

## CRINOIDEA

The crinoid fauna of Australia, so far as is now known, is made up of 101 species, of which 18 (11 genera) are extinct. The 83 living species (grouped in 44 genera) are most abundant on or about the coral reefs of tropical Australia, but a few hardy species brave the cooler waters of the southern coast. Only 3 species of Recent stalked crinoid have as yet been taken, and of one of these, a single specimen from an unknown locality is all we have. The other 2 are known only from moderately deep water, 90-200 fms., off the northwestern and southeastern corners of the continent. Both at Mer near the northern end of the Barrier Reef, and at Broome on the northwestern coast, the free-living, unstalked crinoids are abundant, with some 20 species in each region. But on the coast of New South Wales only 3 or 4 small species occur, and at the southwestern corner of the continent only 5 or 6 species are as yet known. The extinct crinoids are all, except 2, stalked forms which have been found for the most part in the strata of Queensland, New South Wales, and Victoria. A few interesting forms, however, have been obtained in Western Australia. None of them have any direct relationship with the existing crinoid fauna. In connection with the preparation of this section on the crinoids, Mr. Austin Hobart Clark's invaluable publications have been of inestimable service, and his friendly assistance by correspondence and conversation entitles him to my warmest thanks.

### KEY TO THE ORDERS OF CRINOIDEA

- A. Lower brachials part of dorsal cup; all are now extinct:
  - All plates of calyx united by close sutures, and immovable ..... *Camerata*
  - Plates of calyx variously incorporated in dorsal cup, but never rigidly ..... *Flexibilia*
- AA. Lower brachials free above radials and not normally incorporated in dorsal cup:
  - Tegmen plated; mouth subtegmenal; all now extinct ..... *Inadunata*
  - Tegmen coriaceous, with minute calcareous particles, which may be enlarged into small plates; mouth and food grooves exposed; many extinct but chiefly Recent ..... *Articulata*

### Order \*CAMERATA

Three families in this order are known from Australian strata. All are extinct. They may be distinguished from one another as follows:

#### KEY TO THE FAMILIES OF CAMERATA

- A. Base hexagonal; radials separated posteriorly by anal plate:
  - Anal plate heptagonal, followed by 3 plates ..... *Batocrinidae*
  - Anal plate hexagonal, followed by 2 plates ..... *Actinocrinidae*
- AA. Base pentagonal; radials not separated by an anal plate ..... *Platycrinidae*

## Family \*BATOCCRINIDAE

Although some 40 genera have been described and referred to this family, only a single one has been as yet discovered in Australia. This genus was first described from the Silurian rocks of England and Gotland (Sweden). Since the Australian species is based on a single, very incomplete specimen, which came from rocks dubiously indicated as Carboniferous, there is good reason for being skeptical as to the occurrence in Australia of crinoids congeneric with the European species.

## \*PERIECHOCRINUS

*Perieochrinites* Thomas Austin and Thomas Austin, Jr., 1842. Ann. Mag. Nat. Hist., vol. 10, p. 110 (*nomen nudum*).

*Perieochrinites* Thomas Austin and Thomas Austin, Jr., 1843. Ann. Mag. Nat. Hist., vol. 11, p. 203.

*Perieochrinus* Morris, 1843. Cat. Brit. Foss., p. 56.

Genotype: *Perieochrinites articulatus* Austins, 1843, p. 204.

It is, as already suggested, extremely doubtful whether this genus ever really occurred in Australia, but until we have much better and more abundant material, we must accept the identification of so good an authority as Etheridge, who recognizes the following species.

## \*Perieochrinus indicator

Etheridge, 1892. Mem. Geol. Surv. N. S. Wales, Palaeontol., no. 5, pt. 2, p. 78; pl. 22, fig. 4.

A single imperfect specimen, from New South Wales, "Chalky Gully, Wollumba River, Co. Gloucester: ?Carboniferous," is the only basis for this name. "Some flattened and decorticated plates" from "Greenhills, Paterson to Dungog Road, Co. Durham, Mirari Limestone, Carboniferous" are, however, also referred by Etheridge to *Perieochrinus*, as he considers the resemblance to *indicator* "strong," but the specific distinctness "evident."

## Family \*ACTINOCRINIDAE

This is a smaller family than the preceding, with only 10 to 12 genera, nearly all North American. Its right to a place in the Australian fauna is even more dubious than that of the Batocrinidae, although de Koninck is sure that his Australian material is identical with that from Ireland and refers it to the Irish species of the following genus.

## \*ACTINOCRINUS

*Actinocrinites* Miller, 1821. Nat. hist. Crin., p. 94.

*Actinocrinus* L. Agassiz, 1835a. Mem. Soc. sci. nat. Neuchâtel, vol. 1, p. 196.

Genotype: *Actinocrinites triacontadactylus* Miller, 1821, p. 95.

The material so far collected which is referred to this genus has been designated as "sp. indet." or has been referred to the following species originally described from Ireland.

## \*Actinocrinus polydactylus

Miller, 1821. Nat. hist. Crin., p. 103; pl. 1, figs. 1, 2.

The fragmentary material referred to *Actinocrinus* has come from the following localities. That which de Koninck (1877, p. 160) unhesitatingly calls *polydactylus* was from "un psammite grisâtre" at Glen William, New South Wales. McCoy (1847, p. 229) notes the occurrence of "fragments of pelvic plates of this genus" in the Dunvegan shale (Carboniferous), but makes no attempt to give them specific designation. Etheridge (1892, p. 77) refers to "impressions of a few highly ornamented plates" found "in the Star Series of Corner Creek" and the "Gympie Series of the Rockhampton district," which he refers provisionally to *Actinocrinus*. He also describes and figures 2 fragmentary specimens from the Mirari Limestone (Carboniferous) at Greenhills, Paterson to Dungog Road, County Durham, New South Wales. He believes these are identical with de Koninck's material, but considers their identity with the European *polydactylus* "very problematical." The truth is, there is no satisfactory evidence of the occurrence of the European *Actinocrinus* in Australia.

## Family \*PLATYCRINIDAE

This family is represented in Australia by 2 quite distinct genera, which may be distinguished by these characters:

Tegmen low; stem cylindrical	.....	<i>Hapalocrinus</i>
Tegmen fairly high; stem pentagonal	.....	<i>Helicocrinus</i>

## \*HAPALOCRINUS

Jaekel, 1895. Palaeontol. Abhandl., vol. 7, no. 1, p. 95.

Genotype: *Hapalocrinus elegans* Jaekel, 1895, p. 96.

This genus was based on material from the Paleozoic rocks of Germany, usually considered to be Lower Devonian. The single Australian species was described by one of the best paleontologists who ever studied fossil crinoids, and yet one can but wonder whether there is really a generic relationship between the Devonian European crinoid and the Australian Silurian species.

## \*Hapalocrinus victoriae

Bather, 1897. Geol. Mag., n. s., dec. 4, vol. 4, p. 337; pl. 15.

The specimen on which this species is based was found in supposedly Silurian rocks, in the vicinity of the Yarra Improvement Works near Princes Bridge, Melbourne, Victoria. Additional material is still lacking.

## \*HELICOCRINUS

Chapman, 1903. Proc. Roy. Soc. Victoria, n. s., vol. 15, p. 107.

Genotype: *Helicocrinus plumosus* Chapman, 1903, p. 108.

This genus seems to be well justified by the splendid condition of the handsome fossil on which it is based, but it is still monotypic and the type specimen unique.

**\*Helicocrinus plumosus**

Chapman, 1903. Proc. Roy. Soc. Victoria, n. s., vol. 15, p. 108; pls. 17, 18, figs. 1-5.

The type specimen of this crinoid is a beautifully preserved fossil of striking appearance. It was found in a quarry at West Brunswick, Victoria, between Albert and Victoria streets, in rocks considered to be of Silurian age. No further material has been obtained.

Order **\*FLEXIBILIA**

Only a single crinoid which belongs in this order has as yet been found in Australia.

Family **\*LECANOCRINIDAE**

The members of this family have the infrabasals forming a noticeable part of the calyx wall; the crown is commonly small, more or less rotund, with arms abutting, frequently interlocking, and closely infolding distally.

**\*LECANOCRINUS**

J. Hall, 1852. Nat. hist. New York, Palaeontol., vol. 2, p. 199.

Genotype: *Lecanocrinus macropetalus* Hall, 1852, p. 199.

This genus is based on American material but is known also from England and Gotland (Sweden). A single specimen of a remarkable crinoid from New South Wales is considered by Chapman to be congeneric with a Swedish species.

**\*Lecanocrinus breviararticulatus**

Chapman, 1934a. Proc. Roy. Soc. Victoria, n. s., vol. 47, p. 190; pl. 10.

The unique holotype of this species was collected long ago in Silurian rocks at Hatton's Corner, Yass, New South Wales. Height of crown 34 mm., greatest width 31.5 mm.

Order **\*INADUNATA**

Of the 17 families recognized in this order, only 2 seem to deserve a place in this catalogue, although fragmentary specimens have been listed under the names of genera belonging elsewhere. The single small calyx on which *Synbathocrinus ogivalis* de Koninck (1877, p. 158) is based is not an adequate basis for a species, and *Cyathocrinites pinnatus* Blandowski (1858, p. 132) rests on even less satisfactory material. Chapman suggests (*in litt.*) it may possibly be based on fragments of *Helicocrinus plumosus* (*q.v.*). The 2 inadunate families deserving place here may be distinguished thus:

Arms with 2 main branches bearing smaller rami..... Botryocrinidae  
Arms pinnulate, dichotomous, branching frequently..... Poteriocrinidae

Family **\*BOTRYOCRINIDAE**

Only a single genus of this family has been found in Australia.

**\*BOTRYOCRINUS**

Angelin, 1878. Icon. Crin. Silur., p. 24.

Genotype: *Botryocrinus ramosissimus* Angelin, 1878, p. 24.

The records in Australia for this genus of England, Sweden, and North America rest upon relatively imperfect remains of a single species from one locality.

**\*Botryocrinus longibrachiatus**

Chapman, 1903. Proc. Roy. Soc. Victoria, n. s., vol. 15, p. 108; pl. 18, figs. 6-8.

Our knowledge of this crinoid is based on remains "chiefly in casts, in bluish micaceous sandstone" of Silurian age, occurring at Royal Park, Brunswick, Victoria. Relatively small, dorsal cup about 7.5 mm. high, 10 mm. wide at top and 3.5 mm. at bottom. Arms can be traced about 40 mm., and stem is not quite 3 mm. in diameter, 5 mm. from top.

Family **\*POTERIOCRINIDAE**

This large and diversified family is rather well represented in Australia by 9 species referred to 3 genera. But the material is fragmentary and leaves much to be desired as the basis for specific or even generic determinations. The following key shows on what grounds the 3 genera are distinguished:

## KEY TO THE GENERA OF POTERIOCRINIDAE

- A. Infrabasals 5; calyx not globose:  
     Radial present, arms dichotomous, branching freely..... *Poteriocrinus*  
     Radial wanting; arms 5-10, uniserial..... *Phialocrinus*  
 AA. Infrabasals 3; calyx globose..... *Tribrachyocrinus*

**\*POTERIOCRINUS**

*Poteriocrinites* Miller, 1821. Nat. hist. Crin., p. 67.

*Poteriocrinus* L. Agassiz, 1835a. Mem. Soc. sci. nat. Neuchâtel, vol. 1, p. 197.

Genotype: *Poteriocrinites crassus* Miller, 1821, p. 68.

The occurrence of this genus in Australia was first noted by de Koninck (1877, p. 159), though his material was so fragmentary that he was not able to identify it specifically. Some years later Etheridge (1892a, p. 209) gave a specific name, with description and figure, to what he believed was a member of this genus. He was not very sure of the genus, however, as he includes a question mark as part of the proposed name.

\**Poteriocrinus* (?) *smithii*

Etheridge, 1892a. In Jack and Etheridge, Geol. and palaeontol. Queensland, p. 209; pl. 8, fig. 1.

The specimen on which this name rests was collected by James Smith in the Gympie Beds (Carboniferous), at Stanwell, near Rockhampton, Queensland. The figure given indicates a well preserved specimen, but Etheridge says that "the state of preservation does not allow of an exact generic determination" (1892a, p. 82).

## \*PHIALOCRINUS

Eichwald, 1856. Bull. Soc. imp. nat. Moscou, vol. 29, no. 1, sec. 2, p. 114 (second).<sup>1</sup>

Genotype: *Phialocrinus impressus* Eichwald, 1856, p. 115 (second).

Whether this genus should be treated as a synonym of *Graphiocrinus* or not need not be entered into here. Both Trautschold (1879) and Wachsmuth and Springer (1879) overlooked Eichwald's original publication (1856) of *Phialocrinus* with diagnosis and designated species, *impressus*. Since Eichwald himself seems to ignore this paper in his "Lethaea Rossica" (1860), perhaps they can hardly be blamed. The fact remains that *Phialocrinus* must date from Eichwald, 1856. If his species *impressus* is really unrecognizable, then the generic name must be discarded. It surely cannot be used for any other genus. As Etheridge (1892) has used it for 4 Australian fossil crinoids, it seems best to make use of it here, especially as material is scanty and imperfect and the actual generic position of these forms is still open to debate. The 4 species accepted by Etheridge, all from Carboniferous or Permian rocks, may be distinguished by the following key:

## KEY TO THE SPECIES OF PHIALOCRINUS

- A. Size very large; calyx globular-globose:  
 Calyx base markedly depressed; infrabasal plates not visible in normal side view..... *konincki*  
 Calyx base not so depressed; infrabasal plates visible in side view..... *princeps*
- AA. Size not notably large; calyx depressed, more or less saucer-shaped (generic position dubious):  
 Costals more or less consolidated..... *stephensi*  
 Costals not consolidated..... *nodosus*

\**Phialocrinus konincki*

*Cyathocrinus konincki* de Koninck, 1877. Foss. Pal. Nouv.-Galles du Sud, pt. 3, p. 164; pl. 6, figs. 4-4b.

*Phialocrinus konincki* Etheridge, 1892. Mem. Geol. Surv. N. S. Wales, Palaeontol., no. 5, pt. 2, p. 107; pl. 16, figs. 1-4.

This fine large species is based on material from Osterly, on the banks of the Hunter River, New South Wales. Additional material has been collected at Nowra, County St. Vincent, New South Wales. Since the collector, W. B. Clarke, had nothing to do with either figuring or describing the species, de Koninck must be designated as the author. His intention to do as Clarke expressly stipulated is achieved, but he must bear the responsibility for the name himself. This is one

<sup>1</sup> The pagination in this volume is confusing; pages 1-151 have the page numbers repeated.

more illustration of the unwisdom of letting sentiment—no matter how worthy—determine the choice of a supposedly scientific name.

\**Phialocrinus princeps*

Etheridge, 1892. Mem. Geol. Surv. N. S. Wales, Palaeontol., no. 5, pt. 2, p. 110; pl. 17, fig. 1; pl. 18, fig. 1; pl. 22, fig. 5.

This very large and notable species is based on a remarkable specimen in the "Collection of the Maitland Scientific Society," which was found at Bow-wow Creek, Mount Vincent, near East Maitland, County Northumberland, New South Wales.

\**Phialocrinus* (?) *stephensi*

Etheridge, 1892. Mem. Geol. Surv. N. S. Wales, Palaeontol., no. 5, pt. 2, p. 113; pl. 20, figs. 1-5.

The single very imperfect specimen on which this species is based was found at Nowra, County St. Vincent, New South Wales. As even its generic position is uncertain, it might well be omitted from this volume, but in view of its authorship and possible relation to the other species referred to *Phialocrinus*, its inclusion is defensible.

\**Phialocrinus* (?) *nodosus*

Etheridge, 1892. Mem. Geol. Surv. N. S. Wales, Palaeontol., no. 5, pt. 2, p. 112; pl. 14, figs. 4, 5.

The single fragment on which this species is based was found at Copper Point, County St. Vincent, New South Wales, and is in the Australian Museum collection. Its inclusion here is even less justifiable than that of *P. stephensi*.

## \*TRIBRACHYOCRINUS

McCoy, 1847. Ann. Mag. Nat. Hist., vol. 20, p. 228.

Genotype: *Tribrachyocrinus clarkii* McCoy, 1847, p. 228.

This definitely Australian genus was based on material from Darlington, New South Wales, which McCoy saw was quite different from any of the genera of fossil crinoids known up to that time. In a belief, apparently, that there were only three arms, he gave his new genus the name *Tribrachyocrinus*, but he makes no statement as to the derivation of the name. Wachsmuth and Springer (1886), assuming that the name referred to three arms (τριβράχια), emended the spelling to *Tribrachyocrinus*, but under the International Code such an emendation is hardly justifiable, and it seems better to retain the original spelling. Since the genus was established more material has been obtained, and 4 species have been recognized, all Carboniferous or Permian. They may be distinguished as follows:

## KEY TO THE SPECIES OF TRIBRACHYOCRINUS

- A. Calyx highly asymmetrical, with protuberant posterior side:  
 Calyx plates smooth, or, when decorticated, with delicate concentric ridges..... *clarkii*  
 Calyx plates with characteristic ornamentation..... *ornatus*

AA. Calyx more or less symmetrical, with posterior side hardly at all protuberant:

- Calyx globose; sculpture in form of spots and anastomosing, tubercular, vermicular grooves ..... *corrugatus*  
 Calyx depressed (saucer-shaped); sculpture delicate, concentric lines or minute, compact granulation ..... *granulatus*

**\*Tribrachyocrinus clarkei**

McCoy, 1847. Ann. Mag. Nat. Hist., vol. 20, p. 228; pl. 12, figs. 2a-c.

The specimen on which McCoy based his new genus and species was collected by the widely known geologist W. B. Clarke, for whom, by his own statement in his description, McCoy intended to name his species. By an obvious *lapsus calami*, however, he wrote the collector's name as Clark and the specific name as *clarkii*. The correction to *clarkei* was made by Ratte (1885) and has been generally accepted. According to Etheridge (1892), a considerable number of specimens of this crinoid have been found in New South Wales, but only in the Upper Marine series of strata. Fragments have also been found in Tasmania which Etheridge refers to this species.

**\*Tribrachyocrinus ornatus**

Etheridge, 1892. Mem. Geol. Surv. N. S. Wales., Palaeontol., no. 5, pt. 2, p. 94; pl. 19.

The single specimen on which this species is based was found in the Nowra Grit, Upper Marine series, County St. Vincent, New South Wales. Calyx 60 mm. in diameter, arms over 150 mm. in length. Etheridge says it is the only species of the genus in which any trace of arms has been observed.

**\*Tribrachyocrinus corrugatus**

Ratte, 1885. Proc. Linn. Soc. N. S. Wales, vol. 9, p. 1158; pl. 68, figs. 1-12.

Several specimens of this well marked species have been found in County Camden, New South Wales, in the Upper Marine series. The sculpture of the plates when well preserved is very characteristic, but unfortunately the ridges are apt to be worn.

**\*Tribrachyocrinus granulatus**

Etheridge, 1892. Mem. Geol. Surv. N. S. Wales, Palaeontol., no. 5, pt. 2, p. 97; pl. 22, figs. 2, 3.

A single, rather small calyx is the basis of this species. It is characterized by ornamentation which Etheridge considers "can hardly be mistaken" for that of *corrugatus*, to which species *granulatus* is apparently closely allied. The unique type was found on the "banks of the Minumurra River, near Jamberoo, Co. Camden, N. S. W., in the Upper Marine Series."

Order ARTICULATA

This order contains all Recent crinoids as well as many extinct forms. The arrangement of the numerous genera in natural families and higher groups is complicated

by the fact that the obvious feature which sets off the Recent comatulids so sharply from the Recent stalked forms is not of great morphological importance, and any effort to group the stalked forms apart from the comatulids tends to do violence to natural relationships. The arrangement here used is offered in the hope that it makes provision for a fairly natural definition and sequence of families without doing great violence to natural relationships. The first step is the recognition of 3 suborders, which may be distinguished as follows:

KEY TO THE SUBORDERS OF ARTICULATA

- More or less elongated stalk, of many segments and usually without cirri, retained throughout life; radicular outgrowths may be present at base of stalk, or rudimentary cirri elsewhere. Non-Australian ..... Apiocrinida  
 Stalk present or wanting, but cirri usually numerous, in regular whorls when stalk is present, or clustered about a small or rudimentary columnal or centrodorsal plate; if cirri are wholly wanting, centrodorsal is a smooth, flat, more or less pentagonal plate ..... Pentacrinida  
 Cirri wanting; stalk short with a few long segments, or wanting (body directly attached), or replaced by short, thick, unsegmented support. Non-Australian ..... Holopocrinida

Suborder APIOCRINIDA

Although this suborder has not yet been taken in Australian waters, it is probably represented there. There are 4 families, which may be distinguished thus:

KEY TO THE FAMILIES OF APIOCRINIDA

- A. Distal part of stem with radicular cirri, and not enlarged into a terminal stem plate ..... Bourgueticrinidae  
 AA. No radicular cirri:  
 B. Distal end of stem enlarged into a heavy terminal plate:  
 Proximal end of stem enlarged and continuous with sides of calyx ..... Apiocrinidae  
 Proximal end of stem not enlarged ..... Phrynocrinidae  
 BB. Neither end of stem enlarged ..... Plicatocrinidae

The last family, Plicatocrinidae, might better perhaps be placed in the order Inadunata, as suggested by A. H. Clark (1913).

Suborder PENTACRINIDA

This suborder is large and varied and includes all the living crinoids known from Australian seas. For convenience it may be divided into 2 sections, but the division is probably more artificial than natural.

- With more or less of a stem persistent throughout life ..... Caulocrinida  
 With no persistent stem, though so far as known the early stages of development are stemmed ..... Comatulida

Section *Caulocrinida*

The Caulocrinida include but 2 families, one of which (Thiolliericrinidae) is based on and known only from a single genus of European Jurassic and Cretaceous

fossils, *Thiolliericrinus*, which has the stem persistent but consisting of only a single nodal, enlarged and thickened. The other family, PENTACRINIDAE, has a more or less well developed stem with cirri arranged in whorls. More than a dozen genera have been named, but their limits are by no means clear and several are of dubious validity. The Australian species are considered as representing 3 genera, the differences between which are shown in the following key:

## KEY TO THE GENERA OF PENTACRINIDAE

- A. First axillary beyond third, almost always beyond fourth, postradial ossicle ..... *Metacrinus*  
 AA. Second postradial ossicle an axillary:  
 Division series with more than 4 elements ..... *Isocrinus*  
 Division series with fewer than 5 elements, often only 2 or even 1 ..... *Teliocrinus*

## METACRINUS

Carpenter, 1882a. Bull. Mus. Comp. Zool., vol. 10, p. 167.

Genotype: *Metacrinus wyvillii* Carpenter, 1884, pp. 339, 358, 360.

Two species of this genus are known from Australian seas, but the question has arisen whether one of these does not include 2 distinct species representing 2 different genera. The species from southeastern Victoria, described in 1916 as *Metacrinus cyaneus*, is the suspected form. A. H. Clark (1923, p. 9) says in a footnote: "It is evident from Dr. H. L. Clark's description of *Metacrinus cyaneus* that some of his specimens belonged to a species of this genus; the figure, however, represents a true *Metacrinus*." The genus *Saracrinus* A. H. Clark was distinguished from *Metacrinus* by a single character: "the fourth post-radial ossicle is the first axillary," whereas in *Metacrinus* "the first axillary is beyond the fourth, and is usually the seventh, post-radial ossicle." Gislen (1927, p. 66) discusses the validity of this character and cites considerable evidence to show its unreliability. His conclusion as to *Saracrinus* is, "I cannot consider this new genus as valid." My own observations on the material I have examined lead me to the same conclusion, and I am therefore recognizing only the 2 following species of *Metacrinus* from Australia, distinguishable thus:

- Longest cirri with 60-64 segments; third to fifth pinnules longest and largest ..... *cyaneus*  
 Longest cirri with 40-45 segments; first pinnule longest and largest ..... *interruptus*

*Metacrinus cyaneus*

H. L. Clark, 1916. "Endeavour" rept., p. 9; pl. 1.

This very handsome crinoid was met with by the "Endeavour" at three stations off the southeastern coast of Victoria in 90-200 fms. No other specimens of *Metacrinus* have been taken in Australian seas except at Sahul Bank, near Timor, nor indeed within 2500 miles of the region where *cyaneus* occurs, but the relationship of *cyaneus* to other species of *Metacrinus* seems to be open to debate. Austin H. Clark writes me that it is "very close to *M. wyvillii* and it is not quite clear just what the differences are." A cotype of *wyvillii* in the Museum of Comparative Zoology being available for comparison, reliance need not be placed wholly on Carpenter's (1884) description and figures. As regards the stem, the differences in form and

number of internodals, relation of cirri to nodals, form and size of cirrus sockets, number of cirrus joints, and character of stem surface preclude any belief that the two species are identical. The differences (all given in the very detailed description of *cyaneus*, of which there were 7 specimens) in the calyx, in the crown of arms, and particularly in the pinnules amply confirm this conclusion. As was stated in the original description, the Australian species is nearer to *rotundus*, but comparison with specimens of that Japanese species reveal such differences as to prevent any confusion between the two. Whereas *wyvillii* is a smaller, smoother, more delicate species than *cyaneus*, *rotundus* is a rougher, coarser species, nearly as large as, and stouter than, the Australian. The most conspicuous and perhaps the most important difference is in the lower pinnules; in *rotundus* the distal ventrolateral angle of the basal segments is conspicuously produced and spiniferous, but in *cyaneus* this is not the case. Gislen's (1922) opinion that *cyaneus* "ought to be considered as a variety of *M. rotundus*" is erroneous.

*Metacrinus interruptus*

Carpenter, 1884. "Challenger" stalked crin., p. 367; pl. 52.

There is room for debate as to the propriety of including this crinoid in the Australian fauna, since its nearest approach to the continent is at Sahul Bank, which is much nearer to Timor than to Australia. The Bank, however, is south of 9° 30' south latitude and within the 500-fm. line around the continent. Any echinoderms occurring there would almost surely be found sooner or later on Holothuria Bank or elsewhere in the shallow waters of the southern half of the Timor Sea. It is justifiable, therefore, to include *Metacrinus interruptus* in this volume, since Bell in his casual way says (1893, p. 339): "The specimens in the present collection were taken from a telegraph wire in 11° 30' S, 125° E, . . . the depth, unfortunately, is not given. . . . There can however be no doubt that the species is the *Metacrinus interruptus* of P. H. Carpenter." Since this identification has been confirmed by A. H. Clark (1911, pp. 794, 797), we may accept it, even though the following year (1912, p. 269) he himself lists *interruptus* from Sahul Bank with a question mark. The species is known from southern Japan and the Philippines.

## \*ISOCRINUS

von Meyer, 1837. Abhandl. Mus. senckenb., vol. 2, p. 251.

Genotype: *Isocrinus pendulus* von Meyer, 1837, p. 260.

Among the first crinoids found preserved in Australian strata were fragments of a large pentacrinoid to which the specific name *australis* was attached. Different writers have assigned it to different genera, but so far material has been inadequate for the determination of its ultimate position. The superficial resemblance to the figures of *Isocrinus pendulus*, the type species of that genus, are so striking, however (see von Meyer, 1837, pl. 16, figs. 1-5), that it seems justifiable to call the Australian fossil an *Isocrinus*.

\**Isocrinus australis*

*Pentacrinus australis* Moore, 1870. Quart. Jour. Geol. Soc. London, vol. 26, p. 243; pl. 17, fig. 3; pl. 18, fig. 1.

- Isocrinus australis* Etheridge, 1901. Bull. Geol. Surv. Queensland, vol. 13, p. 6; pl. 1, fig. 4; pl. 3, figs. 1-3.  
*Isocrinus australis* var. *albiscopularis* Etheridge, 1904. Rec. Australian Mus., vol. 5, p. 251; pl. 28, figs. 1-4.  
*Isocrinus parvus* Howchin, 1921. Trans. Roy. Soc. S. Australia, vol. 45, p. 1; pl. 1, figs. 1-3.

The more or less fragmentary remains of this species, which is undoubtedly the commonest fossil crinoid in Australia, have been found in the Cretaceous strata of various localities in Queensland, New South Wales, northern South Australia, and southeastern Northern Territory. Most of the material so far found consists of arm fragments, and really good material of calyx and stalk is still to be described. Fully grown specimens seem to have had arms more than 20 cm. long. Howchin's species *parvus* is apparently based on the terminal part of the arms of a young or at least small individual of *australis*; Etheridge's variety *albiscopularis* is a lithological, rather than a zoological, variety. Probably the crinoidal fragments found in Victoria and referred to *Pentacrinus stellatus* Hutton (1873, p. 38) might more properly be assigned to *Isocrinus australis*.

### TELIOCRINUS<sup>1</sup>

Döderlein, 1912. "Valdivia" stalked crin., p. 22.

Genotype: *Hypalocrinus springeri* A. H. Clark, 1909f, p. 650.

Almost at the same time that Döderlein named this group, A. H. Clark determined that it was worthy of recognition and called it *Comastrocrinus*. But Clark's name was not published for several weeks after Döderlein's. The German writer recognized but 1 species, whereas the American gave names to 3 different forms. In 1928, I gave a new name to a single specimen of *Teliocrinus* in the South Australian Museum, from an unknown locality, which seemed to me recognizably different from any of the 4 already described. Meanwhile, A. H. Clark had decided that all his species are identical with Döderlein's; but one of his was described before the German's, and hence, although Döderlein's genus stands, its type species is one of Clark's. Now, after examining some cirri and arms of my supposedly new species, Clark writes me: "I cannot see anything diagnostic in the fragments of the holotype of *Teliocrinus monarthrus*. They seem to agree perfectly with corresponding portions of the form I described as *Comastrocrinus liliaceus*. This species seems to be very variable and scarcely any two specimens are alike. It occurs chiefly in the Bay of Bengal ranging west to the west coast of India and south to the southern coast of Sumatra. It would be very likely to occur in the vicinity of Timor but I would not expect to find it in South Australian waters except that it might be picked up by a cable-ship working on one of the cables to Darwin in the Northern Territory." In view of Clark's much wider experience with the genus, I feel bound to accept his decision and regard *Teliocrinus* as monotypic.

#### *Teliocrinus springeri*

*Hypalocrinus springeri* A. H. Clark, 1909f. Proc. U. S. Nat. Mus., vol. 36, p. 650.  
*Teliocrinus asper* Döderlein, 1912. "Valdivia" stalked crin., p. 22.

<sup>1</sup> A blunder on my part (1928, p. 365) assigns this genus without comment or date to A. H. Clark.

- Comastrocrinus springeri* A. H. Clark, 1912. Crin. Indian Ocean, p. 254.  
*Hypalocrinus ornatus* A. H. Clark, 1909f. Proc. U. S. Nat. Mus., vol. 36, p. 651.  
*Hypalocrinus liliaceus* A. H. Clark, 1909c. Proc. Biol. Soc. Washington, vol. 22, p. 150.  
*Teliocrinus springeri* A. H. Clark, 1923. Jour. Washington Acad. Sci., vol. 13, p. 10.  
*Teliocrinus monarthrus* H. L. Clark, 1928. Rec. S. Australian Mus., vol. 3, p. 365.

The only excuse for including *Teliocrinus* in this list of Australian echinoderms is the occurrence of a specimen without a locality label in the collection of the South Australian Museum. It is a pure assumption, but by no means unwarrantable, that this specimen was taken in South Australian seas, probably (as suggested above) by a cable ship off the coast of the Northern Territory. Whether it is identical, as A. H. Clark believes, with the various forms from the Indian Ocean to which four names have been given remains to be proved, but I surrender to Clark's more experienced judgment. Only a much more considerable series of specimens can really solve the problem.

### Section *Comatulida*

This large group, containing most of the Recent crinoids, falls naturally into 3 superfamilies, as follows:

#### KEY TO THE SUPERFAMILIES OF COMATULIDA

- A. Pelagic forms with more or less swollen calyx, its plates large, thin, and more or less strongly curved outwardly; no cirri; extinct ..... Natanteata  
 AA. Bottom-inhabiting forms with relatively small, saucer- or cup-shaped calyx, its plates not large, thin, and outwardly curved; cirri generally present:  
 Disk more or less studded or even completely covered with large calcareous concretions or plates; pinnules, at least the lower, wholly or in part prismatic, composed of short segments; arms usually more than 10 ..... Oligophreata  
 Disk naked or studded with minute plates, which may become grouped in the interradial angles; pinnules cylindrical or flattened, slender, with long segments; arms commonly 10 ..... Macrophreata

#### Superfamily \**NATANTEATA*

The 3 families composing this group are all extinct, but 2 of them have representatives in the Cretaceous strata of Australia. They may be distinguished as follows:

#### KEY TO THE FAMILIES OF NATANTEATA

- A. Calyx relatively large, composed of many (a dozen or more) plates;  
 Cretaceous:  
 Greatest bulk of calyx below radials; infrabasals 5, very large; arms small, bifurcate ..... Marsupitidae  
 Greatest bulk of calyx above radials; infrabasals very small or wanting; arms 10, unbranched ..... Uintacrinidae  
 AA. Calyx small, composed almost exclusively of 5 radials, which are very thin and elevated into prominent ridges along mid-line; European Upper Jurassic ..... Saccocomidae

## Family \*MARSUPITIDAE

There is but a single genus in this family, a well known and widely distributed Mesozoic fossil.

## \*MARSUPITES

Miller, 1821. Nat. hist. Crin., p. 134.

Genotype: *Marsupites ornatus* Miller, 1821, p. 136.

Although the fossils referred to this genus have been found in Europe, North America, India, Madagascar, and Australia, and names have been given to several of these widely separated forms, only a single species is now generally recognized. The suggested differences are unsatisfactory and unreliable, as most of the known material is fragmentary.

## \*Marsupites testudinarius

*Encrinites testudinarius* von Schlotheim, 1820. Die Petrefactenkunde, etc., p. 339 (no description, but reference is made to Parkinson's [1808, pl. 13, fig. 24] unmistakable figure).

*Marsupites ornatus* Miller, 1821. Nat. hist. Crin., p. 136; plate, no number.

*Marsupites testudinarius* Bather, 1889. Quart. Jour. Geol. Soc. London, vol. 45, p. 172.

The occurrence of *Marsupites* in Australia was discovered by L. Glauert, curator of the Western Australian Museum, Perth, whose diligent investigations of the Gingin deposits (often called the Gingin "chalk") have yielded a number of interesting animals, indicating an Upper Cretaceous age. In view of the wide distribution of *Marsupites*, its occurrence in Australia is not surprising, but it is none the less interesting and important. There is no evidence of its having lived in eastern Australian seas.

## Family \*UINTACRINIDAE

In its wide distribution, its monogeneric character, and the monotypic nature of that single genus, this family closely resembles the preceding. Its genetic relationship is probably less close.

## \*UINTACRINUS

Grinnell, 1876. Amer. Jour. Sci., ser. 3, vol. 12, p. 81.

Genotype: *Uintacrinus socialis* Grinnell, 1876, p. 81.

The remarkable free-swimming crinoid on which this genus is based occurred in great numbers in the Cretaceous seas of North America, where it reached a large size with arms several feet long. Since its discovery in America, similar fossils have been found in England and Germany and more recently in Australia. The general opinion is that all represent a single species.

## \*Uintacrinus socialis

Grinnell, 1876. Amer. Jour. Sci., ser. 3, vol. 12, p. 81.

The only evidence for the occurrence of *Uintacrinus* in Australian seas is the presence of fragments in the Gingin Cretaceous deposits discovered by L. Glauert, of the Western Australian Museum. These are so fragmentary and of such a nature that it is impossible either to assert or to deny that they are a different

species from that which occurred in American seas. No remains of *Uintacrinus* have been found in eastern Australia.

## Superfamily OLIGOPHREATA

The great majority of living comatulids are included in this group. More than a dozen families are recognized, but of course only those known to occur in Australian waters are included in the following key.

## KEY TO THE FAMILIES OF OLIGOPHREATA

- I. Oral pinnules with terminal segments modified to form a so-called "comb"; mouth usually more or less marginal in position and anus correspondingly more or less central ..... Comasteridae
- II. Oral pinnules without terminal comb; mouth more or less central and anus marginal:
  - A. Elements of IBr series united by syzygy ..... Zygommetridae
  - AA. Elements of IBr series united by synarthry:
    - B. At least distal pinnules very slender, cylindrical, composed of much elongated segments; side and covering plates feebly developed or wanting:
      - C. Cirri smooth, carinate dorsally, or bearing single, median dorsal spines:
        - D. Cirri not laterally compressed, dorsal side flattened ..... Aporometridae
        - DD. Cirri laterally compressed distally, dorsal side more or less strongly carinate:
          - IIBr 4 (3+4), or with 10 arms having brachials very short, more or less discoidal at least distally ..... Himerometridae
          - IIBr 2; arms more than 10 ..... Mariametridae
        - CC. Cirrus segments bearing serrate, transverse ridge (or 2), or paired or tricuspid spines, dorsally ..... Colobometridae
      - BB. All pinnules, even distally, prismatic (triangular in cross section), rather stout, the outer with comparatively short segments:
        - E. Pinnule ambulacra without well developed side and covering plates ..... Tropiometridae
        - EE. Pinnule ambulacra with well developed side and covering plates:
          - F.  $P_1$  very delicate, flexible and weak, the 2 basal segments (especially the lower) greatly enlarged;  $P_2$ ,  $P_3$ , or both, much enlarged and stiffened, with elongated segments; disk globose, enclosed by solid pavement of plates ..... Calometridae
          - FF.  $P_1$  without any special modification of basal segments:
            - G. Cirri comparatively slender, with more than 25 segments, of which distal are short and usually bear well developed dorsal spines:
              - H.  $P_1$  shorter and smaller than  $P_2$ :
                - Centrodorsal large, broad, thick, discoidal; cirri numerous, crowded, tending to arrangement in 15 columns ..... Ptilometridae
                - Centrodorsal a short, more or less pentagonal column with conical apex; cirri in double column in each radial area ..... Asterometridae
              - HH.  $P_1$  larger and longer than  $P_2$  ..... Thallasometridae
            - GG. Cirri stout, with fewer than 25 segments, which are sub-equal and without dorsal spines ..... Charitometridae

## Family COMASTERIDAE

This is the largest family of Australian crinoids, containing no fewer than a dozen genera. They are chiefly denizens of the coral reefs of tropical Australia and are beyond question the most beautiful animals found there. The diversity of color and form is beyond description, so that a large basin with a dozen or so comasterids is as lovely as the finest bouquet of flowers. The species occurring on the southern coasts are plainly colored, of smaller size, and hence far less conspicuous.

The sequence of genera in the following key is not as natural as possible, but is the most convenient for the purpose. The more natural sequence, followed by A. H. Clark in his great monograph on the family (1931, Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3), is followed in the subsequent text here. For correlation of key and text, the page number of each genus is given before its name in the key.

## KEY TO THE GENERA OF COMASTERIDAE

- I. Ten arms only:<sup>1</sup>
- A. Several distal cirrus segments bear, each, a tubercle, spinelet, or ridge on dorsal side:  
 Distal end of basal segments of lower pinnules not markedly enlarged ..... (p. 28) *Comissia*  
 Distal end of basal segments of lower pinnules flaring greatly, projecting as rough spurs on aboral side ..... (p. 27) *Comanthoides*
- AA. Distal cirrus segments without dorsal processes (except on penultimate segment):  
 Fewer than 25 cirrus segments, some (usually many) longer than broad ..... (p. 30) *Comatula*  
 More than 30 cirrus segments, mostly twice as broad as long ..... (p. 29) *Comatulella*
- II. More than 10 arms:
- B. Arms 20 (rarely more); no cirri in adults; all division series of 2 ossicles united by syzygy ..... (p. 29) *Validia*
- BB. Not as above:
- C. First pinnule of undivided arm arising from a IIBr or a subsequent axillary on first brachial; syzygy between brachials 2 and 3:  
 Distal cirrus segments more or less carinate dorsally, with spinelets or small tubercles on mid-dorsal line ..... (p. 26) *Capillaster*  
 Distal cirrus segments not carinate dorsally, but each bears straight transverse ridge ..... (p. 27) *Comanthoides*
- CC. First pinnule of undivided arm on second brachial; never syzygy between brachials 2 and 3:
- D. All division series of 2 elements only:  
 Cirri well developed, numerous, rather long; distal segments with dorsal tubercle or spinelet ..... (p. 25) *Comatella*  
 Cirri poorly developed in single, more or less deficient series; distal segments (except penultimate) without dorsal tubercle or spinelet ..... (p. 30) *Comatula*
- DD. Some division series of 4 elements:
- E. Elements of IBr series and first 2 ossicles after every axillary united by syzygy ..... (p. 31) *Comaster*

<sup>1</sup> In certain genera of this group, more than 10 arms may occur, in some species regularly. These genera will also be found in section II of this key.

- EE. Elements of IBr series and first 2 ossicles after every axillary united by synarthry:
- F. Some of IIBr series 4 (3+4):  
 G. Outer IIBr series of each ray 2, inner 4 (3+4) ..... (p. 32) *Comanthina*  
 GG. Outer IIBr series 4 (3+4) or some irregularly 4 and some 2:  
 Cirri always present, numerous, and evenly distributed around periphery of centrodorsal; distal segments markedly shorter than proximal and laterally compressed; IIBr and IIBr series almost invariably 4 (3+4) ..... (p. 35) *Cenolia*  
 Cirri few, small, or wanting; distal segments not much shorter than basal and little compressed; some, often many, division series 2 ..... (p. 37) *Comanthus*
- FF. All IIBr series 2, or sometimes a IIBr 2 series followed by a IIBr 4 (3+4) series ..... (p. 34) *Comantheria*

## COMATELLA

A. H. Clark, 1908c. Smithsonian Misc. Coll., vol. 52, pt. 2, p. 207.

Genotype: *Actinometra nigra* P. H. Carpenter, 1888, p. 304.

This is one of the commonest genera of comatulids in tropical Australia, occurring in very shallow water on the reefs and along shore. Though the 3 species are distinguishable, the lines between them are not sharply drawn, and small specimens of the larger species and large individuals of the smaller are confusing. But in general, the 3 species may be distinguished as follows:

## KEY TO THE SPECIES OF COMATELLA

- A. Arms more than 40; cirrus segments commonly 26-30 ..... *nigra*  
 AA. Arms not more than 35; cirrus segments not more than 25:  
 Arms usually 30-40; cirrus segments 20-25 ..... *stelligera*  
 Arms usually 20 or fewer; cirrus segments 15-20 ..... *maculata*

*Comatella nigra*

*Actinometra nigra* P. H. Carpenter, 1888. "Challenger" Comat., p. 304.

*Comatella nigra* A. H. Clark, 1908c. Smithsonian Misc. Coll., vol. 52, pt. 2, p. 207.

—— 1912. Crin. Indian Ocean, p. 69; fig. 1.

—— 1918. "Siboga" unst. crin., pl. 1 (colored).

—— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 92; figs. 1-3.

H. L. Clark, 1921. Ech. Torres Strait, p. 12.

The northern coasts of Australia mark the extreme southern limit of the range of this big East Indian comatulid. It is so closely related to the following smaller species that the line between them is far from distinct. It has been taken in Australia only at the Murray Islands; near Lizard Island, Queensland (lat. 14° 40' S.), at the northern tip of the Barrier Reef; and at Long Island, Abrolhos, Western Australia. In life the colors range from bright red to nearly black, but preserved specimens tend to be dull brown or nearly black. Fully grown specimens may be 350 mm. across and have up to 80 arms, but the known Australian specimens had not

reached this maximum size. The specimens from Lizard Island are said to have been in life "purple, distal ends of arms, yellow."

### *Comatella stelligera*

- Actinometra stelligera* P. H. Carpenter, 1888. "Challenger" Comat., p. 308; pl. 58.  
*Comatella stelligera* A. H. Clark, 1908c. Smithsonian Misc. Coll., vol. 52, pt. 2, p. 207.  
 ——— 1918. "Siboga" unst. crin., pl. 2 (colored).  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 98; figs. 6-9.  
 H. L. Clark, 1921. Ech. Torres Strait, p. 13; pl. 2, fig. 2 (colored).

Although this species ranges throughout the East Indian region and has been reported from the Barrier Reef region as far south as lat. 18° and on the west coast as far south as Wooded Isle, Abrolhos, Western Australia, lat. 29°, it has not been taken at either Darwin or Broome. It is very common at the Murray Islands, where the color varieties are numerous and baffling, ranging from bright green to deep purple, with markings of orange-yellow, bright yellow, and yellow-green. A common form has the basal parts of the arms purple and the distal parts green, but the line between the two colors is not abrupt. The shades of both colors are very varied, but are commonly lighter in youthful specimens. These comatulids live among the corals and under the margins of slabs of coral rock at low-water mark or just below. They do not live in areas exposed to the surf, but the margins of tidal channels are decidedly favored. They are inactive and apparently move about but little. Their food consists of the minute animal and plant life brought to them in the tidal currents.

### *Comatella maculata*

- Actinometra maculata* P. H. Carpenter, 1888. "Challenger" Comat., p. 307; pl. 55, fig. 2.  
*Comatella maculata* A. H. Clark, 1908c. Smithsonian Misc. Coll., vol. 52, pt. 2, p. 207.  
 H. L. Clark, 1921. Ech. Torres Strait, p. 12; pl. 3, fig. 1 (colored).

Widespread in the East Indian region from the Maldives to the Caroline Islands, this comatulid occurs on the tropical coast of Australia as far south as Bowen, Queensland. Originally taken in Torres Strait, it has since been found to range northward to southern Japan. The Great Barrier Reef Expedition failed to find it at Low Isles, but it has been taken at Port Denison. It is common at the Murray Islands, living on the lower surface of large rock fragments, avoiding the light. It does not show great diversity in coloration, but is very dark brownish purple, with the tips of the pinnules brownish orange. It occurs also on the northwestern coast of Australia, at Cape Leveque and at Broome, where it reaches its maximum size, 100-150 mm. across the arms. Small specimens show a dark green tint which becomes yellowish green near the arm tips; very large specimens are nearly black.

## CAPILLASTER

A. H. Clark, 1909b. Proc. Biol. Soc. Washington, vol. 22, p. 87.

Genotype: *Actinometra sentosa* P. H. Carpenter, 1888, p. 325.

Although 2 species of this genus are recorded from Australia, neither seems to be very common. They may be distinguished as follows:

Arms more than 40; cirrus segments 30-40 ..... *sentosa*  
 Arms not more than 35; cirrus segments usually 23-26 ..... *multiradiata*

### *Capillaster sentosa*

- Actinometra sentosa* P. H. Carpenter, 1888. "Challenger" Comat., p. 325; pl. 66, figs. 4-7.  
*Capillaster sentosa* A. H. Clark, 1909b. Proc. Biol. Soc. Washington, vol. 22, p. 87.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 160; figs. 28, 29, 31.

There is but one record of this wide-ranging East Indian comatulid from Australia, 2 specimens having been taken between Fremantle and Geraldton, Western Australia, by the "Endeavour" in June 1912. The depth is not given in the record, but the dredge hauls made by the "Endeavour" along that coast were between 29 and 120 fms. Little if any collecting at such depths has been done elsewhere on the coast of Western Australia, of the Northern Territory, or of Queensland, so perhaps it is not strange that *sentosa* has not yet been found elsewhere in Australian seas.

### *Capillaster multiradiata*

- Asterias multiradiata* Linné, 1758. Syst. Nat., ed. 10, p. 663.  
*Capillaster multiradiata* A. H. Clark, 1909g. Zool. Anz., vol. 34, p. 364.  
 ——— 1918. "Siboga" unst. crin., pl. 3 (colored).  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 173; figs. 30, 34-36.

Though this comatulid has been reported from a number of stations along the tropical coasts of Australia, it has not been found common anywhere, except possibly at Broome, where 10 specimens were collected, chiefly near low-water mark. It was taken by the "Endeavour" in June 1912 on the western coast between Geraldton and Fremantle, 29-120 fms. The "Gazelle" took it near Dirk Hartog Island, well north of Geraldton, but Dakin did not find it at Houtman's Abrolhos. On the eastern side of the continent, it has been reported from as far south as Cape Flattery (lat. 15° S.), but the Great Barrier Reef Expedition (1928-1929) did not find it at the Low Isles, and the Carnegie Expedition (1913) took but 1 specimen at the Murray Islands. North of Australia, it ranges throughout the East Indian region from the Maldives to Formosa.

In life the colors are dull so far as records show. The specimen taken at the Murray Islands was "black, orally, brown dorsally, with joints between the segments much darker; whole dorsal surface including the cirri heavily silvered or frosted with white." In its dried condition this specimen is light gray, the joints on the dorsal side of the arms noticeably darker.

## COMANTHOIDES

A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 240.

Genotype: *Comanthus spanoschistum* H. L. Clark, 1916, p. 17.

This monotypic genus is distinctively Australian, and combines certain features of *Capillaster*, *Comissia*, and *Comanthus*. Its author considers it more nearly related to *Comissia* than to *Capillaster*, but nearer to the latter than to *Comanthus*.

*Comanthoides spanoschistum*

*Comanthus spanoschistum* H. L. Clark, 1916. "Endeavour" rept., p. 17; pl. 4, fig. 3.  
*Comanthoides spanoschistum* A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 241; figs. 52-58.

This interesting small comatulid has been taken as yet only by the ill-fated "Endeavour," but the collectors on that vessel obtained 46 specimens at seven stations off the southeastern coast of Australia, in Bass Strait, and near Maria Island, eastern Tasmania. It is a small, variable species, and the characters of *Comanthus* and *Comissia*, and even *Capillaster*, seem to be confused in some individuals. There is no information about the appearance in life. In dry or alcoholic material, "the color is more or less yellowish, with either a green or brown cast; one specimen is very dull purplish with yellow cirri, others are yellowish more or less clouded with purplish." In a 19-armed individual dull purplish predominates. Since the arms are usually 10, and 19 is the maximum number, it is reasonable to infer that purple pigment increases with age. Specimens taken in March and April have the genital pinnules swollen with reproductive cells, indicating a breeding season in late summer or early fall. The condition of these pinnules in September, when half the specimens were taken, is unfortunately not recorded.

## COMISSIA

A. H. Clark, 1909c. Proc. U. S. Nat. Mus., vol. 36, p. 501.

Genotype: *Comissia lütkeni* A. H. Clark, 1909c, p. 502.

Although more than a dozen species are assigned to this genus, all are relatively little known, and only one has been reported from Australia.

*Comissia lütkeni*

*Comanthus spanoschistum* H. L. Clark, 1916. "Endeavour" rept., p. 18 (a specimen from Queensland).

*Comissia lütkeni* A. H. Clark, 1909c. Proc. U. S. Nat. Mus., vol. 36, p. 502.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 249; figs. 66, 67.

The only known Australian specimen of *Comissia* was taken by the "Endeavour" in 1914, off Noosa Head, Queensland, 16 fms. It was identified by me as *Comanthus spanoschistum*, and is presumably in the Australian Museum now with that label. Although A. H. Clark has not seen the specimen, on the basis of my statement that it "is noticeably more slender than the other" specimens of *spanoschistum* which were then in my hands, and "the cirri are somewhat more compressed," he says it "seems undoubtedly to be" *Comissia lütkeni*. Since *spanoschistum* is not known from north of Bass Strait, and in view of Clark's great experience in studying the Comasteridae, I yield to his judgment and trust that further collecting off southern Queensland will vindicate it. The species is a small one with only 10 arms and, Clark says, "is rather easily confused with *Comatula pectinata*" in spite of the very different cirri. It is known from only a few East Indian stations, hence this Australian occurrence is of special interest.

## COMATULELLA

A. H. Clark, 1911c. Amer. Jour. Sci., ser. 4, vol. 32, p. 130.

Genotype: *Comatula brachiolata* Lamarck, 1816, vol. 2, p. 535.

No proper diagnosis of this genus was published until 1931, but since only a single species was associated with the new name when it was first used, in 1911, it must be accepted as of that date, especially since its author made use of it repeatedly in the years 1911-1915. Only a single species is known, the most striking comatulid of the southern coasts of Australia.

*Comatulella brachiolata*

*Comatula brachiolata* Lamarck, 1816. Anim. sans vert., vol. 2, p. 535.

*Comatulella brachiolata* A. H. Clark, 1911c. Amer. Jour. Sci., ser. 4, vol. 32, p. 130.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 296; figs. 93-97.

H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 15.

A curiously rigid and ungraceful creature, this little crinoid is given a special charm by its bright color and odd form. Its range seems to be only from the vicinity of Perth southward and eastward to Port Phillip, Victoria. In large individuals, the arms may be 65-85 mm. long, but those at hand from Koombana Bay are considerably smaller. Apparently *brachiolata* is local in its distribution, for only a few specimens were recorded prior to 1911, when its frequent occurrence on the southwestern coast of Western Australia was first made known. It is most common apparently in 5-10 fms., but it occasionally occurs nearer to low-water mark, and the "Endeavour" took it between Fremantle and Geraldton in deeper water, 29-120 fms. There is no record of the actual locality or depth.

## VALIDIA

A. H. Clark, 1909i. Vidensk. Medd., vol. 61, p. 142.

Genotype: *Comatula rotalaria* Lamarck, 1816, vol. 2, p. 534.

Although this group was first proposed as a subdivision of a subgenus, its author later recognized it as subgenus of *Comatula*. Owing to its unique character, a generic status seems warranted.

*Validia rotalaria*

*Comatula rotalaria* Lamarck, 1816. Anim. sans vert., vol. 2, p. 534.

A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 309; fig. 98.  
*Comanthus (Comanthus, Validia) rotalaria* A. H. Clark, 1909i. Vidensk. Medd., vol. 61, p. 142.  
*Comanthus (Validia) rotalaria* A. H. Clark, 1918. "Siboga" unst. crin., p. 6.  
*Validia rotalaria* H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 16.

No adequate figure of this fine comatulid has yet been published. It is known to range from Port Molle, Queensland (20° 30' S.) to Lagrange Bay, northwestern Australia (18° 40' S.). It does not, however, seem to occur in the vicinity of Darwin or at Cape Leveque, so it is quite possible that its range on the tropical Australian coast is not continuous. There are specimens in the British Museum

from the Aru Islands, but *Validia* does not seem to occur in East Indian seas north of that group. The colors in life are striking: pink, yellow, or light brown dorsally; pinnules silvery dorsally, more or less yellow-tipped; sutures dark, more or less purplish; oral surface very dark. Dry specimens, or even alcoholic, show little evidence of such handsome colors. Though the normal number of arms is 20 and their length 100–120 mm., large specimens in Lagrange Bay had 30 or 31 arms, 140 mm. long, and specimens with arms 165 mm. long are recorded.

### COMATULA

Lamarck, 1816. Anim. sans vert., vol. 2, p. 530.

Genotype: *Comatula solaris* Lamarck, 1816, vol. 2, p. 533.

This easily recognized genus is represented by a very common species all along the tropical coast of Australia. A second, larger, species also occurs but is relatively rare. A third form, also large, has been taken on the coast of Queensland, but very few specimens are known and its exact status is still to be determined. The 3 species are distinguishable as follows:

#### KEY TO THE SPECIES OF COMATULA

- A. Cirri wanting (1–3 rarely present); terminal combs on basal pinnules confined to first 3 pairs ..... *cratera*  
 AA. Cirri present; terminal combs not confined to first 3 pairs of pinnules:  
     Cirrus segments 17 or more ..... *solaris*  
     Cirrus segments 15 or fewer ..... *pectinata*

#### *Comatula cratera*

H. L. Clark, 1916. "Endeavour" rept., p. 12; pl. 2, fig. 1.

This fine crinoid is known only from Port Molle, Queensland, in 12 fms., and from 35–40 fms. off Sandon Bluffs, New South Wales. Dorsal side light fawn color, usually with purple markings, stripes, or spots. Disk and oral side of arms yellowish. Arms 175 mm. or more in length. The status of *cratera* is possibly still open to question. A. H. Clark (1931, p. 323) says it is "merely a form of *C. solaris*, related to it in much the same way that *C. purpurea* is to *C. pectinata*." But *pectinata* and *purpurea* occur together in the same localities and even in the same habitat (see H. L. Clark, 1938, p. 18), whereas no specimens of *cratera* are known from the same stations as *solaris* (with a possible exception at Port Molle) and *cratera* ranges much farther south. Apparently *solaris* prefers shallower water, ranging from low-water mark to 12–13 fms., whereas *cratera* has been taken only from 12–13 fms. to 35–40 fms. Moreover, the differences between the two forms in coloration and in the character of the lower pinnules are not to be ignored. Further collecting at Port Curtis and Port Molle, Queensland, and along that coast may produce connecting links that will warrant treating *cratera* as a mere variety of *solaris*, but it is very improbable that it will ever be found mingled with *solaris* as *purpurea* mingles with *pectinata*. It is more probable that it is a species of southern Queensland which occasionally gets as far north as Port Molle.

#### *Comatula solaris*

Lamarck, 1816. Anim. sans vert., vol. 2, p. 533.

A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, pl. 323; fig. 99.

One of the largest and handsomest of the 10-armed comatulids, this fine East Indian species occurs on the Queensland coast from Port Denison to Torres Strait and on the coast of Western Australia from the Abrolhos Islands to Roebuck Bay, and also at Holothuria Bank. It has not yet been reported from the coast of the Northern Territory. Full-grown individuals are nearly half a meter across when expanded and are handsomely colored with great diversity of tints (see H. L. Clark, 1938, p. 20).

#### *Comatula pectinata*

*Asterias pectinata* Linné, 1758. Syst. Nat., ed. 10, p. 663.

*Comatula pectinata* A. H. Clark, 1908a. Proc. U. S. Nat. Mus., vol. 33, p. 685.

——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 339; figs. 49, 100–109, 111, 114.

H. L. Clark, 1921. Ech. Torres Strait, p. 14; pl. 1, fig. 3 (colored); pl. 3, fig. 2 (colored).

——— 1938. Mem. Mus. Comp. Zool., vol. 55, p. 18.

Wide-ranging in the East Indian region and probably the commonest comatulid of tropical Australia, *pectinata* ranges from Port Curtis, Queensland, northward to Torres Strait, and from the Abrolhos Islands, Western Australia, to Dundas Strait in the Northern Territory. It is most abundant just below low-water mark and down to 7–8 fms. Its diversity in both form and color is very great. In large specimens the arms opposite the mouth may exceed 190 mm., those adjoining the mouth being only about three-fifths as long. In small specimens the disproportion is not nearly so marked and in many cases is hardly noticeable. Specimens with more than 10 arms are extremely rare in Australia, but one with 11 has been recorded from Holothuria Bank. A very common form has only 10 cirri (or fewer), a pair (or a single one or none) at each angle of the centrodorsal. Nearly a century ago the name *purpurea* was given to this form, and it has persisted down to the present time. But there is no longer room for doubt that this supposed "species" is based on nothing but an inconstant feature as unreliable as the coloration (see H. L. Clark, 1938, p. 18). The diversity of color is amazing and is apparently in no way associated with habits or habitat. Shades of red or purple are most frequent, and unicolor specimens are more common than varied ones. The colors, especially if bright, are very fugacious. Even in sea water, if Epsom salts are added, the color comes out rapidly and copiously, usually being of a brownish-red shade.

### COMASTER

L. Agassiz, 1835a. Mem. Soc. sci. nat. Neuchâtel, vol. 1, p. 193.

Genotype: *Comatula multiradiata* Lamarck, 1816, vol. 2, p. 354 = *Alecto* or *Comatula multifida* J. Müller, 1841, p. 147 (NON *Asterias multiradiata* Linné, 1758, p. 663 = *Capillaster multiradiata* A. H. Clark, 1909g, p. 364).

This East Indian genus of a dozen species is represented in Australian seas by 2 very unlike species, a large one with 45–150 arms (*multifida*), and a small, very delicate form with fewer than 40 arms (*minima*). In both these strikingly differ-

ent forms, the cirri are wanting or weak and poorly developed, whereas in 9 of the other 10 species they are well developed.

### *Comaster multifida*

*Alecto multifida* J. Müller, 1841. Monatsber. K. preuss. Akad. Wissensch., p. 147.  
*Comaster multifida* A. H. Clark, 1911f. Proc. U. S. Nat. Mus., vol. 41, p. 171.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 413; figs. 140, 141.

This apparently perplexing East Indian comatulid has been reported under at least five different names from tropical Australia. A. H. Clark (1931, p. 424) records it from Port Walcott, Western Australia, Thursday Island, Albany Island, Prince of Wales Channel, and Port Molle, Queensland. I have never seen an Australian specimen, so it probably seldom occurs on the reefs or shores, though Clark says (*loc. cit.*, p. 425) "most of the specimens have been taken in very shallow water." It reaches a large size, with 125-150 arms, 200 mm. or more in length. According to Herklots' (1869) figure, the colors in life are bright, pink, yellow, and orange-brown. Specimens from the Philippine Islands are recorded as "in life, brown of some shade, ranging from dark chocolate to burnt orange."

### *Comaster minima*

*Phanogenia minima* A. H. Clark, 1909d. Proc. U. S. Nat. Mus., vol. 36, p. 392.  
*Comaster minima* A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 435; figs. 155, 156.

This species is as yet but very slightly known, only a few specimens having been taken. It has been found but once on the Australian coast, a single specimen having been obtained in 5-15 fms. off Ellison Reef, outer Great Barrier Reef, Queensland, in 1924 by W. E. J. Paradipe. Other specimens are known from five stations in the East Indies and Philippines. Nothing is reported as to the color in life, but an alcoholic specimen is recorded (A. H. Clark, 1931, p. 435) as "dull yellowish with numerous longitudinal narrow lines on the radials and division series, and transverse lines on the arms, of dark brown."

## COMANTHINA

A. H. Clark, 1909i. Vidensk. Medd., vol. 61, p. 142.

Genotype: *Actinometra nobilis* P. H. Carpenter, 1888, p. 336.

There are but 2 species in this genus of big tropical comatulids, and both occur in Australian waters. They are easily distinguished thus:

IVBr and following series, 2, rarely 4; proximal pinnule segments with strong dorsal processes	.....	<i>belli</i>
IVBr and following series, 4 (3+4), rarely 2; proximal pinnule segments without strong dorsal processes	.....	<i>schlegelii</i>

### *Comanthina belli*

*Actinometra belli* P. H. Carpenter, 1888. "Challenger" Comat., p. 334.  
*Comanthina belli* A. H. Clark, 1911c. Amer. Jour. Sci., ser. 4, vol. 32, p. 130.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 458; figs. 157, 199.

It is hard to say whether this beautiful big "feather star" is more lovely than the equally showy *Comanthus timorensis*. Both deserve the title of "most beautiful marine animal" in tropical Australia. At the Murray Islands the *Comanthus* is much the more abundant, but at Broome the *Comanthina* was much more frequently seen. The diversity of color in *belli* defies description, for it ranges from pale cream color to nearly black; even sky blue, lemon yellow, and grass green are now and then found. Few specimens are unicolor. In the specimens taken at Broome, the cirri were apparently always white, but this does not seem to hold true for material taken elsewhere. In preserved specimens, the cirri are usually no longer really white, but are yellowish, grayish, or light brown. This is one of the largest of Australian crinoids; the arms of fully grown specimens exceed 100 mm. and often are 140-150; individuals with more than 150 arms are occasionally found, but it is virtually impossible to count them accurately without serious injury to the specimen. A large individual may be more than 400 mm. across when fully expanded. The favorite haunt of these beautiful feather stars is among the nooks and crannies of living corals at the edge of well aerated marginal tide pools on the reefs, but they also occur on the lower side of rock and coral fragments that are so supported as to leave ample room for constantly moving sea water. So far as is known at present, *belli* is an endemic Australian crinoid, ranging from Torres Strait westward and southward to the Abrolhos Islands. It is not yet known from the Barrier Reef or the Queensland coast south of lat. 11°.

### *Comanthina schlegelii*

*Actinometra schlegelii* P. H. Carpenter, 1881. Notes Leyden Mus., vol. 3, p. 210.  
*Comanthus schlegelii* A. H. Clark, 1911d. Proc. U. S. Nat. Mus., vol. 39, p. 536.  
 H. L. Clark, 1921. Ech. Torres Strait, p. 20.  
*Comanthina schlegelii* A. H. Clark, 1911a. Notes Leyden Mus., vol. 33, p. 176.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 466; figs. 158-161.

According to A. H. Clark, this fine comatulid has a very extensive range, from the Maldives to the Caroline Islands and south to northern Australia. But he admits only one Australian record, that of a single specimen in the British Museum from the Percy Islands, Queensland, called by Bell (1884) *Actinometra multifida*. The 3 specimens from the Murray Islands which were identified by me (1921) as *Comanthus schlegelii* seem to Clark to be *belli*. I have therefore carefully re-examined the specimens concerned.

Even a superficial examination shows that the 3 specimens represent a single species, and this impression is confirmed by prolonged and critical comparison. All have cirri well developed as in *belli*, but stout and smooth as in *schlegelii*. None have conspicuous dorsal processes on the basal segments of the proximal pinnules, but on a few pinnules at or near the middle of the arm, one or two basal segments have a small process. As a rule the pinnules are definitely more like those of *schlegelii* from the Philippines than they are like those of *belli* from Broome. The 3 specimens must be considered good examples of *schlegelii* if 2 species of *Comanthina* are to be recognized. I am not at all sure that 2 species can rightly be maintained; but until more material is available from the northern coast of Queensland, the Barrier Reef, and Torres Strait, the conspicuous varicolored beauty found from Prince of Wales Channel westward and southward to the Abrolhos Islands and so common at Broome may be called *belli*, and the duller-colored

form from the Percy Islands northward along the Barrier Reef, northeastward to the Carolines, and northwestward to the Maldives may be designated as *schlegelii*. As yet the latter seems to be a rare member of Australia's fauna.

### COMANTHERIA

A. H. Clark, 1909i. Vidensk. Medd., vol. 61, p. 142.

Genotype: *Antedon briareus* Bell, 1884, p. 163.

This is another group of about a dozen large comatulids, ranging from southern Japan to Western Australia and New South Wales. Four nominal species occur in Australian seas, but the line between 2 of these is very vague and it seems unlikely that it exists in nature. The following key points out the features which are supposed to separate these 4 forms, but the use of such a key is attended with obvious difficulties.

#### KEY TO THE SPECIES OF COMANTHERIA

- I. Centrodorsal reduced; cirri absent or rudimentary:
- A. More than 45 arms:
- VBr series 2 ..... *alternans*
- VBr series 4 (3 + 4) ..... *briareus*
- AA. Arms 40 or fewer ..... *rotula*
- II. Centrodorsal well developed, with 15-20 cirri ..... *perplexum*

#### *Comantheria alternans*

*Actinometra alternans* P. H. Carpenter, 1881. Notes Leyden Mus., vol. 3, p. 208.

*Comanthus alternans* A. H. Clark, 1908c. Smithsonian Misc. Coll., vol. 52, pt. 2, p. 206.

H. L. Clark, 1921. Ech. Torres Strait, p. 16; pl. 20, fig. 1.

*Comantheria alternans* A. H. Clark, 1911a. Notes Leyden Mus., vol. 33, p. 176.

This is a fine big comatulid with numerous (80-160) arms, dividing frequently, a VIBr series being often present in adults. The IIBr series are commonly 4 (3+4) and the succeeding series alternate 2 and 4; occasionally the alternation is reversed, with the IIBr series 2 and the succeeding series 4 and 2. The color is usually some shade of brown, ranging from yellow-brown to deep orange-brown. Specimens are not numerous, however, and the color in life may show great diversity as in related species. The only Australian records for *alternans* are Port Molle, Penguin Channel, and the Murray Islands, Queensland, and the Abrolhos Islands, Western Australia.

#### *Comantheria briareus*

*Antedon briareus* Bell, 1884. "Alert" rept., p. 163; pl. 14.

*Comantheria briareus* A. H. Clark, 1911g. Fauna Südwest-Australiens, vol. 3, p. 437.

— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 492; figs. 163, 164.

H. L. Clark, 1938. Mem. Mus. Comp. Zool., vol. 55, p. 23.

Widespread from Formosa to the coast of Western Australia, this varicolored and multibrachiate comatulid is very common at Broome, but has not been found in numbers elsewhere. It has been taken at Port Denison, Queensland, and twice on the outer Great Barrier Reef, between 17° and 19° S. But it was not taken by the Great Barrier Reef Expedition nor by the Carnegie Expedition to the Murray

Islands. At Broome it is a striking feature of the shallow-water fauna. The aboral side in nearly all the larger specimens is a bright yellowish green or greenish yellow; the oral surface is black and the pinnules are black and white, in striking contrast. It is more slender-armed and delicate than *Comanthina belli* or *Comanthus timorensis*, and will not be confused with them when mature. But young specimens are by no means readily identifiable (see H. L. Clark, 1938, pp. 23-25).

#### *Comantheria rotula*

A. H. Clark, 1912b. Proc. Biol. Soc. Washington, vol. 25, p. 23.

— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 503; fig. 165.

On the strength of a photograph of a comatulid taken at Broome, Western Australia, by Mjöberg in 1911, A. H. Clark includes this species in the Australian fauna. Several small *Comantherias* taken at Broome in 1929 and 1932 suggest *rotula* but show no constant features to distinguish them from young *briareus*. It seems very doubtful whether the two nominal species are really distinct. Indeed, *briareus* is not clearly defined.

#### *Comantheria perplexum*

*Comanthus perplexum* H. L. Clark, 1916. "Endeavour" rept., p. 14; pl. 3, fig. 2.

*Comantheria perplexum* A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 506.

Since the unique holotype of this species was taken, "eleven miles south by east of Ballina, N. S. W., 27-28 fms.," only a single additional specimen has been reported. It was taken "in 15 fms., off Norwest Islet, Capricorn group, Queensland, in December, 1930." The holotype is in the Australian Museum. The second specimen is in the Museum of Comparative Zoölogy, gift of the Australian Museum. The 2 specimens are of approximately the same size (200± mm. across) and color (dorsally, light fawn color; orally, disk yellowish gray, arms and pinnules dark). The number of cirri present is 6 in one case, 7 or 8 in the other, with 16-19 segments. As there are about 15 cirrus sockets around the margin of the centrodorsal, it is evident the cirri are more or less fugacious. This is apparently an endemic species quite distinct from its nearest East Indian ally, *C. weberi*, of the Lesser Sunda Islands.

### CENOLIA

A. H. Clark, 1916. Proc. Biol. Soc. Washington, vol. 29, p. 48 (as a subgenus).

Genotype: *Comatula trichoptera* J. Müller, 1846, p. 178.

This genus was suggested as a subgenus of *Comanthus*, but may well be given generic rank. It is well represented in Australia by 5 species, which may be distinguished as follows:

#### KEY TO THE SPECIES OF CENOLIA

- I. More than 60 arms; cirri large, stout, with 20-35 segments, without dorsal processes ..... *bennetti*
- II. Fewer than 60 arms; cirrus segments with dorsal processes:
- A. Cirri long, stout, numerous (more than 50), with more than 30 segments; usually about 40 arms ..... *plectrophorum*

- AA. Cirri shorter and more slender, with fewer than 30 segments; fewer than 30 arms:  
 B. Axillaries with anterior angle obtuse, not produced; cirrus segments 12-15; arms 15-21 ..... *samoana*  
 BB. Axillaries with anterior angle acute and somewhat produced; arms 20-40:  
 Cirrus segments about 14-17; arms about 37 ..... *tasmaniae*  
 Cirrus segments up to 18-20, often fewer; arms 15-30, sometimes up to 37 ..... *trichoptera*

### *Cenolia bennetti*

- Alecto bennetti* J. Müller, 1841. Monatsber. K. preuss. Akad. Wissensch., p. 187 (duplicated in Arch. f. Naturgesch., vol. 7, p. 146).  
*Comanthus (Cenolia) bennetti* A. H. Clark, 1918. "Siboga" unst. crin., p. 50.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 531; figs. 186-189.

This big East Indian comatulid is rare in Australia. Only 2 individuals have been recorded, 1 from Port Denison, Queensland, and 1 from 19 fms. near Direction Island, Great Barrier Reef. The Port Denison record is an old one (1877); the one from Direction Island is of a small individual, with only 30 arms, taken by the Great Barrier Reef Expedition. It is dull olive-brown, with a broad longitudinal whitish band on the distal third of the longer arms; the cirri are yellow and the very young arms (of which there are 10) are cream yellow.

### *Cenolia plectrophorum*

- Comanthus plectrophorum* H. L. Clark, 1916. "Endeavour" rept., p. 15; pl. 4, fig. 1.  
*Comanthus (Cenolia) plectrophorum* A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 530; figs. 62, 190, 191.

As far as is now known, this is one of Australia's endemic comatulids, having a very restricted range. The only recorded specimens have been taken near the eastern end of Bass Strait in rather deep water (100-300 fms.). There are 38-44 arms in adults, and the numerous long cirri have 28-38 segments. The basal segments of the lower pinnules have very characteristic large T-shaped processes. The color in alcohol is light brown, which becomes light fawn or pale buff on drying.

### *Cenolia samoana*

- Comanthus (Comanthus) samoana* A. H. Clark, 1909h. Proc. U. S. Nat. Mus., vol. 37, p. 30.  
*Comanthus luteofusca* H. L. Clark, 1915b. Carnegie Inst. Wash. Pub. 212, p. 102.  
 ——— 1921. Ech. Torres Strait, p. 18; pl. 20, figs. 2, 3.  
*Comanthus (Cenolia) samoana* A. H. Clark, 1918. "Siboga" unst. crin., p. 52.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 593; figs. 208, 219, 220.

This is a relatively small and stout, dark-colored comatulid, easily confused with small specimens of *Comanthus parvicirra* and *C. timorensis*. But the rather stocky appearance, the yellowish-brown or darker coloration, the small number of arms, and the cluster of short, stout, strongly recurved cirri enable one to recognize it without great difficulty. It ranges along the tropical Australian coast from Broome southwestward to the Arolhos Islands, and from Mer, at the northern end of

the Barrier Reef, south to the Low Isles. It has not yet been taken between Broome and Torres Strait, though it is known from Timor and Salawati. Its extra-Australian range is from Ceylon to Samoa, but it is not yet known from the coast of Asia or north of Mindoro, Philippine Islands.

### *Cenolia tasmaniae*

- Comanthus tasmaniae* A. H. Clark, 1918a. Proc. Biol. Soc. Washington, vol. 31, p. 41.  
*Comanthus (Cenolia) tasmaniae* A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, pp. 531, 586.

This little comatulid is known only from Bass Strait and Tasmanian waters. No figure has been published and little information has been given as to its distribution. A. H. Clark (1931, p. 587) refers to "a fine series of 24 specimens collected by the "Endeavour," but gives no information as to where they were taken. Apparently it may be considered a distinctively Tasmanian species. As I have seen no specimens, I cannot pass on the validity of the species, but I am very skeptical.

### *Cenolia trichoptera*

- Comatula trichoptera* J. Müller, 1846. Monatsber. K. preuss. Akad. Wissensch., p. 178.  
*Comanthus trichoptera* A. H. Clark, 1909h. Proc. U. S. Nat. Mus., vol. 37, p. 30.  
*Comanthus (Cenolia) trichoptera* A. H. Clark, 1916. Proc. Biol. Soc. Washington, vol. 29, p. 48.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, pp. 531, 579; figs. 4, 203.

This may be considered the most typical crinoid of the endemic fauna of Australia, for it is confined to the southern coasts along with the very characteristic sea urchins *Amblypneustes* and *Holopneustes*. It ranges along that coast westward to Albany and Bunbury and northward thence to Dongarra, Western Australia. On the eastern coast its range extends northward to Cape Hawke, New South Wales. At Lord Howe Island, it is common among the living corals in the lagoon at Ned's Beach. It has probably reached Lord Howe Island on the foul bottoms of ships from Australian ports. In this locality it is seldom more than 100 mm. across, whereas at Port Jackson and elsewhere on the mainland coast it reaches twice that size. The colors are never showy, commonly white and brown of various shades, more generally yellowish. Alcoholic and dry specimens are often yellowish brown, with or without gray and brownish mottling. It lives under rock fragments or among corals, bryozoa, sponges, etc., usually near low-water mark, but the range extends out to about 40 fms.

As was stated above, the differences supposed to distinguish this species from *tasmaniae* are unreliable and need clarification. Probably the two are identical.

## COMANTHUS

- A. H. Clark, 1908d. Proc. Biol. Soc. Washington, vol. 21, p. 220.

Genotype: *Alecto parvicirra* J. Müller, 1841, p. 185.

Individuals of this genus occur in great numbers near low-water mark on the reefs and shores of tropical Australia, particularly in the Barrier Reef region. Their large size and beautiful colors make them very conspicuous, and their diversity

of form and shade combine to make them the loveliest of marine animals, rivaled only by their close relatives in the genus *Comanthina*. So great is the individual diversity, it is exceedingly difficult to draw specific lines. Of 1 species only a single specimen is known, hence its validity is open to question. The other 2 species are so common that all degrees of intergradation seem to occur. Though the two extremes are very different, many specimens cannot be indisputably determined, but must be arbitrarily placed on the basis of general appearance.

## KEY TO THE SPECIES OF COMANTHUS

- A. Arms very numerous (78), extraordinarily variegated with pale brown, deep yellow, black, white, and green, but general impression light-colored; cirri present but few and small, with up to 16 segments ..... *callipepla*
- AA. Arms fewer than 70 (usually much fewer); color very diversified, but commonly bright shades of brown, green, or red, often very deep brown or nearly black; never variegated as in *callipepla*:  
 Arms more than 30; functional cirri usually wanting, never well developed ..... *timorensis*  
 Arms not more than 30; size small; functional cirri present ..... *parvicirra*

*Comanthus callipepla*

H. L. Clark, 1915b. Carnegie Inst. Wash. Pub. 212, p. 102.  
 ——— 1921. Ech. Torres Strait, p. 17; pl. 1, fig. 1 (colored).

Since this unusually beautiful species rests upon a single specimen taken at Mer, Murray Islands, in 1913, its validity is open to question. A. H. Clark is of the opinion (1931, p. 614) that it is only an unusual specimen of *timorensis*. I believe, however, that further collecting on the Barrier Reef at the northern end will reveal more specimens of *callipepla* and that its status as a valid species will be vindicated. The holotype was nearly 200 mm. across in life, and had 78 arms and 8 small cirri about 7 mm. long. The coloring defied description, but is perfectly shown in the published figure.

*Comanthus timorensis*

*Alecto timorensis* J. Müller, 1841. Monatsber. K. preuss. Akad. Wissensch., p. 186.  
*Comanthus timorensis* A. H. Clark, 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, pp. 159 et al.; figs. 204-207.

This big, common, widespread comatulid ranges from Ceylon to Tonga and Fiji, and from the Bonin Islands in the north to Geraldton, Western Australia, and the Capricorn Islets, Queensland, in the south. So diversified are its multi-brachiate forms that it has been given no fewer than 11 specific names, and has frequently been confused with the following species. The intricate synonymy has been admirably worked out by A. H. Clark.

At the Murray Islands this is the most conspicuous feature of the reef life (see *Comanthus annulata*, H. L. Clark, 1921, p. 16), but on the northwestern coast near Broome it finds a notable rival in *Comanthina belli* (see H. L. Clark, 1938, p. 21). Under projecting edges of large coral or rock fragments or among coral heads and branches where there is an abounding supply of pure sea water, near low-water mark or in large tide pools, *timorensis* flourishes in all its varied beauty.

Under such conditions it may attain a diameter of 400 mm. The number of arms is normally 32-42 but may exceed 60; the largest number recorded is 68.

One of the color forms found at the Murray Islands was so striking and so fundamentally different from all other individuals of *timorensis* seen that it was designated var. *xantha*. Three specimens were obtained. Its brilliant colors are fugacious, and preserved specimens are apparently not distinguishable from ordinary *timorensis*. In life, however, it is unmistakable; the calyx and dorsal side of the arms are bright yellow, and the pinnules are bright red in striking contrast (see H. L. Clark, 1921, p. 17; pl. 1, fig. 6). No examples of this variety were found in 1929 or in 1932. Quite possibly it is found only at the Murray Islands or along the northern part of the Barrier Reef.

*Comanthus parvicirra*

*Alecto parvicirra* J. Müller, 1841. Monatsber. K. preuss. Akad. Wissensch., p. 185.  
*Comanthus (Comanthus) parvicirra* A. H. Clark, 1911d. Proc. U. S. Nat. Mus., vol. 39, p. 536.  
 ——— 1931. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 3, p. 631; figs. 184, 209-218, 221.  
 H. L. Clark, 1921. Ech. Torres Strait, p. 19; pl. 1, figs. 5, 7 (colored).

The wide geographical distribution of this comatulid (from Madagascar and Mauritius to the Tonga Islands, north to southern Japan and Amoy, China, south to Fremantle, Western Australia, and Moreton Bay, Queensland) combines with its general commonness and its almost infinite diversity of color, form, and structural details to make it the most frequently misidentified crinoid in the world. It is no wonder that A. H. Clark's list of synonyms (1931, pp. 631-636) extends to more than 5 pages and includes 22 specific names assigned to 8 different genera. The truth seems to be that nature has not yet completed the line of division between *parvicirra* and *timorensis*, and even the lines between *Comanthus*, *Cenolia*, *Comantheria*, *Comanthina*, and *Comaster* are continually crossed by individual variants. Order has been brought out of chaos by the competent efforts of A. H. Clark, but there is no reliable character or group of characters that will always distinguish specimens of *parvicirra* from the related species.

In its typical condition, with 20 arms and a dozen or so cirri having 13 or 14 segments, *parvicirra* is usually easily recognized; in life, the arms have a relatively soft texture and greater width than is ever found in *timorensis*. The trouble begins as the arms increase and the cirri decrease in number. A further discussion of these points and of the problem of color will be found in H. L. Clark 1921, page 19. Although many specimens of *parvicirra* were taken at Mer (Murray Islands, 1921), none were seen at either Darwin or Broome (1929 and 1932). Further studies on the northern coast of Queensland and the Barrier Reef may ultimately reveal the true distinctions between *timorensis* and *parvicirra*.

## Family ZYGOMETRIDAE

This is a small family containing only a few genera, of which but one occurs in Australia. The distinguishing character is that the union of the elements of the IBr series is by syzygy, a feature not found in any of the following families. It is a character much easier to state than to see clearly, but it seems to be constant and trustworthy.

## ZYGOMETRA

A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, p. 347.

Genotype: *Antedon microdiscus* Bell, 1884, p. 163.

The 4 species of this genus occurring in Australia are confined to the tropical coasts and reefs, where they are often to be found in large numbers. They are among the most characteristic animals on the vast flats exposed at low water during spring tides at Broome. The species may be distinguished as follows, but the line between the 2 smaller species is vague and arbitrary.

## KEY TO THE SPECIES OF ZYGOMETRA

- A. More than 33 cirrus segments:  
 IIIBr and following division series 4 (3 + 4) ..... *microdiscus*  
 IIIBr and following division series 2 ..... *elegans*
- AA. Fewer than 33 cirrus segments:  
 20-30 cirrus segments ..... *comata*  
 Fewer than 20 cirrus segments ..... *punctata*

*Zygometra microdiscus*

*Antedon microdiscus* Bell, 1884. "Alert" rept., p. 163; pl. 15.

P. H. Carpenter, 1888. "Challenger" Comat., pl. 37, figs. 4-6.

*Zygometra microdiscus* A. H. Clark, 1909g. Zool. Anz., vol. 34, p. 367.

In spite of the specific name, given (according to A. H. Clark) through a misinterpretation of the character of the disk in the original type, the disk is normally large. In a big specimen taken at Broome, rather more than 300 mm. across, the disk was 35-40 mm. This specimen was carefully dried (from alcohol) fully extended, and in drying the margin of the disk detached itself from the arm bases and shrank symmetrically to a present diameter of about 18 mm., leaving a conspicuous scar all around. There are about 110 arms; the exact number cannot be counted without damage.

This handsome crinoid is not uncommon at Broome (see H. L. Clark, 1938, p. 32), but it is rarer and seems to prefer deeper water than the following species. We did not find it at Darwin or even at Cape Leveque, nor did the Carnegie party (1913) find it in Torres Strait or at the Murray Islands. A. H. Clark (1911) reports it from several points in the Torres Strait region and on the northwestern coast (Nicol Bay and Dampier Archipelago). Bell gives Port Molle, Queensland, 12 fms., as the type locality, but apparently the species is not common on the Queensland coast.

*Zygometra elegans*

*Antedon elegans* Bell, 1884. "Alert" rept., p. 162; pl. 13, figs. B, Ba.

P. H. Carpenter, 1888. "Challenger" Comat., pl. 8.

*Zygometra elegans* A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, p. 348.

The differences between this species and the preceding are obvious enough where the two are found side by side, as at Broome (see H. L. Clark, 1938, p. 31). No *Zygometras* were met with by us in 1913 in the Torres Strait region, but the

present species has been found as far south as Port Curtis, Queensland. We found it at Darwin and abundantly at Broome, but not at any intermediate point. It is known, however, from Baudin Island and Mermaid Strait, and even as far south as between Geraldton and Fremantle. Although it reaches about as large a size as *microdiscus*, it does not develop so many division series and hence so many arms. The maximum number seems to be about 60. The "Siboga" did not take this species in the East Indies, so it is quite possible that its range is limited to the tropical coasts of Australia.

*Zygometra comata*

A. H. Clark, 1911. Recent crin. Australia, p. 762, footnote.

— 1912. Crin. Indian Ocean, p. 105; fig. 6.

H. L. Clark, 1938. Mem. Mus. Comp. Zool., vol. 55, p. 29.

This is a common comatulid at Broome, but has not as yet been found elsewhere on the Australian coast. It occurs, according to its author, "in the Mergui Archipelago, at Singapore and among the Philippine Islands." At Broome (see H. L. Clark, 1938) it is a common species, but shows very great diversity in size, number of arms, color, and number of segments in the cirri. The largest specimens were 175-200 mm. across when spread out, and the number of arms ranged from 11 to 25. The number of segments in the cirri was usually 20-23, rarely up to 27, never less than 20.

*Zygometra punctata*

A. H. Clark, 1912b. Proc. Biol. Soc. Washington, vol. 25, p. 24.

— 1918. "Siboga" unst. crin., p. 61; pl. 19, figs. 40, 41.

The validity of this species is open to serious question, for it seems to be impossible to draw a sharp line between it and *comata*. Now that the latter species has been found abundantly at Broome, the recorded occurrence of *punctata* at the Low Isles and northern end of the Barrier Reef (H. L. Clark, 1932), as well as at the Aru Islands, places it in virtually the same area as that occupied by *comata*. If, as A. H. Clark holds, the little comatulid on which *Heterometra delicata* H. L. Clark (1915b) was based is a young *punctata*, another Australian locality is added for the small *Zygometra*. I am not convinced that *delicata* is a *Zygometra*, but believe it wise to let the species lapse (see under *Heterometra*). Further collecting in Torres Strait may some day reveal its real relationship.

Three small comatulids whose cirri seemed to warrant regarding them as *punctata* were taken at the Low Isles and near Direction Island, Barrier Reef, by the Great Barrier Reef Expedition. When I identified them in 1930-1931, I had not critically studied the *Zygometras* from Broome. Now, comparison of the Low Isles specimen, retained by the Museum of Comparative Zoölogy, with the specimens from Broome leaves no doubt that they are all the same species. It may quite properly be claimed that I have not yet seen a real example of *punctata*. The conclusion is, however, inescapable that if *punctata* is a valid species it has not yet been taken in Australia, unless the little type of "*Heterometra delicata*" is really a young one.

## Family HIMEROMETRIDAE

There are only half a dozen species representing this family in the Australian fauna, and these are all found on the reefs and shores of the tropical coasts. The record of *Craspedometra acuticirra* from Sydney, New South Wales, is based on an old and erroneous locality label. None of the species is sufficiently common to be conspicuous, with the possible exception of *Heterometra crenulata* at Broome.

## KEY TO THE GENERA OF HIMEROMETRIDAE

- A. More than 10 arms:  
 P<sub>D</sub> longer and stouter than P<sub>1</sub>, which is longer and stouter than P<sub>2</sub> ..... *Himerometra*  
 P<sub>D</sub> shorter and more slender than P<sub>1</sub>, which is shorter and more slender than P<sub>2</sub> ..... *Heterometra*  
 AA. Only 10 arms; cirri large and stout ..... *Amphimetra*

## HIMEROMETRA

A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, p. 355.

Genotype: *Antedon crassipinna* Hartlaub, 1890, p. 185.

Only a single species of this conspicuous group of comatulids has as yet been taken in Australian seas, and this is apparently rare.

*Himerometra robustipinna*

*Actinometra robustipinna* P. H. Carpenter, 1881. Notes Leyden Mus., vol. 3, p. 201.

*Himerometra robustipinna* A. H. Clark, 1912. Crin. Indian Ocean, p. 117.

H. L. Clark, 1926. Rec. Australian Mus., vol. 15, p. 184.

*Antedon crassipinna* Hartlaub, 1891. Nova acta Deutsch. Akad., vol. 58, p. 11; pl. 1, figs. 1, 5, 10.

The only occurrence of this fine comatulid in Australian waters, as yet reported, was off Ellison Reef, outer Great Barrier Reef, Queensland, in 5-15 fms. W. E. J. Partridge, surgeon on the "Geranium," collected 2 specimens, one with 29, the other with 36 arms. The cirri are peculiar in having the dorsal teeth confined to the outermost 1-6 segments.

## HETEROMETRA

A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 11.

Genotype: *Antedon quinduplicava* P. H. Carpenter, 1888, p. 262.

Only 2 species of *Heterometra* occur on the Australian coasts. A third supposed species, *H. delicata* H. L. Clark, was based on a single specimen, which, after being relegated to the synonymy of *Zygometa punctata* by A. H. Clark, is now abandoned by mutual consent as being "altogether too young for determination." The 2 Australian species are quite different from each other, and may be distinguished thus:

- Arms 35-40; enlarged proximal pinnules smooth, slender, the segments without lateral processes or produced, spinous distal edges ..... *nematodon*  
 Arms 14-26; enlarged proximal pinnules with broad, rounded, lateral processes, making a strongly serrate profile ..... *crenulata*

*Heterometra nematodon*

*Antedon nematodon* Hartlaub, 1890. Nachricht. Gesellsch. Göttingen, no. 5, p. 185.

— 1891. Nova acta Deutsch. Akad., vol. 58, p. 27; pl. 1, fig. 9.

*Heterometra nematodon* A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 11.

This is apparently a rare or at least a seldom collected comatulid. It is known only from Bowen and Port Molle on the Queensland coast, but probably occurs at many places on the Barrier Reef. It has numerous arms (38) about 80 mm. long, and the cirri have 40-50 segments.

*Heterometra crenulata*

*Antedon crenulata* P. H. Carpenter, 1882. Jour. Linn. Soc. (Zool.), vol. 16, p. 507.

— 1888. "Challenger" Comat., p. 256; pl. 36, figs. 1-6; pl. 48, figs. 3-5; pl. 49, figs. 1, 2 (all as *Antedon variipinna*).

*Heterometra crenulata* A. H. Clark, 1918. "Siboga" unst. crin., p. 77.

This is a very widespread and variable East Indian comatulid to which many specific names have been given. It ranges from Double Island Point, in southern Queensland, to Singapore and the Philippines; on the Australian coast, it has been taken in Torres Strait, at Holothuria Bank, Dundas Strait, and Baudin Island. At Broome it is very common and wonderfully diversified in color and in ruggedness of structure (see H. L. Clark, 1938, p. 33). Large specimens of *crenulata* have 20-30 arms, 75-90 mm. long. Specimens with milk-white arms and rose-red cirri are beautiful beyond words.

## AMPHIMETRA

A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 6.

Genotype: *Comatula (Alecto) milberti* J. Müller, 1846, p. 178 = *Amphimetra tessellata tessellata* A. H. Clark, 1941, p. 360.

There are apparently 3 species or "forms" of this genus in the coastal waters of tropical Australia, but none of them is a conspicuous feature of the fauna, as all are rather rare. They may be distinguished by the characters of the cirri, but the status and validity of these forms are still debatable.

## KEY TO THE SPECIES OF AMPHIMETRA

- A. Cirrus segments 30-50:  
 Cirri rather slender, tapering more or less distally, longer proximal segments about as long as broad, sometimes slightly longer, distal segments with small dorsal spinules ..... *tessellata*  
 ..... *discoidea*  
 Cirri stouter, with dorsal spines appearing in side view as broad triangles with apex produced ..... *tessellata*  
 ..... *tessellata*  
 AA. Cirrus segments fewer than 30 ..... *pinniformis*

*Amphimetra tessellata discoidea*

*Alecto tessellata* J. Müller, 1841. Monatsber. K. preuss. Akad. Wissensch., p. 184.

*Himerometra discoidea* A. H. Clark, 1908c. Smithsonian Misc. Coll., vol. 52, pt. 2, p. 215.

- Amphimetra discoidea* A. H. Clark, 1911b. Bull. Mus. hist. nat. Paris, no. 4, p. 250.  
 ——— 1918. "Siboga" unst. crin., pl. 6 (colored); pl. 18, fig. 35.  
*Amphimetra tessellata discoidea* A. H. Clark, 1941. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 4a, p. 376.

Although this comatulid is recorded from half a dozen places on the tropical coast of Australia between Port Molle, Queensland, on the east, and south of Geraldton, Western Australia, on the other side of the continent, we did not meet with it during the three expeditions of 1913, 1929, and 1932. It may reach a considerable size, with arms 150–200 mm. long and cirri 30–50 mm. long. The color is "uniform dark purple or violet" or "yellow brown, the cirri and pinnules purple," but there is probably considerable individual diversity. A. H. Clark (1941) now thinks *discoidea* is best treated as a subspecies of a species *tessellata*, but the species itself also occurs in the same area, and the supposed difference in the cirri seems trivial. One form or the other (or both) is widely distributed in the East Indian region from Formosa and Sunda Strait to subtropical Australia.

### *Amphimetra tessellata tessellata*

- Comatula jaquinoti* J. Müller, 1846. Monatsber. K. preuss. Akad. Wissensch., p. 178.  
*Amphimetra jaquinoti* A. H. Clark, 1918. "Siboga" unst. crin., p. 85; pl. 18, fig. 36.  
*Amphimetra tessellata tessellata* A. H. Clark, 1941. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 4a, p. 360.

Unlike most comatulids, this form is notably lacking in grace and beauty. The long arms (125–135 mm.) are ungainly and somewhat rigid, and the rather numerous cirri are also long and stiff, 40–50 mm., with numerous segments (28–47). The color is deep reddish purple or violet, often more or less marked or banded with white or yellow, but the amount and location of the light color show great diversity; sometimes it is confined to the pinnules or to the dorsal side of the arm tips, or to regenerating parts of injured arms. Though not uncommon at Broome, this comatulid was met with only three times. It is, however, widely distributed on the tropical coast of Australia, having been taken at several stations on the Queensland coast (Port Molle and northward) and on the Western Australian coast between Geraldton and Fremantle and at Houtman's Abrolhos. It is also known from several stations in the East Indian islands.

### *Amphimetra pinniformis*

- Antedon pinniformis* P. H. Carpenter, 1881. Notes Leyden Mus., vol. 3, pp. 175, 180.  
*Amphimetra pinniformis* A. H. Clark, 1911a. Notes Leyden Mus., vol. 33, p. 182.

This little-known species, originally described from Andai, New Guinea, is included in this volume on the strength of a single dubious record from 15 fms. on Holothuria Bank, northwestern Australia. The specimen is in the British Museum, and A. H. Clark (1913, p. 25) says it is "probably" this species. Many years later (1941, p. 360) he says it is "probably" (line 6), and then "definitely" (line 25), *pinniformis*. Until more material is available the validity of *pinniformis* is open to doubt. No figure has been published.

## Family MARIAMETRIDAE

The Australian members of this family fall into 3 genera, all of which are more or less conspicuous because of form or color or both. They occur only in the tropics and are obviously members of the East Indian fauna. One species ranges westward to Madagascar and others eastward to Tonga and perhaps to Hawaii. None is peculiar to Australia. The 3 genera are distinguished by the following characters:

### KEY TO THE GENERA OF MARIAMETRIDAE

- A. One or more of proximal pinnules enlarged, stiffened, and spinelike, usually with fewer than 18 long segments ..... *Stephanometra*  
 AA. None of lower pinnules stiffened and spinelike; enlarged lower pinnules with at least 20 segments, flagellate distally:  
     P<sub>2</sub> and P<sub>3</sub> similar and of equal length ..... *Liparometra*  
     P<sub>2</sub> markedly longer and more or less stouter than P<sub>3</sub> or P<sub>1</sub> ..... *Lamprometra*

## STEPHANOMETRA

- A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 9.

Genotype: *Antedon monacantha* Hartlaub, 1890, p. 179 (p. 12 of reprint).

The 3 species of this genus occurring in tropical Australia show considerable diversity, but the following key will help to distinguish them:

### KEY TO THE SPECIES OF STEPHANOMETRA

- A. P<sub>2</sub> only pinnule enlarged and stiff:  
     P<sub>2</sub> more or less recurved, becoming very slender distally, composed of 15–20 segments, of which fourth and fifth are not noticeably longest ..... *indica*  
     P<sub>2</sub> much enlarged and stiffened, of 11–15 segments, of which fourth and fifth are typically longest ..... *monacantha*  
 AA. P<sub>3</sub>, like P<sub>2</sub>, enlarged, stiffened, and spinelike ..... *spicata*

### *Stephanometra indica*

- Comatula indica* E. A. Smith, 1876. Ann. Mag. Nat. Hist., ser. 4, vol. 17, p. 406.  
*Stephanometra indica* A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 10.  
*Stephanometra callipecha* H. L. Clark, 1921. Ech. Torres Strait, p. 21; pl. 1, fig. 9 (colored); pl. 36, figs. 2a–c.

This is a species of the western part of the Indo-Pacific area, ranging from northern Australia and the Lesser Sunda Islands to Madagascar. It is evidently rare in Australian seas, being known there only from the single specimen taken at the Murray Islands, October 27, 1913, which I made the basis of a new species (*callipecha*), not having any specimens of *indica* for comparison. Further experience leads me to accept A. H. Clark's present opinion that the specimen is best considered typical *indica*.

*Stephanometra monacantha*

- Antedon monacantha* Hartlaub, 1890. *Nachricht. Gesellsch. Göttingen*, no. 5, p. 179 (p. 12 of reprint).  
 — 1891. *Nova acta Deutsch. Akad.*, vol. 58, p. 59; pl. 3, figs. 33, 38.  
*Stephanometra monacantha* A. H. Clark, 1909. *Proc. Biol. Soc. Washington*, vol. 22, p. 9.  
 — 1912. *Crin. Indian Ocean*, p. 137; fig. 14.

This species is known to range from the Maldive Islands to Tonga, but it is rare in Australia, where it has been taken only in Torres Strait and at the Murray Islands. The Torres Strait record seems to be dubious, for A. H. Clark (1918, p. 96) says of Hartlaub's specimen from that region that it "represents *indica*." If that is the case, then my specimen from Mer (M.C.Z. no. 599) is the only one known from Australia. In 1918, Clark thought this specimen was also *indica*, but subsequent examination satisfied him that it really is *monacantha*, which he now (1941) considers a synonym of *S. indica protecta*. In my opinion, it is a distinct species.

*Stephanometra spicata*

- Antedon spicata* P. H. Carpenter, 1881. *Notes Leyden Mus.*, vol. 3, p. 190.  
*Stephanometra spicata* A. H. Clark, 1909. *Proc. Biol. Soc. Washington*, vol. 22, p. 10.  
 — 1918. "Siboga" *unst. crin.*, pl. 7 (colored).  
*Stephanometra stypacantha* H. L. Clark, 1915b. *Carnegie Inst. Wash. Pub.* 212, p. 103.  
 — 1921. *Ech. Torres Strait*, p. 22; pl. 22, fig. 4; pl. 36, figs. 3a-c.

Although this species is widely distributed in the East Indian region from Ceylon to the Loyalty Islands, the only recorded occurrence in Australian seas is the single specimen taken at the Murray Islands, in October 1913. In this individual, the 16 arms, about 70 mm. long, were a uniform deep red-purple, strikingly different from the "Siboga" specimen, taken in the Sulu Archipelago and suggestive of a distinct species.

## LIPAROMETRA

A. H. Clark, 1913a. *Proc. Biol. Soc. Wash.*, vol. 26, p. 143.

Genotype: *Himerometra grandis* A. H. Clark, 1908d, p. 222.

Only a single species of this genus occurs in Australia, and it is apparently rare or unusually secretive.

*Liparometra articulata*

- Comatula (Alecto) articulata* J. Müller, 1849. *Abhandl. K. preuss. Akad. Wissensch.* (1847), p. 263 (p. 27 of reprint).  
*Liparometra articulata* A. H. Clark, 1913a. *Proc. Biol. Soc. Washington*, vol. 26, p. 143.  
*Antedon reginae* Bell, 1884. "Alert" rept., p. 160; pl. 12, figs. A, Aa.

The range of this species is given by A. H. Clark as "Molucca to Northern Australia," but the only Australian record is the single specimen taken by the "Alert" at Port Molle, Queensland, which Bell called *Antedon reginae*. It must be a secretive, if not a very rare, comatulid in Australia.

## LAMPROMETRA

- A. H. Clark, 1913a. *Proc. Biol. Soc. Washington*, vol. 26, p. 143.  
 — 1941. *Bull. 82 U. S. Nat. Mus.*, vol. 1, pt. 4a, p. 472.

Genotype: *Antedon imparipinna* P. H. Carpenter, 1882, p. 505 = *Alecto palmata* J. Müller, 1841, p. 185.

The species of this genus show such differences in structure and so much individual diversity in details that they are by no means well defined. The 2 Australian species may be distinguished as follows if the specimens are mature and in good condition:

- $P_2$  very long, rather stiff, and very stout, though tapering gradually to a more or less flagellate tip ..... *palmata*  
 $P_2$  resembling  $P_1$  but of greater length ..... *gyges*

*Lamprometra palmata*

- Alecto palmata* J. Müller, 1841. *Monatsber. K. preuss. Akad. Wissensch.*, p. 185.  
*Lamprometra protectus* A. H. Clark, 1913a. *Proc. Biol. Soc. Washington*, vol. 26, p. 144.  
 — 1918. "Siboga" *unst. crin.*, p. 271; pl. 8 (colored).  
*Lamprometra brachypecha* H. L. Clark, 1921. *Ech. Torres Strait*, p. 22; pt. 2, fig. 1 (colored); pl. 22, figs. 1, 2.  
*Lamprometra palmata* A. H. Clark, 1929. *Jour. Linn. Soc. (Zool.)*, vol. 36, p. 641.  
 — 1941. *Bull. 82 U. S. Nat. Mus.*, vol. 1, pt. 4a, p. 474.

The diversity shown by this perplexing comatulid is emphasized by the fact that A. H. Clark in 1918 (p. 100) assigned 16 names to its synonymy, and in 1941 he devotes more than 4 pages to the synonymy and 37 pages to a discussion of its diversity and distribution. It ranges throughout the East Indies from Ceylon to Hong Kong and southward to the northern coasts of Australia. To the east, it extends to Tonga, and Clark lists it as from Hawaii. There are 7 specimens from the "northern coast of Australia" in the South Australian Museum (see H. L. Clark, 1928, p. 368), and 4 specimens were taken at Mer, Murray Islands, in 1913. These latter specimens were regarded by me as representing a new species which I called *brachypecha*. A. H. Clark, however, considers them "a form of *palmata* with the lower pinnules rather more slender than usual." At Mer, this crinoid is, in life, beautifully colored with green, white, and deep yellow. It occurs on the under surface of large coral fragments on the reef flat on the southeastern side of the island.

*Lamprometra gyges*

- Antedon gyges* Bell, 1884. "Alert" rept., p. 160; pl. 12, figs. Ba-b.  
*Lamprometra gyges* A. H. Clark, 1913a. *Proc. Biol. Soc. Washington*, vol. 26, p. 144.  
 H. L. Clark, 1921. *Ech. Torres Strait*, pl. 1, fig. 4 (colored); pl. 21, figs. 4, 5; pl. 22, fig. 3.

This species has been repeatedly taken on the northern coast of Australia, and as far south on the east coast as Port Denison and on the west as Wooded Isle, Houtman's Abrolhos. At Darwin, 5 specimens were taken in 1929, and at Broome, where 19 specimens were obtained, it is fairly common (see H. L. Clark, 1921, p. 23; 1938, p. 35). A. H. Clark now considers *gyges* a subspecies or form of *palmata*, but I feel sure that the latter name already covers 2 or more distinct species whose limits will be determined only when good series can be studied in the field at several different, well separated places.

## Family COLOBOMETRIDAE

Second only to the Comasteridae in the number of its representatives among the comatulids of Australia, this family is found on all suitable parts of the tropical and even subtropical coasts of the continent. A dozen species are known, and there is reason to believe that others, perhaps many, remain to be discovered. They are, for the most part, small, 10-armed forms, active in their movements but secretive in habits. The dozen species are grouped in 8 genera, which may be distinguished as follows:

## KEY TO THE GENERA OF COLOBOMETRIDAE

- A.  $P_8$  present on all arms: ..... *Cenometra*  
 B. More than 10 arms .....  
 BB. Only 10 arms:  
 C.  $P_1$ ,  $P_2$ , and  $P_3$  similar, elongated, stiffened, segments beyond basal 2 much elongated;  $P_2$  longest ..... *Iconometra*  
 CC. Not as above:  
 D.  $P_1$  shorter, smaller, weaker than  $P_2$  ..... *Oligometra*  
 DD.  $P_2$  longest, stoutest pinnule on arm:  
 Some basal segments of genital pinnules more or less expanded laterally; cirrus segments each with single transverse dorsal ridge ..... *Austrometra*  
 No basal segments of genital pinnules expanded; cirrus segments each with 2 transverse ridges ..... *Oligometrides*  
 AA.  $P_8$  absent:  
 E. More than 10 arms ..... *Petasometra*  
 EE. Only 10 arms:  
 Outer cirrus segments each with long, prominent dorsal spinelet ..... *Colobometra*  
 Outer cirrus segments each with serrate, transverse dorsal ridge ..... *Decametra*

## CENOMETRA

A. H. Clark, 1909. Proc. Biol. Soc. Wash., vol. 22, p. 8.

Genotype: *Himerometra unicornis* A. H. Clark, 1908c, p. 216.

This is a genus chiefly of the western and northern parts of the East Indian region, and only 1 species has been reported from Australia.

*Cenometra cornuta*

A. H. Clark, 1911. Rec. crin. Australia, p. 772.

— 1913. Smithsonian Misc. Coll., vol. 61, no. 15, p. 33.

Only a single specimen, the holotype in the British Museum, was recorded in connection with the original description of this species, and no figure has been published. This individual was reported to have 26 arms, about 110 mm. long, banded white and purple, and 14 brown cirri. The type locality was given as "Adele Island, north Australia," which lies off Cape Leveque, Western Australia. The locality "Baudin Island," which lies 200 miles or so northeast of Adele, is also given, though no specimen from there is mentioned. Two years later (1913, p. 33) the type is again described and no mention is made of Baudin Island, but a "broken specimen" from "no locality" is mentioned as being like the holo-

type in color. Obviously *Cenometra cornuta* is a rare comatulid, possibly confined to a seldom visited area of Australia's northwestern coast.

## ICONOMETRA

A. H. Clark, 1929. Jour. Linn. Soc. (Zool.), vol. 36, p. 643.

Genotype: *Iconometra speciosa* A. H. Clark, 1929, p. 643.

This little genus is represented in Australia by a single species, originally taken in Torres Strait but now known to range farther south on the Queensland coast. The other 2 species occur in the Philippines and off southern Annam.

*Iconometra anisa*

*Oligometra anisa* H. L. Clark, 1915b. Carnegie Inst. Wash. Pub. 212, p. 105.

— 1921. Ech. Torres Strait, p. 23; pl. 1, fig. 10 (colored); pl. 4, figs. 1, 3 (colored); pl. 21, figs. 1-3; pl. 36, figs. 1a-c.

*Iconometra anisa* A. H. Clark, 1929. Jour. Linn. Soc. (Zool.), vol. 36, p. 643.

Although this pretty, diversely colored little comatulid was not rare at the Murray Islands, we did not meet with it anywhere else along the northern coast of the continent. The Great Barrier Reef Expedition took 2 specimens ½ mile north of Eagle Island, northern Queensland, in 10 fms., indicating that this is really a Barrier Reef species. Its diversity of color, general appearance, and activities are recorded in H. L. Clark, 1921, pages 23-24.

## OLIGOMETRA

A. H. Clark, 1908. Proc. Biol. Soc. Washington, vol. 21, p. 126.

Genotype: *Antedon serripinna* P. H. Carpenter, 1881, p. 182.

This widely spread Indo-Pacific genus is represented in Australia by 2 species whose ranges overlap in the Torres Strait region. They may be distinguished thus:

$P_2$  very stout, composed of short segments bearing long lateral processes ..... *carpenteri*  
 $P_2$  not so conspicuously stout, lateral processes only moderately developed ..... *serripinna*

*Oligometra carpenteri*

*Antedon carpenteri* Bell, 1884. "Alert" rept., p. 157; pl. 10, figs. Aa-c.

*Oligometra carpenteri* A. H. Clark, 1908. Proc. Biol. Soc. Washington, vol. 21, p. 126.

This comatulid ranges from Port Curtis, Queensland, to Baudin Island, off Cape Voltaire, northern Western Australia. It is reported from the Aru Islands, but is otherwise strictly Australian. We did not find it at Darwin, or at Cape Leveque, Western Australia, but W. E. J. Paradipe took 2 specimens in 1923 at the Sir Edward Pellew group of islands in the Gulf of Carpentaria.

*Oligometra serripinna*

*Antedon serripinna* P. H. Carpenter, 1881. Notes Leyden Mus., vol. 3, pp. 175, 182.

*Oligometra serripinna* A. H. Clark, 1908. Proc. Biol. Soc. Washington, vol. 21, p. 126.

— 1912. Crin. Indian Ocean, pp. 169-174; fig. 28.

This is a wide-ranging species, having been taken at Ceylon, in the Philippines, in New Guinea, and at Long Island, in Houtman's Abrolhos, Western Australia. The last is the only Australian record of which I know, but the specimen was examined by A. H. Clark, who considers it undoubtedly *serripinna*, though not typical.

### AUSTROMETRA

A. H. Clark, 1916a. Jour. Washington Acad. Sci., vol. 6, p. 115.

Genotype: *Oligometra thetidis* H. L. Clark, 1909, p. 522.

This monotypic genus is peculiar to southeastern Australia.

#### Austrometra thetidis

*Oligometra thetidis* H. L. Clark, 1909. "Thetis" rept., p. 522; pl. 47, figs. 1-3.

*Austrometra thetidis* A. H. Clark, 1916a. Jour. Washington Acad. Sci., vol. 6, p. 115.

In addition to the 15 specimens taken by the "Thetis" off Wollongong, New South Wales, in 55-56 fms. on a bottom of "sand and mud to rock," this little comatulid is known from 2 specimens taken by the "Endeavour" on the "eastern slope, Bass Strait," depth and character of bottom not recorded; and from 3 specimens taken in December 1929, west-southwest of Gabo Island, Victoria, in 70 fms., character of bottom not recorded. It is small, with 10 arms only a little more than 25 mm. long, and about 16 cirri with 15-18 segments. The color ranges from cream color or yellowish to reddish violet or dull purplish, but most commonly is variegated, either light with purplish markings or violet with small light areas. The fact that all the "Thetis" specimens were taken at one station suggests that the species is more or less gregarious.

### OLIGOMETRIDES

A. H. Clark, 1913. Smithsonian Misc. Coll., vol. 61, no. 15, p. 37.

Genotype: *Comatula adeonae* Lamarck, 1816, vol. 2, p. 535.

This is another monotypic genus occurring in Australia but not confined to those coasts, as the "Siboga" obtained specimens in the Aru Islands and near Flores.

#### Oligometrides adeonae

*Comatula adeonae* Lamarck, 1816. Anim. sans vert., vol. 2, p. 535.

*Oligometrides adeonae* A. H. Clark, 1913. Smithsonian Misc. Coll., vol. 61, no. 15, p. 37.

*Antedon bidens* Bell, 1884. "Alert" rept., p. 158; pl. 11, figs. Aa-c.

Döderlein, 1898. Semon's Crin., in Jena Denkschr., vol. 8, p. 476; pl. 36, figs. 3-3d.

Although the Carnegie Expedition of 1913 failed to find this species in the Torres Strait region, both Coppinger, in 1881, and Semon, in 1892, obtained specimens. Döderlein (1898, p. 476) says there were "many specimens" in Semon's collection from Thursday Island. Coppinger found *adeonae* at Port Curtis and Port Denison, Queensland, also. We did not find it at Darwin or at Port Essington, but at Broome, both in 1929 and in 1932, it was common, more than 60 speci-

mens being collected. These showed a great deal of diversity in color and some were very handsome. One specimen having 11 arms was taken, a single II Br 2 series being present. For further details see H. L. Clark, 1938, p. 40.

### PETASOMETRA

A. H. Clark, 1912a. Smithsonian Misc. Coll., vol. 60, no. 10, p. 25.

Genotype: *Antedon clarae* Hartlaub, 1890, p. 174 (p. 7 of reprint).

This is a small group of handsome comatulids characteristic of the East Indies and northern Australia. The Australian species are very distinct from one another as well as from the genotype, which has not yet been taken so far south. None of the species are well known or at all common, for of all 3 combined, only 4 specimens have been taken.

#### KEY TO THE SPECIES OF PETASOMETRA

- A. Arms 15; cirri with only 18-22 segments ..... *brevicirra*  
 AA. Arms more than 20:  
     Color light yellowish with brown articulations; cirrus segments,  
     28-31 ..... *helianthoides*  
     Color black or dark brown variegated with cream color; cirrus seg-  
     ments, 22-25 ..... *variegata*

#### Petasometra brevicirra

H. L. Clark, 1938. Mem. Mus. Comp. Zool., vol. 55, p. 36; figs. 1, 2.

This species is based on a single specimen with 15 arms 45-60 mm. long. The coloration is a variegated combination of deep buff, purplish brown, and dark purple. The specimen was taken at False Cape Bossut, Western Australia, southwest of Broome, September 9, 1929; although we were repeatedly in that region both in 1929 and in 1932, no other individual was seen.

#### Petasometra helianthoides

A. H. Clark, 1912a. Smithsonian Misc. Coll., vol. 60, no. 10, p. 26 (no figure).

This handsome species is also based on a single specimen, taken by Michaelsen and Hartmeyer, June 16, 1905, in 5 fms. in the south passage of Shark Bay, Western Australia.

#### Petasometra variegata

H. L. Clark, 1938. Mem. Mus. Comp. Zool., vol. 55, p. 38; figs. 3, 4.

This is one of the few echinoderms found at Darwin and not elsewhere. Only 2 individuals were taken, both being dredged near the Shell Islands, in Darwin harbor, in 3-6 fms. on a sponge and alcyonarian bottom. The short, strongly recurved cirri and the very dark, though more or less variegated, color set this species apart from its congeners. It is evidently a secretive form and not at all gregarious.

## COLOBOMETRA

A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 5.

Genotype: *Antedon perspinosa* P. H. Carpenter, 1881, p. 178.

Here is another genus represented in Australia by a single species, and again the material is scanty and the records are far from satisfactory.

*Colobometra perspinosa*

*Antedon perspinosa* P. H. Carpenter, 1881. Notes Leyden Mus., vol. 3, p. 178.

*Antedon loveni* Bell, 1884. "Alert" rept., p. 158; pl. 10, figs. B, C, e.

*Colobometra perspinosa* A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 6.

——— 1918. "Siboga" unst. crin., p. 124; pl. 28, fig. 103.

Although this species is recorded from Port Jackson, New South Wales, and Lord Howe Island, as well as from Penguin Channel, 16 fms., and Port Denison, Queensland, the type locality is the island of Jobi, New Guinea, and later collections are from the southern East Indian region. It obviously belongs to the tropical fauna and ought not to be included in that of New South Wales until the supposed records are verified. The long cirri, the slender and rather rigid lower pinnules, and the dark color are a combination of characters that should distinguish it easily among Australian crinoids.

## DECAMETRA

A. H. Clark, March 1911. Proc. U. S. Nat. Mus., vol. 40, p. 31 (no diagnosis).

——— August 1911. Rec. crin. Australia, p. 774 (diagnosis and type given as *D. mobiusi* sp. nov., a nomen nudum).

——— 1912. Crin. Indian Ocean, p. 158 (type given as *Antedon informis* P. H. Carpenter, 1888, p. 205).

In March 1911, the name *Decametra* is used without even a hint that it is a new genus, and 3 species, listed as new, are described, the first being *möbiusi*. Two other species, *D. informis* (presumably *Antedon informis* P. H. Carpenter) and *D. taprobanes* (presumably *Cyllometra taprobanes* A. H. Clark), are mentioned incidentally. If "*möbiusi*" of August is to be considered a typographical error for "*möbiusi*" of March, as seems indubitable, then it is the type of the genus. But if it is to be arbitrarily treated as a different name, then *informis*, designated in 1912, must be accepted as the type. It does not greatly matter which species we accept, but the case illustrates well the annoyances which arise from publishing a new generic name without either a diagnosis or a designated type.

The genus seems to be represented in Australia by 1 species of the west coast and 1 of the east. Each is known from only a single specimen, and the 2 may be distinguished by the cirri:

Cirrus segments 16-18	.....	<i>studerii</i>
Cirrus segments 26-28	.....	<i>zebra</i>

*Decametra studeri*

*Oligometra studeri* A. H. Clark, 1909a. Proc. Biol. Soc. Washington, vol. 22, p. 41.

*Decametra studeri* A. H. Clark, 1911. Rec. crin. Australia, p. 774.

This species is known only from the unique holotype taken during the voyage of the "Gazelle" at Turtle Bay Anchorage, Dirk Hartog Island, Western Australia, in 7 fms. No figure has been published.

*Decametra zebra*

*Oligometra zebra* H. L. Clark, 1916. "Endeavour" rept., p. 22; pl. 2, fig. 2.

The unique holotype of this species was taken by the "Endeavour" in 35-36 fms., 11 miles east-southeast of the mouth of the Clarence River, New South Wales. A. H. Clark has suggested that it is better considered a *Decametra*. It has arms about 70 mm. long, pale buff or brownish white, with the joints (that is, the lines between the segments) rich reddish purple in sharp contrast.

## Family TROPIOMETRIDAE

This family contains but a single genus and only a few species.

## TROPIOMETRA

A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, p. 349.

Genotype: *Comatula carinata* Lamarck, 1816, vol. 2, p. 534.

Of the 7 species recognized by A. H. Clark in this tropical genus, only 1 occurs in Australia.

*Tropiometra afra*

*Antedon afra* Hartlaub, 1890. Nachricht. Gesellsch. Göttingen, no. 5, p. 172 (p. 5 of reprint).

——— 1891. Nova acta Deutsch. Akad., vol. 58, p. 86; pl. 5, figs. 50, 52.

*Tropiometra afra* A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, p. 349.

——— 1918. "Siboga" unst. crin., p. 132; pl. 28, fig. 106.

This big, rigid, nearly black comatulid has but rarely been taken, only 8 being recorded. Of these, 1, taken long ago by the United States Exploring Expedition, is from an unknown locality in the "South Pacific"; 2 are from Bowen, Queensland; 1 was taken by the "Siboga" between Misol and New Guinea in 18 fms.; 3 are from Mer, Murray Islands, Queensland; and 1 is from between Geraldton and Fremantle, Western Australia, 60-80 fms. Of the first 3 specimens, A. H. Clark says (1911, p. 780), "So far as known the color is always either entirely yellow or entirely violet, never mottled," but the "Siboga" specimen was "violet with large blotches of light yellow." The other 4 specimens were in life "dark purplish-brown" or "at first sight, black," "in bright light, deep purple." Judging from the specimens taken at Mer, *afra* is an exceptionally inert and rigid comatulid (see H. L. Clark, 1921, p. 25). It grows to a large size, with arms 200 mm. or more in length and cirri 35-45 mm. long.

## Family CALOMETRIDAE

This is a small family of East Indian crinoids ranging from southern Japan to southwestern Australia. Only 2 genera reach Australia, and they are easily distinguished thus:

IIBr series 4 (3 + 4)

IIBr series 2

*Reometra*  
*Neometra*

## REOMETRA

A. H. Clark, 1934. Proc. Biol. Soc. Washington, vol. 47, p. 14.

Genotype: *Oreometra mariae* A. H. Clark, 1912, p. 179.

The name *Reometra* was proposed to replace the *Oreometra* of 1912, which proved to be preoccupied, the name having been used in 1910 by Aurivillius for a genus of geometrid moths. *Reometra* is a small and apparently rare genus, as only 2 specimens are known, one the type of *R. mariae* from an unknown locality, the other the type of the following species. A. H. Clark tells me that he cannot see that *pericalles* differs from *mariae*. Of course he means that he does not think the differences are sufficiently weighty to warrant considering the 2 specimens as representing 2 species. There can be no doubt, however, about the existence of the differences which are given in the original description of *pericalles*. In my judgment it would be an error to regard the 2 specimens as 1 species, and the matter must rest here until more material is available.

*Reometra pericalles**Oreometra pericalles* H. L. Clark, 1916. "Endeavour" rept., p. 20; pl. 3, fig. 1.

This species rests on a single badly damaged specimen lacking cirri and some of the arms. The comatulid in life was apparently more than 150 mm. across and was handsomely colored with purple and white. It was taken by the "Endeavour" 13 miles north by west of Double Island Point, Queensland, in 25-26 fms. More material is greatly to be desired, as several morphological details demand new and careful study.

## NEOMETRA

A. H. Clark, 1912. Crin. Indian Ocean, p. 181.

Genotype: *Antedon multicolor* A. H. Clark, 1907a, p. 130.

This East Indian genus has been found on the western coast of the Australian continent in moderately deep water, but it has not yet been found on the eastern coast. Apparently it is not strictly littoral in its habitat. The 2 species are to be distinguished as follows:

Dorsal processes on outer cirrus segments triple, a median carination with a dorsolateral keel on either side; about 40 arms ..... *gorgonia*  
Dorsal processes on outer cirrus segments a median keel only; 30 arms or fewer ..... *conaminis*

*Neometra gorgonia*

A. H. Clark, 1914. Rec. W. Australian Mus., vol. 1, pt. 3, p. 125 (no figure).

The "Endeavour" took 7 specimens of this comatulid in 80-120 fms. between Fremantle and Geraldton. It has not been taken since either in Australia or elsewhere. The numerous arms are nearly 100 mm. long and the 19-22 cirri are 35-45 mm. long with 40-50 segments. The coloration is purple and white.

*Neometra conaminis*

A. H. Clark, 1914. Rec. W. Australian Mus., vol. 1, pt. 3, p. 129 (no figure).

The "Endeavour" took this species also in 80-120 fms. between Fremantle and Geraldton, but there is no indication of "stations" and we do not know whether the 2 *Neometras* were taken in the same dredge hauls or not. This species has not been taken elsewhere as yet, and must therefore be considered, like the preceding, endemic. It is somewhat smaller with only about half as many arms, somewhat fewer and much shorter cirri, and different coloration, yellow and white.

## Family PTILOMETRIDAE

This family, containing a single genus, is endemic in Australia and is confined to the southern temperate coasts. It is thus isolated geographically, though structurally it is allied to the Asterometridae of the East Indian region and to the large tropicopolitan family Himerometridae. Probably *Antedon protomacronema* Chapman (1913, p. 179), based on 2 minute centrodorsals from borings in the Lower Miocene of western Victoria, is more nearly related to this family than to the Antedonidae.

## PTILOMETRA

A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, p. 358.

Genotype: *Comatula macronema* J. Müller, 1846, p. 179.

When this genus was established, *Alecto macronema* J. Müller, 1841, was designated as the type, but there is no such combination in Müller's writings and no such combination is listed in A. H. Clark's "Nomenclature of the Recent Crinoids" (1908b). In 1911 (Rec. Crin. Australia, p. 781) Clark corrected the error and designated the type as given above. The 2 species of this genus are the most characteristically Australian crinoids that there are. Inhabiting the colder southern coast, they are strikingly different in habit and structure from their tropical relatives. They are distinguished from each other by details of form in the segments of their long, numerous cirri:

Basal cirrus segments twice as broad as long; cirrus sockets irregularly arranged; middle segments of proximal pinnules not so long as broad ..... *australis*  
Basal cirrus segments as long as broad or longer; cirrus sockets in more or less regular columns; middle segments of proximal pinnules 1.5-2 times as long as broad ..... *macronema*

*Ptilometra australis**Encrinurus australis* Wilton, 1843. Tasmanian Jour. Nat. Sci., vol. 2, pp. 118-120.*Ptilometra mülleri* A. H. Clark, 1909a. Proc. Biol. Soc. Washington, vol. 22, p. 41.

— 1921. Bull. 82 U. S. Nat. Mus., vol. 1, pt. 2, pl. 53, fig. 1346.

*Ptilometra australis* A. H. Clark, 1941 (*in litt.*).

The first *Ptilometra* studied in Europe came from King George Sound nearly a century ago, receiving the name *Comatula macronema*. Thereafter, until 1909, all *Ptilometras* from Australia were called by that name. A. H. Clark, however,

discovered that the specimens from Sydney were definitely different from those taken in Western Australia, and suggested the specific name *mülleri* for the eastern form. In 1911, he used this name in his work on the Recent crinoids of Australia (p. 783), at the same time (p. 735) making clear the characters which distinguished the two species.<sup>1</sup> At the conclusion of the paper, its editor, R. Etheridge, director of the Australian Museum, called attention to the paper published in 1843 by Charles P. N. Wilton "On a New Species of Encrinite (*Encrinus australis*)." Careful study of this paper convinces Clark that Wilton's *Encrinus* is a *Ptilometra*, and in this conclusion I concur. Since his specimens were taken at Newcastle, New South Wales, at the mouth of the Hunter River, he was unquestionably dealing with *Ptilometra mülleri* A. H. Clark, and consequently the correct name for this crinoid is *Ptilometra australis* (Wilton).

This *Ptilometra* is essentially a species of New South Wales; it ranges as far north as the Clarence River and southward to the entrance of Bass Strait. There are no reliable records west of Bass Strait. The record from Port Phillip is probably based on a specimen of *Aporometra wilsoni*. Fully grown specimens have 18-23 arms 75 mm. long, and the numerous cirri nearly equal them, having 70-94 segments. Nothing is recorded as to the color in life. Museum specimens range from "pinkish white" to dark brown, either reddish or yellowish or grayish. One of the few disappointments of my Australian collecting was my failure to meet with *Ptilometra* anywhere. Apparently it does not occur near low-water mark, but only from 6 fms. down to 78, though it is recorded from Sow and Pigs reef, Port Jackson.

#### *Ptilometra macronema*

*Comatula macronema* J. Müller, 1846. Monatsber. K. preuss. Akad. Wissensch., p. 179.

*Antedon macronema* P. H. Carpenter, 1888. "Challenger" Comat., pl. 38, figs. 4, 5.

*Ptilometra macronema* A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, p. 358.

The "Endeavour" found this species "very abundant" at Geraldton, well up on the coast of Western Australia, in 25-40 fms. She also took specimens in the Great Australian Bight in 62 fms., and in 28-37 fms. off the South Australian coast. Verco found it common in his numerous dredgings in St. Vincent and Spencer gulfs. It is reported from Port Phillip, Victoria, and may well occur there, but that is apparently the eastern limit of its range. There are 25-31 arms in large specimens, but in size and coloration, so far as we know, there are no important differences between this species and the preceding.

#### Family ASTEROMETRIDAE

The only members of this family that can be called Australian were taken on Sahul Bank many years ago. As is stated on page 2, it seems necessary to include that area within the limits of Australia, as accepted for this report. The Asterometridae must therefore be included here, since 2 species of *Asterometra* are among the Sahul Bank crinoids. Both were listed by Bell (1893, p. 339) as *Antedon longicirra* P. H. Carpenter.

<sup>1</sup> In this paper, the specific name is spelled *mülleri* only 5 times in 26 trials, the incorrect *mulleri* being generally used.

#### ASTEROMETRA

A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, p. 358.

Genotype: *Antedon macropoda* A. H. Clark, 1907a, p. 136.

Although Bell (1893) listed the Asterometras from Sahul Bank as all 1 species, A. H. Clark's re-examination of the material determined that there were 2 species, neither of which was the species of Carpenter to which Bell assigned them all. The 2 species may be distinguished thus:

Elements of IBr series and first 2 brachials without prominent median keels ..... *acerba*  
Elements of IBr series and first 2 brachials with prominent median keels ..... *mirifica*

#### *Asterometra acerba*

A. H. Clark, 1909c. Proc. Biol. Soc. Washington, vol. 22, p. 147.

— 1912. Crin. Indian Ocean, p. 194; fig. 34.

This comatulid is known as yet only from the original specimen (apparently unique) taken on Sahul Bank.

#### *Asterometra mirifica*

A. H. Clark, 1909c. Proc. Biol. Soc. Washington, vol. 22, p. 146.

— 1912. Crin. Indian Ocean, p. 192; fig. 33.

Neither Bell nor Clark gives a hint as to how many specimens there were of this species from Sahul Bank, but apparently there were several. Two specimens were reported by Clark in 1912 (p. 647) from Rotti Strait, 100 fms.

#### Family THALASSOMETRIDAE

This large and cosmopolitan family is represented in Australian seas by only 2 genera, neither of which is common. They may be distinguished by the number of arms:

Arms 10-12 ..... *Daidalometra*  
Arms more than 15 ..... *Cosmiometra*

#### DAIDALOMETRA

A. H. Clark, 1916a. Jour. Washington Acad. Sci., vol. 6, p. 116.

Genotype: *Antedon hana* A. H. Clark, 1907a, p. 137.

A single species of this genus is recorded from Australia.

#### *Daidalometra arachnoides*

*Stenometa arachnoides* A. H. Clark, 1909d. Proc. U. S. Nat. Mus., vol. 36, p. 402.

*Daidalometra arachnoides* A. H. Clark, 1918. "Siboga" unist. crin., p. 157; pl. 23, fig. 60.

The right of this comatulid to a place in the Australian fauna is based on a single specimen supposed to be from Port Denison, Queensland. All other known species are from the East Indies and southern Philippine Islands, and from deep water.

## COSMIOMETRA

A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 16.

Genotype: *Thalassometra komachi* A. H. Clark, 1908e, p. 311.

There are 2 representatives of this genus in Australia, but they seem to be rare indeed, for one has been taken once at the northwestern corner of the continent, and the other is known from 2 specimens taken at the southeastern corner. They are easily distinguished by their cirri:

Cirri with 68-74 segments ..... *dasybrachia*  
 Cirri with about 40 segments ..... *woodmasoni*

*Cosmiometra dasybrachia*

H. L. Clark, 1916. "Endeavour" rept., p. 24; pl. 4, fig. 2.

This well marked species has 20 arms about 90 mm. long and some 35 cirri about half as long. The color in alcohol is light yellow-brown. Two specimens were taken by the "Endeavour" east of Flinders Island, Bass Strait, in 70-100 fms.

*Cosmiometra woodmasoni*

*Antedon woodmasoni* Bell, 1893. Jour. Linn. Soc. (Zool.), vol. 24, p. 340; pl. 23; pl. 24, fig. 1.

*Cosmiometra woodmasoni* A. H. Clark, 1909. Proc. Biol. Soc. Washington, vol. 22, p. 17.

This notable comatulid is known only from Sahul Bank, where at least 2 specimens were taken at an unrecorded depth. The 20 arms were 110 mm. long and there were about 18 cirri. The color was "white with faint patches of brown here and there."

## Family APOROMETRIDAE

This little family of small comatulids is peculiar to the southern coasts of Australia. It contains a single genus, differentiated apparently into 3 species.

## APOROMETRA

H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 41.

Genotype: *Himerometra paedophora* H. L. Clark, 1909, p. 524.

For a full account of this group and a discussion of its place in the system, see the memoir referred to above (H. L. Clark, 1938), which gives A. H. Clark's conclusions in regard to its relationships. The small size and relatively long and conspicuous cirri make it a very interesting and well characterized genus.

## KEY TO THE SPECIES OF APOROMETRA

- A. Longest cirrus segments not longer than broad:  
 Cirri with 39-61 segments, of which even the longest are distinctly broader than long ..... *occidentalis*  
 Cirri with 25-35 segments, of which most are about as long as broad ..... *paedophora*  
 AA. Longest cirrus segments half again as long as broad ..... *wilsoni*

*Aporometra occidentalis*

H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 43 (no figure).

This is a very common comatulid at Koombana Bay, Western Australia, and it has also been found near Garden Island, Fremantle, Western Australia. A full account was given with the description of the species.

*Aporometra paedophora*

*Himerometra paedophora* H. L. Clark, 1909. "Thetis" rept., p. 524; pl. 47, figs. 4-10.

*Ptilometra mülleri* A. H. Clark, 1911. Rec. crin. Australia, p. 785 (partim).

*Aporometra paedophora* H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 42.

This species is known as yet only from the "Thetis," "St-28, off Manning River, N. S. W., 22 fms., fine gray sand," where 23 specimens were taken. Apparently the species is, like the preceding, gregarious and local.

*Aporometra wilsoni*

*Antedon Wilsoni* Bell, 1888. Ann. Mag. Nat. Hist., ser. 6, vol. 2, p. 403 (no figure).

*Aporometra wilsoni* H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 42 (no figure).

The only locality for this species known as yet is Port Phillip, Victoria, and it does not seem to have been taken there since the original collection by J. Bracebridge Wilson. Bell does not say how many specimens there were, but he does say (1888, p. 402) there was "quite sufficient material" to warrant describing a new species. Apparently, therefore, *wilsoni* is uncommon but gregarious in Port Phillip, as the 2 other *Aporometras* are in their respective habitats.

## Family CHARITOMETRIDAE

This large cosmopolitan family is virtually absent from Australia, only a single species of an East Indian genus having been taken on Sahul Bank.

## PERISSOMETRA

A. H. Clark, 1916b. Jour. Washington Acad. Sci., vol. 6, p. 606.

Genotype: *Antedon flexilis* P. H. Carpenter, 1888, p. 217.

This genus of more than a dozen species is included here on the strength of specimens collected on Sahul Bank and identified by Bell as a species taken by the "Challenger" near the Kei Islands.

*Perissometra patula*

*Antedon patula* P. H. Carpenter, 1888. "Challenger" Comat., p. 219; pl. 43.

*Perissometra patula* A. H. Clark, 1916b. Jour. Washington Acad. Sci., vol. 6, p. 607.

There were 4 specimens of this crinoid in the collection from Sahul Bank which was studied by Bell.

Superfamily *MACROPHREATA*

There are but 3 families of macrophreate comatulids, and of these only 1 has yet been found in Australia.

## Family ANTEDONIDAE

This large and widely distributed family is rather poorly represented in Australian seas, as only 5 genera have as yet been taken there. Of these, however, one is endemic and known only from the vicinity of Broome. An Eocene fossil crinoid has been recorded by E. V. Clark (1900) from the South Australian coast, under the name "*Antedon pertusa* Tate, *mss.*," but nothing further has been published concerning it. A very small comatulid in the Australian Museum, taken in Albany Passage, Queensland, is thought by A. H. Clark (1912, p. 232) to represent the East Indian genus *Iridometra*.

## KEY TO THE GENERA OF ANTEDONIDAE

- A.  $P_2$  same length and character as  $P_3$ , much shorter than  $P_1$ ; pinnule segments with strongly produced or everted, coarsely spinous distal edges ..... *Compsometra*  
 AA. Not as above:  
 B. Distal cirrus segments with prominent dorsal processes ..... *Nanometra*  
 BB. Distal cirrus segments without prominent dorsal processes:  
 C.  $P_2$  same length and character as following pinnules ..... *Euantedon*  
 CC. Not as above:  
 First pinnules not moniliform ..... *Dorometra*  
 First pinnules moniliform, at least in basal half ..... *Monilimetra*

## COMPSOMETRA

A. H. Clark, 1908. Proc. Biol. Soc. Washington, vol. 21, p. 131.

Genotype: *Antedon loveni* Bell, 1882a, p. 534.

This genus of delicate little comatulids is widely distributed, for in addition to the 2 following Australian species, A. H. Clark recognizes 1 from Japan, 1 from the Hawaiian Islands, and 1 from the West Indies. The last, however, is known from only 2 specimens. The Australian species may be distinguished from each other by the cirri:

- Cirri comparatively stout, distalmost segments broader than long ..... *incommoda*  
 Cirri slender and delicate, distal segments much longer than broad ..... *loveni*

*Compsometra incommoda*

*Antedon incommoda* Bell, 1888. Ann. Mag. Nat. Hist., ser. 6, vol. 2, p. 404.

*Compsometra incommoda* A. H. Clark, 1910. Proc. U. S. Nat. Mus., vol. 38, p. 275.

This little comatulid is found all along the coast of Western Australia from Albany west and north as far at least as Geraldton. It is also recorded from South Australia and from Port Phillip, Victoria, and even from Port Jackson, New South Wales. But just where and how its range meets or overlaps with

that of the following species remains to be worked out. It seems to me very doubtful whether the record from Port Jackson can be trusted. No figure has been published.

*Compsometra loveni*

*Antedon loveni* Bell, 1882a. Proc. Zool. Soc. London, p. 534.

*Compsometra loveni* A. H. Clark, 1908. Proc. Biol. Soc. Washington, vol. 21, p. 131.

*Antedon pumila* Bell, 1884. "Alert" rept., p. 157; pl. 10, figs. B, Ba, b.

This delicate little crinoid is very common in Port Jackson; we took scores near Middle Head in 4-5 fms., November 21, 1929. Whitelegge (1889) says "Very common in deep water; occasionally found under stones." The range outside Port Jackson is ill defined. Records from as far north as Port Stephens and Point Halliday, New South Wales, may well be accepted, but we may wisely be skeptical of the record from "Claremont Island" if the label refers to the islets of northern Queensland. There is no satisfactory evidence of occurrence west of Bass Strait or even south of Port Jackson. Records from Port Phillip, Victoria, need confirmation.

## NANOMETRA

A. H. Clark, 1907. Smithsonian Misc. Coll., vol. 50, pt. 3, p. 348.

Genotype: *Antedon minor* A. H. Clark, 1907a, p. 144.

This small East Indian genus has recently been found to occur in southeastern Australian waters.

*Nanometra johnstoni*

D. D. John, 1939. Rept. British, Australian and New Zealand Antarctic Res. Exped., ser. B, vol. 4, pt. 6, p. 193; fig. 1.

Five specimens of this interesting little comatulid were taken in Bass Strait and near Tasmania in 70-90 fms. Little is said of the color, but in at least 2 specimens purple or purplish-brown spots were present. Presumably the ground color is more or less nearly white. Calyx about 3 mm. in diameter; cirri 10 mm. long.

## EUANTEDON

A. H. Clark, 1912a. Smithsonian Misc. Coll., vol. 60, no. 10, p. 31.

Genotype: *Antedon moluccana* A. H. Clark, 1912, p. 129.

This is a small group of delicate little antedons occurring in the East Indian region and at Tahiti. The discovery of a species in South Australian waters was to say the least unexpected.

*Euantedon paucicirra*

H. L. Clark, 1928. Rec. S. Australian Mus., vol. 3, p. 369; fig. 109.

Two specimens of this comatulid were taken in St. Vincent's Gulf by Verco and presented to the South Australian Museum. Arms about 40 mm. long; color (perhaps more or less bleached) nearly white.

## DOROMETRA

A. H. Clark, 1917. Jour. Washington Acad. Sci., vol. 7, p. 128.

Genotype: *Antedon nana* Hartlaub, 1890, p. 170 (p. 3 of reprint).

This is another genus of delicate little comatulids, characteristic of the East Indian region but ranging westward to the Red Sea and Madagascar. The 2 species that have been taken in Australia are distinguished primarily by the basal pinnules:

$P_2$  resembling  $P_1$  in size and number of segments ..... *nana*  
 $P_2$  intermediate between  $P_1$  and  $P_3$  ..... *parvicirra*

*Dorometra nana*

*Antedon nana* Hartlaub, 1890. Nachricht. Gesellsch. Göttingen, no. 5, p. 170 (p. 3 of reprint).

— 1891. Nova acta Deutsch. Akad., vol. 58, p. 89; pl. 5, figs. 57, 58.

*Dorometra nana* A. H. Clark, 1917. Jour. Washington Acad. Sci., vol. 7, p. 128.

Ranging from the Maldives to Tonga, this fragile little comatulid is found as far south as Torres Strait, where we took 2 specimens at Mer in 1913. For an account of its graceful swimming, see H. L. Clark, 1921, page 25.

*Dorometra parvicirra*

*Antedon parvicirra* P. H. Carpenter, 1888. "Challenger" Comat., p. 204; pl. 36, figs. 7, 8.

*Dorometra parvicirra* A. H. Clark, 1917. Jour. Washington Acad. Sci., vol. 7, p. 128.

We found this pretty little comatulid at Darwin in 1929 and again in 1932. It was known previously only from the Philippine Islands, but it is now known from Eagle Island, northern Queensland, so it undoubtedly occurs in the Torres Strait region. See H. L. Clark, 1938, page 46.

## MONILIMETRA

H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 47.

Genotype: *Monilimetra nomima* H. L. Clark, 1938, p. 48.

This interesting group of small comatulids, reminding one of the West Indian Cocometras, is as yet known only from the northwestern coast of Australia in the vicinity of Broome. Four species have been differentiated, which may be distinguished as follows:

## KEY TO THE SPECIES OF MONILIMETRA

A. Cirrus segments 4-6 not conspicuously different from others, rather stout, slightly compressed, not twice as long as thick; color of arms dorsally, brown of some shade or yellowish or whitish, often more or less variegated with purple or dusky and light shades:

B. Normal mature cirri short, with 13-15 segments, basal ones not much compressed; pinnules unicolor or at any rate not handsomely banded:

Fourth pinnule very large, nearly or quite equaling third; first pinnule conspicuously moniliform, with more than 23 segments; color brown of some shade, sometimes variegated, sometimes very light ..... *nomima*

Fourth pinnule obviously much smaller than third; first pinnule moniliform only in basal half, with fewer than 23 segments; color light, faintly mottled with dusky, sometimes a broad longitudinal blackish stripe on dorsal side of arm ..... *lepta*

BB. Normal mature cirri with 16-18 segments, all rather short, compressed, though not markedly so proximally; pinnules handsomely banded purple and white ..... *poecila*

AA. Cirrus segments 4-6 elongated, more than twice as long as diameter of the nearly cylindrical middle; color purple and white; cirri pure white, except sometimes at base; arms usually deep purple, but may be white, and purple only on basal pinnules ..... *bicolor*

*Monilimetra nomima*

H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 48; figs. 5, 6.

This is apparently the most common *Monilimetra* in the Broome region, but it is far from abundant, as only 7 specimens were taken in our three months of collecting. There is considerable diversity of color, but shades of brown predominate.

*Monilimetra lepta*

H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 51; figs. 7, 8.

Seven specimens of this species were taken, but it was apparently met with only twice, as 6 of the 7 were obtained at the same time and place. It is very light-colored, more or less nearly white with some dusky or purplish-gray blotches on the arm bases.

*Monilimetra poecila*

H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 53; figs. 9, 10.

Only 4 specimens of this species were taken, and, owing to an extraordinary sensitivity, 3 of these were badly broken up in the process of collecting and preserving. The color, variegated white, yellow, and purple, is very striking, the handsome banding of the purple and white pinnules being especially notable.

*Monilimetra bicolor*

H. L. Clark, 1938. Mem. Mus. Comp. Zoöl., vol. 55, p. 55; figs. 11, 12.

This species was met with four times, but only a single specimen was obtained each time. The contrast between the purple arm bases and the white cirri is very striking, but whether it will prove to be a constant and reliable species character remains to be demonstrated.