east, Low Isles, 19. x. 28, Agassiz trawling, 12 fms., mud," there is a specimen, about 60 mm. by 25, with tentacles well expanded but in poor condition, which shows no marked difference between the dorsal and ventral surfaces, though the pedicels are perhaps fewer and larger dorsally; the calcareous ring and particles answer almost perfectly to Théel's figures and description. The third specimen is, like the smallest, from St. XIX, 10 fms., but is very large, nearly 100 mm. long (not including the tentacles) and 25 mm. in diameter; the tentacles are notably big, the dorsal ones over 30 mm. long when fully extended; there is no marked difference between the dorsal and ventral surfaces and no indication that the body was ever quadrangular; the calcareous ring is very heavy and the posterior prolongations of the radial pieces are much shorter than in the smaller specimens, where they exceed the height of the ring itself. The calcareous particles in the body-wall are not distinguishable from those of the smaller specimens.

It seems to me, from the evidence of these three specimens, that Ludwig's *mirabilis* is identical with Théel's *papuensis*, and that both are very near *fuscus*. But, as Dr. Deichmann called to my attention, the pedicels in the Australian species are noticeably larger than in the European and lack the curved supporting rod-tables so common in *fuscus*. I think Semper's *villosus* from the Philippines may be identical with the Australian form, and several other forms described from the East Indian region also have tables more or less like those of *fuscus*. Until I have examined more material I propose to let the Low Isles *Thyone* bear the name suggested by Théel, but it probably should be called *mirabilis* Ludwig, as that name is earlier than Théel's.

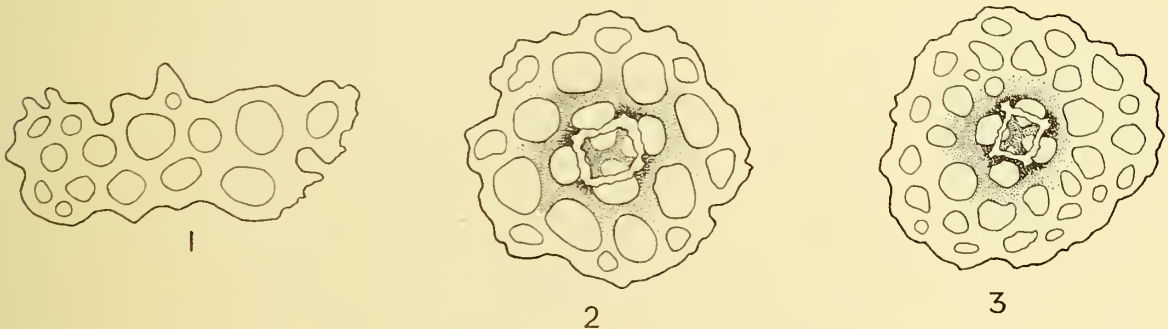
Thyone perforata,* sp. nov.

Length from mouth to anus along the somewhat concave back about 13 mm., but along the convex ventral side it is more than 20 mm.; diameter about 7 mm.; body nearly cylindrical at middle. Tentacles strongly contracted, apparently 9, with one smaller than the others; probably 10, with two small ones as usual in *Thyone*. Pedicels numerous all over the body, but distinctly less numerous on dorsal side. Anal teeth present, or, at least, anal papillae markedly calcified. Calcareous ring relatively large and stout; radial pieces 2 mm. high, of which about .75 mm. consists of posterior prolongations; inter-radial pieces 1 mm. high, of which about one-third is the acute anterior point, and nearly 1 mm. wide; neither radial nor interradial pieces have the appearance of being made up of smaller pieces, as is so often the case in *Thyone*. Polian vessel single, rather conspicuous. Madreporic canal single, slender.

Calcareous particles, tables and perforated plates. Tables of two kinds, but both are characterized by large discs with many perforations, and a more or less complete spire; in one kind (Text-fig. 2), which I believe are youthful and would probably be lacking in adult specimens, the perforations are regularly arranged, four at the centre, then a circle

* The name is selected because of the large number of perforations in the disks of the tables.

of eight very large ones and then eight much smaller ones; this outer circle is usually incomplete and often wanting; in the mature tables (Text-fig. 3) the four central perforations are present, but smaller than in the youthful ones, while distal to them are many perforations of diverse sizes, but generally small, and quite irregularly arranged. In both sorts of tables the spire is commonly incomplete; it may consist merely of four vertical pointed rods, one arising from each of the bars which separate the four central perforations; these rods are, however, commonly united with each other by a single, median bar, forked at each end, giving a point of contact with each vertical rod; generally the vertical rods extend considerably above the connecting bar, and at the upper end send out two horizontal projections, at right angles to each other, growing out towards the corresponding projections of the neighbouring rods; these horizontal projections ultimately meet their fellows and fuse with them, forming a quadrilateral top to the spire; when complete this top carries several small and irregularly projecting teeth, usually at the corners. Very



Thyone perforata, sp. nov.

TEXT-FIG. 1.—Perforated plate from dorsal body-wall.

TEXT-FIG. 2.—Youthful table.

TEXT-FIG. 3.—Mature table. All figures $\times 445$.

few tables have a complete spire, but probably in an adult individual the tables would be more generally complete. When fully developed, the height of the spire is rather more than half the diameter of the disc. The perforated plates (Text-fig. 1) are of diverse sizes and shapes, but are usually longer than wide; they may be constricted at the middle or they may be widest at that point. Neither terminal plates nor supporting rods have been detected in the pedicels, beyond question, but I believe terminal plates are present. The tables seem to be most abundant ventrally and scarce or wanting dorsally; the perforated plates, on the other hand, are scarce ventrally and more common, but by no means abundant dorsally; nowhere are the calcareous particles sufficiently common to overlap one another; they are usually well spaced in the body-wall, even ventrally.

Colour of specimen light grey; tentacles dark brown. The unique holotype of this noteworthy species was taken at St. XII in "Penguin Channel, 10–15½ fms., rock and shell gravel, mud on edges of pit." So far as I can see this interesting *Thyone* is quite unlike any species as yet described, the characteristic tables setting it apart very distinctly from all the known species of the genus, and I do not think there can be any doubt that it is a *Thyone*.

Thyone sacellus (Selenka).

Stolus sacellus, Selenka, 1867, Z. wiss. Zool. XVII, p. 355, pl. xx, figs. 115, 116.

Thyone sacella, von Marenzeller, 1882, Verh. Zool.-Bot. Ges. Wien, XXXI, p. 134.

A specimen from St. X, 14-17 fms., seems to be of this species. It is 40 × 10 mm. and bright brown in colour. The pedicels are few, especially on the back.

Phyllophorus holothurioides, Ludwig.

Ludwig, 1875, Arb. Zool. Inst. Würzburg, II, p. 96.

Two small holothurians undoubtedly belong to this species, which has previously been reported from the East Indies and north-western Australia; thus addition is made to the fauna of the Queensland coast. Like Ekman's specimen from north-western Australia, these individuals are very small, only about one-third as large as Ludwig's type. One is 25 × 13 mm., strongly contracted and dark grey in colour; the pedicels are rather numerous and irregularly scattered, except at the ends of the body, where they are confined to a double series in each ambulacrum, most evident posteriorly; the calcareous particles and ring are like Ekman's figures; this specimen was dredged at St. XIX, 10 fms. The other individual, 25 × 9 mm., was taken at St. XVII, 19 fms., is of a light brown colour and the pedicels are apparently confined to the ambulacra; the calcareous ring and particles are similar to those of the specimen from St. XIX; the tentacles appear to be quite definitely arranged in an outer circle of five pairs of rather large tentacles and an inner circle of five pairs of much smaller tentacles alternating with them.

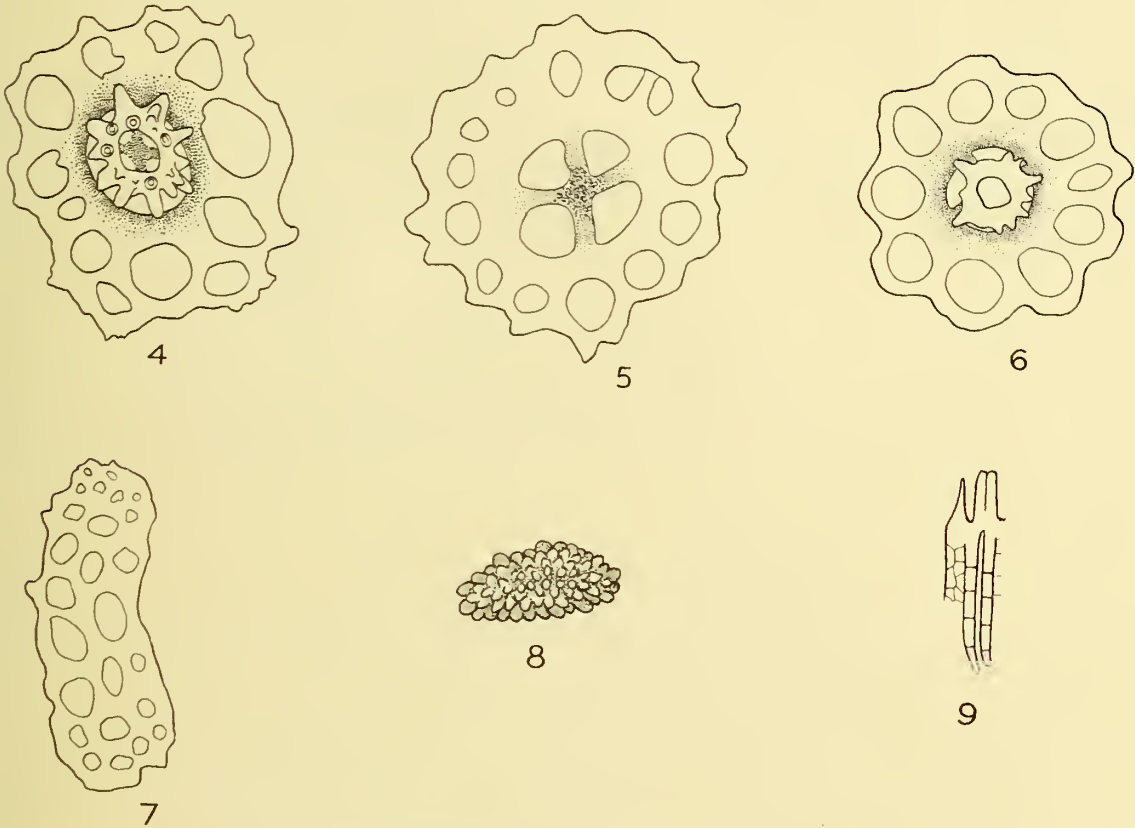
Phyllophorus trapezus,* sp. nov.

Length from tip of expanded tentacles to anus, along the concave dorsal side, 37 mm.; along the convex ventral surface, 57 mm.; diameter about 8 mm.; body nearly cylindrical at middle, but tapering towards each end, especially posteriorly. Tentacles 20, fully expanded, 5 pairs of large ones (about 7 mm. long) alternating with 5 pairs of small ones (about 2 mm. long). Pedicels numerous all over the body, but both anteriorly and posteriorly they form a distinct double series in each ambulacrum, with none on the interambulacra between; this is, however, for a distance of only 2-3 mm.; at the middle of the body the terminal discs of the pedicels are about 0.4 mm. in diameter. Calcareous ring (Text-fig. 9) relatively high and stout (about 5 mm. high, with posterior prolongations of radial pieces about 7 mm. more); radial pieces square cut at anterior end, very deeply forked posteriorly, each posterior prolongation being made up of several pieces; a deep longitudinal furrow on the outer surface nearly divides the anterior part of the plate into two narrow pieces; interradial pieces long, narrow, very acute anteriorly, truncate posteriorly; posterior half made up of 5-7 pieces. Polian vessel single of moderate size. Madreporic canal not detected.

Calcareous particles, tables, perforated plates and miliary granular plates. The granular plates (Text-fig. 8) are found only in the introvert, so far as known, and are not

* This name is selected because of the characteristic tables in the skin.

abundant there; they may be circular, oval or elliptical in form, but are noticeably convex, at least on the outer surface. The perforated plates (Text-fig. 7) are found only at the tips of the pedicels close to the terminal plates, which are large and circular. The tables are found well distributed over the body surface, but are nowhere abundant; the disk is circular (Text-fig. 5) or more or less quadrangular (Text-fig. 4), with the margin



Phyllophorus trapezus, sp. nov.

TEXT-FIG. 4.—Table with base more or less quadrilateral, from holotype.

TEXT-FIG. 5.—Table with more circular base, seen from below, from holotype.

TEXT-FIG. 6.—Table from one of the paratypes.

TEXT-FIG. 7.—Supporting plate from pedicel.

TEXT-FIG. 8.—Miliary granule from introvert of holotype.

TEXT-FIG. 9.—A piece of the calcarous ring, $\times 2$.

Text-figs. 4-8 \times c. 450.

undulate or more or less rough, with projecting teeth, which are usually blunt or rounded at tip; there is a large perforation at centre, and around this is a circle of about 10 nearly circular perforations of considerable size (Text-fig. 6), usually with a number of smaller holes irregularly placed distal to them. The spire is about as tall as the diameter of the disk, is well developed, and crowned with a complete circular or square summit, open at the centre, and bearing a number of projecting blunt spines, as shown in Text-figs. 4 and 6.

Colour of holotype light yellowish brown, with tentacles a pale brown; one of the

paratypes is a similar yellow brown, but the others are considerably darker, in part at least because they are much more contracted.

The holotype was taken at Low Isles. The 6 paratypes, of which the largest is 35 mm. long and 15 mm. in diameter, were dredged $\frac{1}{4}$ mile south of Cape Kimberley in 4 fms. on a bottom of shell and gravel, 2nd December, 1928.

The paratypes are all much contracted, but the calcareous particles are so similar to those of the holotype, I feel sure of their identity. In one of the smaller ones the tables are nearly all as shown in Text-fig. 6; I believe these are more youthful tables than the majority of those found in the holotype; in all of the specimens some of the tables are of the youthful type. There is no doubt that this species of *Phyllophorus* is nearly related to *cebuensis* (Semper) and *fragilis*, Ohshima, but it is easily distinguished from the former by the calcareous ring and from the latter by the tables. Unfortunately our knowledge of *cebuensis* is very incomplete, as no description of the calcareous particles has ever been published and Semper's single figure is very inadequate. Ohshima's description and figures of *fragilis* are very satisfactory, and the resemblance between *fragilis* and *trapezus* in general appearance and in the calcareous ring is striking, but the tables in the Japanese species have a low and usually incomplete spire, so I do not think the Australian specimens may be properly referred to it. Of course, abundance of material from the East Indian region may show sufficient diversity to prove that *cebuensis*, *fragilis* and *trapezus* are really but a single species.

Pseudocucumis africanus (Semper).

Cucumaria africana, Semper, 1868, Reisen im Archipel der Philippinen. I, Holothurien, p. 53, pl. xv, fig. 16.

Pseudocucumis africana, Ludwig, 1888, Zool. Jahrb. Syst. III, p. 815.

This little holothurian, easily recognized by its very characteristic calcareous plates, is represented in the present collection by three specimens, 30–35 mm. long, from Low Isles, labelled "*Holothuria (atra?)*"; eleven specimens, 18–40 mm. long, from Low Isles, labelled "Only under coral blocks, juv."; one specimen, 18 mm. long, from Three Isles, 5th May, 1929.

Pseudocucumis intercedens, Lampert.

Lampert, 1885, Semper, Reisen im Archipel der Philippinen. IV, Abt. 3, Die Seewalzen, p. 254, fig. 54A.

The holotype of this species was from an unknown locality, but in 1886 Ludwig recorded a specimen from Amoy, China. It was not reported again until 1918, when Ekman discussed three individuals, one quite immature, from the north-western coast of Australia. It is therefore of much interest to find three specimens in the present collection; the largest, 36 mm. long, is a typical specimen from St. XVII, 19 fms.; a second, only 20 mm. long, much contracted, but typical, is from St. XVI 20 fms.; the third, from St. IX, 12–14 fms., although 30 mm. long, has a very thin body-wall with small tables, such as Ekman describes as found in a juvenal specimen examined by him. There is some ground for believing that *P. eurystichus*, H. L. C., from Friday Island, Torres Strait, is really identical with *intercedens*, but a re-examination of the holotype of that species leaves me in doubt. The Torres Strait specimen has more pedicels

and wider ambulacra. and the calcareous ring is heavier and has distinct posterior prolongations on the radial pieces, though these are somewhat exaggerated in my original figure. These differences may prove to be due to age, but for the present the two species may be permitted to stand. There is no important difference in the calcareous particles, the tables being essentially alike in the two forms.

Actinocucumis typica, Ludwig.

Ludwig. 1875, Arb. Zool. Inst. Würzburg, II. p. 91.

At St. XIX, 10 fms., a very fine specimen of this species was taken. It is 125 mm. long by 20 mm. in diameter and bright brown in colour. The body-wall is notably firm, though not particularly thick.

Pentacta coerulea (Semper).

Colochirus coeruleus, Semper, 1868, Reisen im Archipel der Philippinen. I. Holothurien, p. 59, pl. xi, fig. 1; pl. xiii, fig. 18; pl. xiv, figs. 1, 14; pl. xv, fig. 1.
= *Colochirus quadrangularis*, auct. mult. since 1846.

For many years this holothurian has borne the name *quadrangularis* (Lesson), but Ekman (1918) has pointed out that Lesson's species was an aspidochirote and his name ought not to be used for a dendrochirote form. As I fully agree with this conclusion, I am adopting Semper's name, which is accompanied in its original publication with an adequate description and beautiful figures. Lesson's *Holothuria quadrangularis* is probably a *Stichopus*, and the figure and description would do fairly well for *chloronotus* (Brandt) except for colour. As the type locality is a bay on Waigeou, a place rarely visited by zoologist or collector, it is not impossible that *quadrangularis* is a valid species.

In the present collection are five specimens representing *Pentacta coerulea*: A small specimen, 65 × 22 mm., dredged at St. XII, 10–15½ fms., a very young one, only 19 × 6 mm., at St. XIV, 19 fms., and three very dark coloured individuals (the largest 110 × 35 mm.) at St. XIX, 10 fms. The species has not been recorded hitherto from the Queensland coast.

Pentacta cucumis (Semper).

Colochirus cucumis, Semper, 1868, Reisen im Archipel der Philippinen. I, Holothurien, p. 58, pl. xiii, fig. 17; pl. xiv, fig. 16.

Pentacta cucumis, H. L. Clark, 1921, Pap. Dept. Mar. Biol. Carn. Instn. X, p. 171.

I am referring to this species a small holothurian, 25 × 11 mm. in its contracted condition, which was taken at St. XVI, 19 fms. It is probably young, but the calcareous particles warrant referring it to Semper's species. It must be said, however, that there is no genus of holothurians in which the species are more confused than in *Pentacta*, and one may not hope to be sure of the identity of any small specimens, until the group has been carefully revised.

Pentacta jagorii (Semper).

Colochirus jagorii, Semper, 1868, Reisen im Archipel der Philippinen. I, Holothurien, p. 60.

A small *Pentacta* from St. XVII, 19 fms., has been the source of much perplexity. Both Dr. Deichmann and I were inclined to regard it as a specimen of *P. australis*, Ludwig, which we do not consider a synonym of *doliolum*, Pallas. But the more critically it has been studied, the more difficult it has been to identify it with Ludwig's species, and I was about to set it down as an undescribed form, when my attention was directed to Semper's *Colochirus jagorii* from Singapore. The original description is very brief, and not accompanied by any figures; so far as I know, no further information regarding *jagorii* has been published, but Théel (1886) expressed the opinion that it may be identical with *quadrangularis*, Lesson. This does not seem to me probable.

The *Pentacta* before me, which I am referring to *jagorii*, agrees very well with Semper's description of that species, and it seems better to me to refer it to *jagorii* than to describe it as new. But a full description of the present specimen is here given so that in the future, when material from Singapore is available, it may be possible to determine whether the Australian form really is identical therewith. The individual from St. XVII is markedly quadrangular, becoming pentagonal anteriorly and rounded pentagonal at the posterior end. It is 42 mm. long, 8 mm. wide and 7 mm. high, 10 mm. from the anterior end, and 5 mm. wide and 4 mm. high close to the posterior end. Body-wall thick and hard, more or less rigid, from the abundance of calcareous plates and particles which it contains. Mouth terminal, not wholly closed by the five equal well-developed, triangular oral valves; these valves terminate the radii of course, and each bears 2 or 3 papillae (like those of the ambulacra, but smaller) and several small tubercles. Dorsal ambulacra each with a single series of 7 or 8 large, irregularly spaced papillae, about 2 mm. high by 1 in diameter; these papillae are truncate, and have a distinctly pedicel-like tip, with a terminal plate. Each lateral ambulacrum has a series of about a dozen similar papillae, somewhat smaller, more retractile and more like pedicels; this series is on the dorsal margin of the ambulacrum, and ventral to it are two or more crowded series of pedicels, which are fully retracted. Midventral ambulacrum with a double series of large pedicels, which are strongly retracted; it is uncertain whether there are additional pedicels on each side still more retracted; both anteriorly and posteriorly this ventral band of pedicels is replaced by large papillae like those of the dorsal radii, anteriorly there are two such, one in front of the other; posteriorly there are two, placed side by side. Besides the papillae and pedicels of the ambulacra, there seem to have been much smaller pedicels scattered all over the interambulacra; owing to the strongly contracted condition of the appendages, however, it is uncertain whether these are really indications of pedicels, or merely pits in the outer layer of the body-wall. Anus surrounded by overlapping scales, which are well developed, but are distinctly seen only when the animal is partly dried; they could hardly be called distinct "teeth."

Tentacles 10, the 2 ventral much smaller than the others, which are only moderately retractile owing to the large amount of calcareous material which they contain in the form of densely crowded perforated supporting rods. Calcareous ring simple and not peculiar; there are no posterior prolongations, but each piece is concave posteriorly and has a long anterior projection; the projections of the radial pieces to which the retractor muscles

are attached are wider and blunter than those of the interradial pieces. There is a single rather large Polian vessel and two moderately developed clusters of genital tubes. Not more than a single stone canal is present.

Calcareous particles of the body-wall excessively numerous. The innermost layer is made up, as usual in *Pentacta*, of large, irregular, unequal plates or scales, many of which are a millimeter or more across. External to this is a thin but crowded layer of perforated plates and ellipses, no two of which are exactly alike: the fundamental form of these plates, which are rather delicate in structure, has four large perforations, ten or more marginal projections, and about ten small knobs on the outer (upper) surface; the number of perforations is generally more than four, and there is a tendency for projections and arches to grow up, meet and transform the plate into a perforated ellipse, which, however, is provided with numerous knobs and projections; on the other hand, many of the plates are more or less imperfectly developed. It is useless to give figures of these plates, so great is their diversity of detail; many of them are almost exactly like those found in *Pentacta minuta* and other species of the genus. Large, thick, knobbed buttons or plates, such as are characteristic of *australis* and *minuta*, seem to be quite lacking. The outermost layer of the body-wall is made up of somewhat compressed "baskets" or reticulate hemispheres, as deep as they are wide, with smooth outer surface and only a few rather coarse, marginal teeth. Supporting rods of pedicels in the form of narrow perforated plates; those of the tentacles, curved or bent rods, perforated at the ends and often at the middle also. Colour greyish white, with a brownish tinge on back and sides; terminal branches of tentacles dark brown.

A comparison of the above description with the brief diagnosis of *jagorii* given by Semper shows some points of difference which call for comment. Semper's specimen was considerably stouter, the dorsal papillae were bigger, and the pedicels in the ventral ambulacra much more numerous, but such differences might easily be due to age and degree of contraction. It is uncertain whether *jagorii* has the large papillae along the latero-ventral margins, but it may be inferred that they were present, since Semper calls especial attention to the presence of such papillae anteriorly and posteriorly on the ventral surface; it is quite unlikely these would be present if the lateral ones were absent. There is little significance in the absence of the "numerous, small" stone-canals on the circumoral water-ring to which Semper refers; this might be a matter of age or condition. Of course if such a difference were found to be constant, it would be of great interest and importance.

Pentacta minuta (Ludwig).

Colochirus minutus, Ludwig, 1875, Arb. Zool. Inst. Würzburg, II, p. 89.

Two small specimens of *Pentacta*, quite unlike in external appearance, but identical in their calcareous deposits, are best referred to this species, which is still very imperfectly known. The type locality is Bowen, Queensland. The smaller specimen is 28 mm. long, and 4 mm. in diameter; the form is distinctly quadrangular, but the body-wall is thin and not very rigid; the dorsal ambulacra bear a few fully retracted pedicels (or papillae?) and are not clearly indicated; each of the three ventral ambulacra is marked by a double series of large pedicels; the ten tentacles are well expanded, the two ventral conspicuously smaller than the others; colour of both body and tentacles light brown.

This individual was dredged at St. XVI, 20 fms. The larger specimen was taken at St. IX, 12-14 fms., and has a very different appearance. The colour is nearly white, the tentacles are fully retracted, and the hard body is sharply quadrangular. The dorsal ambulacra bear small pedicels, many of which are on papillae of irregular size and appearance, each series forming a dorso-lateral angle of the body; the ventro-lateral angles are formed by a similar series, immediately below which is an imperfect double series of large pedicels; the midventral ambulacrum is indicated by a somewhat irregular series of large pedicels, double at each end, but at least four pedicels wide at the middle; many ventral pedicels are imperfectly or little contracted, owing apparently to the numerous calcareous rods and plates in the walls. This specimen is over 40 mm. long, 8 mm. wide and 7 mm. high.

In both specimens the calcareous particles correspond so well with the descriptions and figures given by Théel (1886) and Erwe (1913) that I do not see any differences worth noting. As in all *Pentactas*, there is the greatest diversity in the individual particles of any particular kind, but it would be futile to try to describe or figure all of these. It is still uncertain whether the differences between *minuta* and *australis* are really specific or whether they are merely a matter of age.

Pentacta tuberculosa (Quoy and Gaimard).

Holothuria tuberculosa, Quoy and Gaimard, 1833, Voy. "Astrolabe," IV, p. 131.

Pentacta tuberculosus, H. L. Clark, 1921, Pap. Dept. Mar. Biol. Carn. Instn. X, p. 171.

Ten strongly contracted specimens, showing no indication of the living colour or form, represent this common species, which ranges from southern Japan to Port Jackson, N.S.W. None of these specimens is full grown and none call for comment; seven were taken at St. XIX, 10 fms., and one each at St. XIV, 19 fms., St. XVII, 19 fms., and in 12 fms., on muddy bottom, north of east of Low Isles, 16.x.28.

Mesothuria parva, Théel.

Mesothuria murrayi, var. *parva*, Théel, 1886, Voy. "Challenger," Zool. XIV, Holothurioidea, pt. 2, p. 186, pl. ix, fig. 2; pl. xvi, figs. 4, 5.

Mesothuria parva, Fisher, 1907, Proc. U.S. Nat. Mus. XXXII, p. 686, pl. lxxi, figs. 2A-C.

At St. XV, 210 fms., three specimens of this species were taken. They measure in their present condition 55 × 13 mm., 90 × 20 mm. and 150 × 30 mm. They are pale grey, with the tentacles darker. The bare ventral area is least evident in the smallest and most conspicuous in the largest specimen. The calcareous particles are similar in the three specimens, and agree well with Fisher's description and figures. He is, I believe, quite right in considering *parva* a species distinct from *murrayi*. The genus has not hitherto been recorded from Australian seas.

Holothuria albiventer, Semper.

Semper, 1868, Reisen im Archipel der Philippinen. I, Holothurien, p. 83, pl. xxx, fig. 14; pl. xxxv, fig. 5.

There are two strongly contrasted individuals from St. XVII, 19 fms., which seem to represent this East Indian species not hitherto known from Australia. They

are each about 35×18 mm., and show no marked contrast in colour between the upper and lower surfaces. A third specimen, 55×20 mm., from St. XII, 10–15½ fms., is not quite so strongly contracted, and the ventral surface is conspicuously lighter than the dorsal. The calcareous particles, especially the tables, are somewhat different from those of the other specimens, but these differences do not seem to be significant.

Holothuria arenicola, Semper.

Semper, 1868, Reisen im Archipel der Philippinen. I, Holothurien, p. 81, pl. xx; pl. xxx, fig. 13; pl. xxxv, fig. 4.

This common and widespread species is represented by three specimens, of which two, from General Survey I, are strongly contracted, and yet are 180–190 mm. long by 20 mm. in diameter; they are strongly tinged with rust-colour—such a frequent characteristic of the species. The third specimen, labelled only Low Isles, is smaller (150×30 mm.) and not at all rusty, but the characteristic dark blotches of the dorsal side are well marked.

Holothuria atra, Jaeger.

Jaeger, 1833, De Holothuriis, p. 22.

This common species is represented by 8 specimens: 1 from Low Isles; 2 small ones also from Low Isles; 2 large ones (150×50 mm.), very black, "killed in fresh water, sand flats, covered with a sand film, 7.ix.28"; and 3 specimens, 80–150 mm. long, from "Low Island, off Port Douglas, Queensland."

Holothuria coluber, Semper.

Semper, 1868, Reisen im Archipel der Philippinen, I, Holothurien, p. 90, pl. xxviii; pl. xxx, fig. 28.

A single, average specimen is in the collection from "Gen. Survey 1M1."

Holothuria curiosa, Ludwig.

Ludwig, 1875, Arb. Zool. Inst. Würzburg, II, p. 110.

This species, originally described from Bowen, Queensland, is represented by a single small (75×17 mm.) but typical specimen from Low Isles. The general colour is brownish grey, but the periproctal area is very dark in striking contrast; dark rings at the base of the papillae are present, but are not conspicuous; they were a marked feature of Théel's specimen from Fiji, which was 180 mm. long.

Holothuria edulis, Lesson.

Lesson, 1830, Cent. Zool. p. 125.

There are two very typical specimens of this common species; the smaller, 150 mm. long by 25 mm. thick, dark slate grey above, light grey below, has no locality label; the larger (175×37 mm.), from Linden Bank, St. V, 29.xi.28, has the upper surface and the

middle of the oral surface dusky, the remainder of the oral surface dirty cream colour. In life the species is quite handsome, the upper surface brown and the lower bright rose-colour, but alcohol completely destroys the beauty.

Holothuria erinaceus, Semper.

Semper, 1878, Reisen im Archipel der Philippinen. I, Holothurien, p. 91, pl. xxx, figs. 23, 24.

This species is represented by a single small specimen, 30×12 mm., from Gen. survey, 6d, 22.iii.29. It has been recorded from Port Mackay, Queensland.

Holothuria fusco-olivacea, Fisher.

Fisher, 1907, Proc. U.S. Nat. Mus. XXXII, p. 672, pl. lxix, figs. 3, 3a-f; pl. lxx, fig. 3.

Although this species has hitherto been known only from the Hawaiian Islands, I venture to refer to it a holothurian, 60×15 mm., from Low Isles. It answers so well to Fisher's description and figures, and the calcareous particles are so characteristic that I feel no doubt as to the identity. But there are no light rings around the dorsal papillae, so far as I can see, and I found none of the "very large tables," of which Fisher says they are "few." I am inclined to think it possible that these large tables do not really belong to this species, but came from a specimen of *Stichopus tropicalis*. Everyone who has worked with holothurian material knows how easy it is for spicules from one species to appear in preparations from a totally different form. Where any form of spicule is notably infrequent, suspicion as to its normal presence may well be aroused.

Holothuria hypamma, H. L. Clark.

H. L. Clark, 1921, Pap. Dept. Mar. Biol. Carn. Instn. X, p. 177, pl. xxxviii, figs. 20-24.

There is a single typical specimen, 50 mm. long, 20 mm. wide and 10 mm. thick, from Low Isles.

Holothuria impatiens (Forskål).

Fistularia impatiens Forskål, 1775, Descr. Anim. p. 121.

Holothuria impatiens Gmelin, 1788, Linn. Syst. Nat. ed. XIII, I, pt. 6, p. 3142.

There are sixteen specimens of this widespread, puzzling holothurian, which show such diversity of form and colour, it is hard to admit that they represent only a single species. They range from 35 to 200 mm. in length, with the large ones fully 30 mm. in diameter. The colour ranges from the uniform purplish-grey of "variety *concolor*" to a rich red brown. Several specimens have the papillae yellow in marked contrast to the purplish-grey body-wall. One small specimen is almost whitish with dark spots dorsally. As Fisher pointed out, the papillae have the tips quite like pedicels, with well-formed terminal plates. Several of the specimens have no label, and others are marked as from Low Isles only, but the following definite localities are given: Tripneustes Spit, 21.iii.29; extra collection E. A. F., RA. On the whole the calcareous particles of this species are quite distinctive and easily recognized. It seems to be true, however, that large

specimens have the tables larger, with several or sometimes many small perforations peripheral to the usual nine holes in the disk, and the top of the spire crowded with numerous teeth. But I can find no satisfactory characters by which *botellus*, Selenka, as figured by Semper, can be separated from *impatiens*, even though I feel strongly inclined to doubt their identity.

Holothuria leucospilota (Brandt).

Stichopus (Gymnochirota) leucospilota Brandt, 1835, Rec. Actes Acad. Imp. Sci. St. Pétersb. p. 251. [Reprinted as *Prædr. descr. Anim.* p. 51.]

Holothuria leucospilota, Ludwig, 1881, Z. wiss. Zool. XXXV, p. 595.

There are nine small specimens, under 100 mm. long, from the following localities: Low Isles; Three Isles, 5.v.29; Three Isles, 8.iii.29. The species is so well known, these specimens call for no comment.

Holothuria marmorata (Jaeger).

Bohadschia marmorata, Jaeger, 1833, De Holothuriis, p. 18.

Holothuria marmorata. Semper, 1868, Reisen im Archipel der Philippinen. I, Holothurien, p. 79, pl. xxx, fig. 10; pl. xxxv, fig. 3.

There are two small, much-contracted specimens from Low Isles, one with the label 1M1.

Holothuria martensii, Semper.

Semper, 1868, Reisen im Archipel der Philippinen, I, Holothurien, p. 86, pl. xxx, fig. 16.

There are two fine examples of this notable species, taken in the vicinity of Lizard Island; one, 70 mm. long, 29 mm. wide and only 16 mm. high, was dredged at St. XXII, 13½ fms.; the other, 80 × 28 × 24 mm., was dredged at St. XXIII, 8 fms. In the smaller specimen the ventral papillae are very white. Study of this material satisfies me that *Holothuria subverta*, H. L. Clark, from the Murray Islands, is based on a specimen of this remarkable form.

Holothuria monacaria, Lesson.

Lesson, 1830, Cent. Zool. p. 225.

It is curious that this species, common at the Murray Islands and also found at Green Island near Cairns, should be represented in the present collection by only a single, poor, small specimen, labelled simply Low Isles.

Holothuria notabilis, Ludwig.

Ludwig, 1875, Arb. Zool. Inst. Würzburg, II, p. 102.

After much hesitation I have decided to refer to this species, originally described from Bowen, Queensland, two holothurians, one from 4 fms. ¼ mile south of Cape Kimberley, the other from Low Isles. The former is much contracted, about 50 mm. long by

17 mm. in diameter; the latter is in much better condition, about 80×20 mm. Both are deep brown above, lighter ventrally, with numerous whitish spots, in each of which is a pedicel; on the dorsal side is a double series of blackish blotches, which are rather faintly indicated, particularly in the larger specimen. The calcareous particles are quite distinctive and correspond fairly well with Ludwig's description (his figures are inadequate), but a large proportion of the buttons have more than three pairs of holes; Ludwig does not refer to the number of holes, merely saying the buttons are small. The tables range from perfectly-formed ones, with a disk having the margin spiny and a normal spire terminating in a nearly circular, ring-like top carrying a few teeth, to more or less aborted ones, the extreme form having no spire, being thus reduced to small concave plates with a few marginal spines and several irregular perforations, like Ludwig's figures. The calcareous ring is moderately stout, but the radial plates are not at all like Ludwig's figure, as they are wide, do not project posteriorly, and have that margin strongly concave. As already noted, the colour corresponds only imperfectly to Ludwig's description; he makes no mention of the numerous nearly whitish spots, which are so conspicuous in the present specimens. The internal organs of these specimens are in poor condition, but apparently Cuvier's organs were present. On the whole, it seems to me better to consider these individuals as *notabilis* rather than to describe them as a new species; the similarity in the calcareous particles is too marked.

Holothuria ocellata (Jaeger).

Bohadschia ocellata, Jaeger, 1833, De Holothuriis, p. 19.

Holothuria ocellata, Semper, 1868, Reisen im Archipel der Philippinen. I, Holothurien, p. 80.

A very fine typical specimen of this handsome species was dredged at St. XXI, 10 fms. It is 150 mm. long, 45 mm. wide and only 30 mm. high; the lateral margins are pronounced. In preparing my list of the echinoderms of Torres Strait (1921), this species was carelessly overlooked. It is closely related to *martensii*; the two should be separated generically from typical *Holothuria*. The description and figures given by Théel (1886) of the Challenger specimen from Torres Strait is what warrants referring the present specimen to Jaeger's species.

Holothuria pardalis, Selenka.

Selenka, 1867, Z. wiss. Zool. XVII, p. 336, pl. xix, fig. 85.

There are four specimens of this common species, but all are small and much contracted. One has no locality label, and one is labelled "Gen. Survey, RD and R16, 22.iii.1929." The other specimens are notable for the very numerous heaps of calcareous "buttons."

Holothuria pervicax, Selenka.

Selenka, 1867, Z. wiss. Zool. XVII, p. 327, pl. xviii, fig. 54.

The single specimen of this species is about 175 mm. long and was dredged at St. XIV, 19 fms. The colour is uniformly dark with no dorsal blotches, but the spicules,

calcareous ring and internal anatomy are typical. There is a label reading: "Holothurian from which *Fierasfer* was obtained."

Holothuria pleuripus (Haacke).

Cystipus pleuripus, Haacke in Möbius, 1880, Beiträge zur Meeresf. der Insel Mauritius, p. 47.

Holothuria pleuripus, Ludwig, 1883, Ber. Oberhess. Ges. Nat- u. Heilk. XXII, p. 174.

A little, flat holothurian, 16 mm. long, 9 mm. wide and only 4 mm. high. of a nearly white colour. was collected at Low Isles. There are large papillae dorsally, and numerous pedicels in approximately three series on the ventral side. The calcareous spicules are very characteristic, and seem to me more like those of this species than they are like those of *bowensis* Ludwig. the closely related species described from a single specimen, 45 mm. long, from Bowen, Queensland. It is possible that the two species will prove to be identical when more material is available.

Holothuria scabra, Jaeger.

Jaeger, 1833, De Holothuriis, p. 23.

There are four adult specimens, ranging in size from 170 × 90 mm. to 300 × 60 mm. All are of the usual finely speckled grey, and only one has large, dark blotches on the dorsal side. They were taken at Low Isles, and one is also labelled IM1. I am also referring to this species two small, grey holothurians, only about 60 × 17 mm., whose calcareous deposits are in general like those of *scabra*. But a surprisingly large proportion of the buttons are asymmetrical and have 4-6 pairs of holes, while, as Théel says, in adults the buttons are mostly symmetrical, with three pairs of holes. Possibly in youth the character of the buttons is less fixed.

Stichopus chloronotus, Brandt.

Brandt, 1835, Rec. Actes Acad. Imp. Sci. St. Pétersb. p. 250. [Reprinted as Prodr. descr. Anim. p. 50.]

There are four specimens, ranging from 150 × 35 mm. to 240 × 45 mm. On two bright rust-brown specimens the dorsal and lateral papillae are very conspicuous. The other specimens (RP3) call for no comment.

Stichopus horrens, Selenka.

Selenka, 1867, Z. wiss. Zool. XVII, p. 316, pl. xviii, figs. 27-29.

There are five small adults (80-125 mm.), of which four were dredged at St. XIX, 10 fms., while one is labelled "South moat among dead branches of *Porites*." I am also referring to this species a little holothurian, about 10 mm. long by 6 mm. wide, translucent white, and with only 15 tentacles, but with calcareous particles which indicate it is a *Stichopus* and probably *horrens*. It is labelled "Gen. Survey, between Anchorage Reefs and Tripneustes Spit, 11.iv.29."

Stichopus variegatus, Semper.

Semper, 1868, *Reisen im Archipel der Philippinen*. I, Holothurien, p. 73, pl. xvi; pl. xxx, figs. 1, 6; pl. xxxv, fig. 1.

There are five specimens of this species, of which one very large one (300 × 100 mm.) is in poor condition, having been badly cut into. The smallest specimen measures 150 × 27 mm.

Actinopyga miliaris (Quoy and Gaimard).

Holothuria miliaris, Quoy and Gaimard, 1833, *Voy. "Astrolabe,"* IV, p. 137.

Actinopyga miliaris, Bell, 1887, *Sci. Trans. R. Dublin Soc.* (2), III, p. 653, pl. xl, fig. 1.

This holothurian, commercially valuable as "black-fish," is represented in the present collection by two typical specimens, about 200 mm. long; one is from St. XVII, 19 fms. and the other is from St. XIX, 10 fms.

LIST OF STATIONS.

Particulars of reef-collecting stations are contained in "The Structure and Ecology of Low Isles and Other Reefs," by T. A. Stephenson, Anne Stephenson, G. Tandy and M. Spender, 'Great Barrier Reef Exped. 1928-1929, *Sci. Repts.*, iii, 2, 112 pp., 27 pls., 1931. The dredging stations are as follows:

- I. "Merinda." 24.xi.28. Linden Bank, 20 fathoms; coral bottom; dredge 30 minutes.
- II, III. "Merinda." 24.xi.28. Linden Bank, 28 fathoms; shell and sand; dredge 10 minutes and 5 minutes.
- IV. "Merinda." 24.xi.28. Linden Bank, 38 fathoms; mud; dredge 15 minutes.
- V. "Merinda." 24.xi.28. Linden Bank, 37 fathoms; mud; Agassiz 30 minutes.
- VI. "Merinda." 24.xi.28. Off Linden Bank, 114 fathoms; mud; dredge 15 minutes.
- VII. "Merinda." 24.xi.28. Off Linden Bank, 114 fathoms; mud; Agassiz 15 minutes.
- VIII. "Magneta." 21.ii.29. 1½ miles N.W. Low Isle, 11 fathoms; mud; 2 dredges, 30 minutes and 15 minutes; 1 Agassiz 30 minutes; 1 grab.
- IX. "Magneta." 22.ii.29. Penguin Channel, 12-14 fathoms; in clean pit and on mud at sides; 6 dredges about 20 minutes each.
- X. "Magneta." 22.ii.29. Across Satellite Reef, working on sides to S.W. and N.E., 14-17 fathoms; coral, shell, gravel and mud; 2 dredges, 20 minutes each.
- XI. "Magneta." 23.ii.29. Inside Wentworth Reef, 7 fathoms; mud and rock; 5 dredges, about 15 minutes each.
- XII. "Magneta." 24.ii.29. Penguin Channel, 10-15½ fathoms; rock and shell gravel, mud on edges of pit; 5 dredges, about 30 minutes each.
- XIII. "Magneta." 7.iii.29. ½ mile W. of Two Isles, 16¼ fathoms; hard; 2 dredges, 20 minutes each.
- XIV. "Magneta." 7.iii.29. ½ mile S.E. Lizard Island, 19 fathoms; shell gravel; 3 dredges, 20-30 minutes each. Rich Halimeda.
- XV. "Magneta." 8.iii.29. ½ mile outside Cook's Passage, drifting N., 210 fathoms; clean sand and coral *débris*; 2 dredges, 30 and 45 minutes; 1 Agassiz, 30 minutes.

- XVI. "Magneta." 9.iii.29. About $\frac{1}{2}$ mile W. of N. Direction Island, 20 fathoms; stony; 6 dredges, 20–30 minutes each.
- XVII. "Magneta." 9.iii.29. About $\frac{1}{4}$ mile N. of N. Direction Island, 19 fathoms; sand, thick Halimeda; 2 dredges, 40 minutes each.
- XVIII. "Magneta." 9.iii.29. $\frac{1}{2}$ mile S.E. Lizard Island, 20 fathoms; shell gravel, rich Halimeda; 1 Agassiz, 35 minutes.
- XIX. "Magneta." 10.iii.29. About $\frac{1}{2}$ mile N. of Eagle Island, 10 fathoms; shell gravel, rich Halimeda; 3 dredges, 20–30 minutes.
- XX. "Magneta." 10.iii.29. About $\frac{1}{4}$ mile N. Eagle Island, 6 fathoms; coral; 3 short dredges, quickly caught in coral.
- XXI. "Magneta." 11.iii.29. $\frac{1}{2}$ mile N.W. Howick Island, 10 fathoms; mud and shell, forams; 2 dredges, 30 and 40 minutes.
- XXII. "Magneta." 11.iii.29. To East of Snake Reef, $13\frac{1}{2}$ fathoms; mud with forams. and shells; 2 dredges, $\frac{1}{2}$ hour each.
- XXIII. "Magneta." 12.iii.29. In lee of Turtle Isles, 8 fathoms; mud and shell; 3 dredges, two 30 minutes, one 45 minutes.
- XXIV. "Magneta." 13.iii.29. $\frac{3}{4}$ mile N.E. Pasco Reef, $16\frac{1}{2}$ fathoms; hard and shell bottom; 6 dredges, all poor, as twine broke every time owing to great movement of boat.
- XXV. "Magneta." 17.iii.29. In Papuan Pass, 20–25 fathoms; forams. and coral fragments; series of dredgings, $2\frac{1}{4}$ hours in all.
- XXVI. "Magneta." 18.iii.29. Papuan Pass, ? fathoms; dredge and 340 metre wire lost.
- XXVII. "Magneta." 18.iii.29. Papuan Pass, 17 fathoms; coarse sand; series of dredgings, $1\frac{1}{2}$ hours in all.

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DESCRIPTION OF PLATE I.

Ophiocoma delicata.

- FIG. 1.—Aboral surface, natural size.
FIG. 2.—Aboral surface of disk and proximal arm-joints, $\times 3$.
FIG. 3.—Oral surface of same, $\times 3$.

Pericosmus macronesius.

- FIG. 4.—Aboral surface, natural size.

Laganum dyscritum.

- FIG. 5.—Paratype, aboral surface, natural size.
FIG. 6.—Paratype, oral surface, natural size.
FIG. 7.—Paratype, side view, natural size.
FIG. 8.—Holotype, aboral surface, natural size.
FIG. 9.—Holotype, oral surface, natural size.

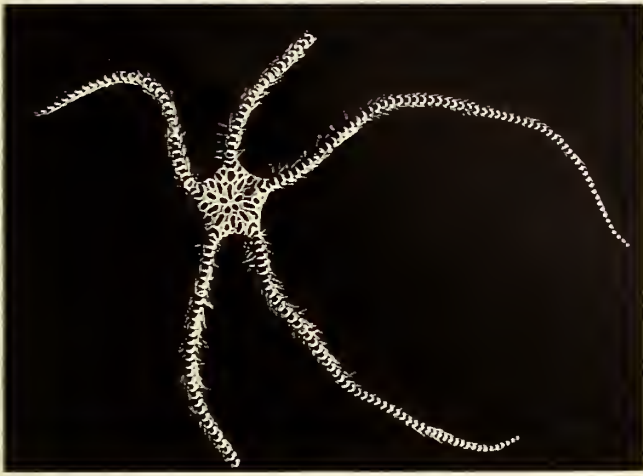


FIG. 1.

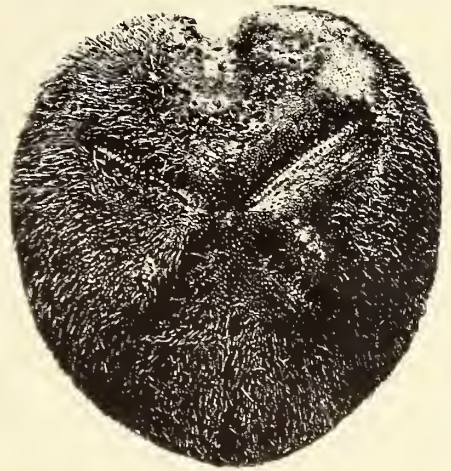


FIG. 4.



FIG. 2.



FIG. 5.

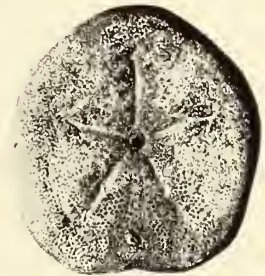


FIG. 6.



FIG. 3.



FIG. 7.

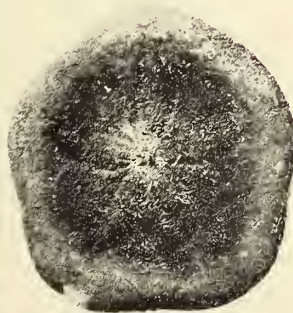


FIG. 8.

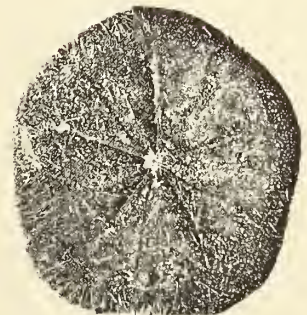


FIG. 9.