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THE CRINOIDS OF THE NATURAL
HISTORY MUSEUM AT
HAMBURG

BY

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PREFACE

During the summer of 1910 I visited Hamburg where, thanks to the kindness and courtesy of Professors K. Kraepelin and G. Pfeffer, I was so fortunate as to be able to study in great detail the collection of crinoids preserved in the Natural History Museum.

This collection is a large and exceedingly important one, and I soon found that it would be quite impossible to do justice to it in the limited time at my disposal. It was, therefore, arranged that I should lay aside such specimens as were exceptionally puzzling, or called for comparison with types or other specimens in the U. S. National Museum, and that these would be sent to me after my return to America.

As a result of this act of generosity on the part of Professors Kraepelin and Pfeffer the U. S. National Museum now possesses a complete set of photographs of all the types, and other interesting specimens, which are preserved in the Hamburg Museum.

HISTORICAL ACCOUNT

The first notice of a crinoid in the collection of the Hamburg Museum was Professor Sven Lovén's description of the famous "recent cystidean" *Hyponome sarsi*, which appeared in 1868. This was soon identified as the detached visceral mass of an endocyclic comatulid, and later shown to belong to one of the species of the genus *Zygometra*.

In the preparation of the *Challenger* report upon the comatulids Dr. Philip Herbert Carpenter visited Hamburg, and in 1882 published a detailed account of the specimens he examined, describing eleven new species. The new species described by Carpenter (with their present determinations) are as follows:

<i>Actinometra robusta</i>	<i>Comatula solaris</i>
<i>Actinometra grandicalyx</i>	<i>Comantheria grandicalyx</i>
<i>Actinometra meyeri</i>	<i>Comanthus annulata</i>
<i>Antedon variipinna</i>	<i>Amphimetra variipinna</i>
<i>Antedon crenulata</i>	<i>Amphimetra crenulata</i>
<i>Antedon lævipinna</i>	<i>Amphimetra lævipinna</i>
<i>Antedon acuticirra</i>	<i>Craspedometra acuticirra</i>
<i>Antedon ludovici</i>	<i>Craspedometra acuticirra</i>
<i>Antedon bipartipinna</i>	<i>Craspedometra acuticirra</i>
<i>Antedon æquipinna</i>	<i>Dichrometra protectus</i>
<i>Antedon imparipinna</i>	<i>Dichrometra protectus</i>

Of these four are synonyms of previously described forms, and two are synonyms of a species described in the same paper, leaving five as the total of actual new species.

Carpenter incorporated the data published in this paper in his *Challenger* monograph (1888), and, by inserting his supposed new species in his specific keys, indicated their relationships with allied forms.

In the preparation of his memoir upon the comatulids of the Indian Ocean, Dr. Clemens Hartlaub also visited the Hamburg Museum, examining Carpenter's types and studying the specimens which had been received since Carpenter's visit. In his preliminary paper (1890) he included descriptions of twelve new species, seven of which were exclusively and five in part based upon material at Hamburg. The new species described by Hartlaub (with their present determinations) are as follows:

<i>Actinometra macrobrachius</i>	<i>Capillaster macrobrachius</i>
<i>Antedon crassipinna</i> (part).....	<i>Himerometra magnipinna</i>
<i>Antedon kracplini</i>	<i>Himerometra</i> (? species)
<i>Antedon nematodon</i>	<i>Amphimetra nematodon</i>
<i>Antedon oxyacantha</i> (part).....	<i>Stephanometra oxyacantha</i>
<i>Antedon monacantha</i> (part).....	<i>Stephanometra monacantha</i>
<i>Antedon erinacca</i>	<i>Oxymetra erinacca</i>
<i>Antedon lepida</i>	<i>Dichrometra protectus</i>
<i>Antedon tenera</i> (part).....	<i>Dichrometra gyges</i>
<i>Antedon afra</i>	<i>Tropiometra afra</i>
<i>Antedon hupferi</i>	<i>Antedon hupferi</i>
<i>Antedon nana</i>	<i>Iridometra nana</i>

Of these one is not sufficiently well preserved to be determinable, two are synonyms of previously described species, and one, a type in part, is not the same species as that represented by the remainder of the type material, leaving eight as the total of actual new forms.

In the finished memoir (1891) Hartlaub elaborated his preliminary descriptions of these new species, publishing figures of most of them.

A specimen of *Solanometra magellanica* collected by Dr. H. Rehberg was recorded by Hartlaub in 1895, while a part of the material collected by Professor W. Kükenthal at Spitzbergen and at Ternate, recorded by Professor Pfeffer, and of that collected at Spitzbergen by Römer and Schaudinn, recorded by Professor Ludwig Döderlein, is in the Hamburg Museum.

The present author's report upon the crinoids collected by the Hamburg West Australian Expedition, under Drs. W. Michaelsen and R. Hartmeyer, was based upon material which is now divided between the Hamburg Museum and the Museum für Naturkunde at Berlin.

ANNOTATED LIST OF THE SPECIES

The following list includes reidentifications of all the specimens in the Hamburg Museum previously recorded with, when necessary, redescriptions. There are also notices of many specimens which have been received from various sources since the publication of Hartlaub's memoir, and which are here identified for the first time. A few specimens collected by the Hamburg West Australian Expedition, which were sent to me with the collection of the Hamburg Museum, were unfortunately overlooked at the time I prepared my memoir upon the West Australian crinoid fauna; these are recorded herein.

The citations given under the species headings refer only to the specimens recorded, as indicated by the numbers in parentheses following.

Family COMASTERIDÆ

Subfamily CAPILLASTERINÆ

COMATELLA STELLIGERA (P. H. Carpenter)

Actinometra stelligera 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 104 (1).

1. *Samoa and Fiji*.—Two specimens, each with thirty arms.

2. ? *Chinese Coast* (the accompanying label reads, in Chinese characters, "very deep water").—One specimen; the centrodorsal is thick discoidal with a flat dorsal pole 4.5 mm. in diameter; the cirri are XVIII, 20-21, 20 mm. long; there are thirty-eight arms about 80 mm. long; the distal edges of the brachials are produced and finely spinous and the distal ends of the elements of the division series are prominent, these two features together giving the animal a very rugose appearance.

COMATELLA MACULATA (P. H. Carpenter)

Actinomeira pulchella 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 105 (1).

1. *Ruk, Caroline Islands*.—One small specimen with twenty arms; the cirri are XXIII, 15-17.

CAPILLASTER MACROBRACHIUS (Hartlaub)

Actinometra macrobrachius 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 186 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 101 (1).

1. *China Sea*.—One specimen, well described by Hartlaub; in general appearance this curious form resembles such species as *Comantheria briareus*, but the arm structure is that of a typical *Capillaster*.

CAPILLASTER SENTOSA (P. H. Carpenter)

1. *Cebu*.—One large specimen with the brachials and the elements of the outer division series strongly everted distally.

CAPILLASTER MARIÆ (A. H. Clark)

Actinometra multiradiata (part) 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 104.

Dr. Hartlaub records a specimen of this species from Kagoshima, Japan, in the Stuttgart Museum.

CAPILLASTER MULTIRADIATA (Linné)

Actinometra multiradiata (part) 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zool.) vol. 16, p. 521 (1).—1888. "Challenger" Report, Comatulæ, p. 325 (1).—1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 103 (2).

Actinometra fimbriata 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 102 (3).

Actinometra coppingeri 1900. PFEFFER, Abhandl. der Senck. naturforsch. Gesell., vol. 25, p. 85 (4).

1. *Sumatra*.—Fragments of a dry specimen.

2. *Formosa (Actinometra gracilis Lütken, MS.)*.—One rather slender medium sized specimen with thirty-six arms and cirri XII, 22-24.

3. *Ruk, Caroline Islands*.—One specimen, described in detail by Hartlaub; the cirri are XXI, 24-28.

4. *Ternate*.—Two specimens, one with fifteen the other with seventeen arms; the brachials of both have very strongly everted distal edges.

5. *Ekalin, St. Matthias Island, Dr. G. Duncker*.—One typical specimen.

Subfamily COMACTININÆ

COMATULA SOLARIS Lamarek

Actinometra solaris 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 514 (1).—1888. "Challenger" Report, Comatulæ, p. 288 (1, 2).—1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 107.

Actinometra robusta 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 517 (2).

1. *Hong Kong*.—One fine large specimen of the slender armed type; this individual was well described by Carpenter.

2. *Australia*.—One dry specimen.

3. *Singapore*.—One specimen similar to the one from Hong Kong but slightly more slender; there are 21 cirrus segments. This and the individual from Hong Kong resemble the slender form of *pectinata* except for the much greater size and number of cirrus segments; they have not the broadly expanded arms and stout cirri of the Australian "*robusta*" type, nor are the arms so flat dorsally. Both are in color light brown with a fine median dorsal line and borders to the arms of white. The Hong Kong specimen has three cirri and the one from Singapore two, and two stumps. In both the centrodorsal is undergoing reduction.

4. *Rockhampton, Queensland*.—One typical specimen.

COMATULA PURPUREA (J. Müller)

1. *Abrolhos Islands (Houtman's Rocks), Western Australia*.—Two specimens; one has the anterior arms 120 mm. long and the posterior arms 60 mm. long; the cirri are VIII, 14-15, of the stout type though the arms are only very slightly broadened; the color is a very light brown, the centrodorsal and most of the IBr series rose pink; the other differs only in having the cirri slightly more slender, XIII.

2. *South Passage, Sharks Bay, Western Australia; 9 meters; June 16, 1905; Drs. Michaelsen and Hartmeyer*.—One specimen with the anterior arms 70 mm. long; the cirri are IX (one unpaired), robust.

Subfamily COMASTERINÆ

COMASTER BELLI (P. H. Carpenter)

Comaster typica (part) 1911. A. H. CLARK, Die Fauna Südwest-Australiens, Bd. 3, Lief. 13, p. 453 (Port Hedland, Western Australia).

1. *Abrolhos Islands (Houtman's Rocks), Western Australia.*—One small specimen with seventy-three arms about 85 mm. long; the cirri are VI, 14-16, 10 mm. to 12 mm. long.

2. *Broome, Roebuck Bay, Western Australia.*—Two medium-sized specimens; one has seventy-three arms 135 mm. long, and cirri XVII, 11 mm. long; there are a few scattered small nodules on the disk; the color is grayish brown; the other has sixty-eight arms 125 mm. long, and cirri XIV; the disk is thickly studded with small calcareous nodules; the color is bright yellow green, the centrodorsal and cirri light slaty.

The three small specimens from Port Hedland which I referred to *Comaster typica* in my report upon the crinoids collected by the Hamburg West Australian Expedition are undoubtedly representatives of this species.

Comaster belli is a very curious form; large specimens are in superficial appearance strikingly like similarly large specimens of *Comanthina schlegelii*, both species agreeing in possessing a unique type of arm division. Carpenter placed the two forms side by side in his "Parvicirra Group" of *Actinometra*, and heretofore I have followed him in keeping them close together. The terminal combs of *belli* and the arm division beyond the IIIBr series, however, are of the type typical of *Comaster*, and I find that, taking all the characters together, the smaller the individual the greater the resemblance to other species of *Comaster*, and the greater the difference from similar small specimens of *Comanthina schlegelii*. It thus becomes necessary to place *Actinometra belli* in the genus *Comaster*, where it finds its proper systematic position near *C. typica*.

COMASTER TYPICA (Lovén)

Actinometra typica 1888. P. H. CARPENTER, "Challenger" Report, Comatulæ, p. 296 (1).

1. *Fiji.*—One specimen.

COMASTER NOVÆGUINEÆ (J. Müller)

Actinometra novæ-guineæ 1900. PFEFFER, Abhandl. der Senck. naturforsch. Gesell., vol. 25, p. 85 (1).

1. *Ternate.*—Two small specimens.

COMANTHERIA GRANDICALYX (P. H. Carpenter)

Actinometra grandicalyx 1882 P. H. CARPENTER, Journ. Linn. Soc. (Zool.), vol. 16, p. 520 (1).—1888. "Challenger" Report, Comatulæ, p. 330 (1).

1. *Canton, China; Werner*.—One specimen, the type of the species; the centrodorsal is large, low hemispherical, 9 mm. in basal diameter; the dorsal pole is concave in the center, 4 mm. in diameter; the cirri are about XL, 22-24 (usually the latter), 25 mm. long; the longest proximal segments (the eighth or ninth) are slightly longer than broad; the outermost ten or eleven are rather abruptly shorter than the preceding, about twice as broad as long, highly polished, with low obscure broad median tubercles which become better developed distally; the forty-seven arms are about 100 mm. long; the IIBr series are all 4(3+4), the IIIBr series all 2, and the IVBr series all 4(3+4); the disk is 35 mm. in diameter; the terminal comb on the proximal pinnules has from twelve to fifteen (usually fourteen) teeth which are low and rounded; they arise gradually and distally gradually become obsolete; the basal segments of the pinnules (the second to the fifth) have spinous rounded distal processes, suggesting the conditions carried to an extreme in *Comaster belli*; the color is grayish brown, with a broad median line of white on the division series and arms.

The general appearance of this animal is similar to that of *Comanthus pinguis*, and there is the same large centrodorsal; the brachials imbricate slightly.

2. *Fuchow, Province of Fokien, China; Consul G. Siemssen; April 4, 1906*.—One specimen closely resembling the type, but slightly smaller and less robust; the centrodorsal is large, with a strongly concave dorsal pole 3 mm. in diameter; the cirri resemble in general form those of *Comanthus bennetti*; they are 25 mm. long with 23-25 segments of which the first three are very short, the fifth is about as long as broad, and the seventh-tenth the longest, slightly longer, though scarcely so much as one-third longer, than broad; the following decrease very slowly in length to about as long as broad or slightly broader than long; but the terminal nine or ten are abruptly shorter than the preceding, twice as broad as long or even broader; these, as in the type, have a polished surface in contrast to those preceding which have a dull surface, and bear a low rounded and obscure dorsal hump which becomes more evident toward the end of the cirrus; the forty-eight arms are about 110 mm. long; the IIBr series are all 4(3+4); all but two of the IIIBr series are 2, the exceptions being 4(3+4); six of the IVBr series are 4(3+4) and two are 2; the division series are rather broad, well-rounded dorsally and not in lateral

contact; the disk is 30 mm. in diameter; the color is a uniform deep yellow brown.

3. *Fuchow, Province of Fokien, China*.—One specimen.

COMANTHINA SCHLEGELII (P. H. Carpenter)

Actinometra parvicirra 1891. HARTLAUB, *Nova Acta Acad. German.*, vol. 58, No. 1, p. 96 (1).

1. *Mortlock Island, Carolines; Capt. Pohl*.—One specimen with fifty-two arms about 85 mm. long, and cirri VIII, 13-14, small but typical; four of the rays have the division series as characteristic for the species; the fifth has one of the external IIIBr series 4(3+4) instead of 2.

2. *Cebu; Capt. Ringc*.—One typical specimen with a single cirrus remaining.

3. *Ekalin, St. Matthias Island; reef; Dr. G. Duncker*.—One small specimen without cirri.

COMANTHUS BENNETTI (J. Müller)

Actinometra bennetti 1882. P. H. CARPENTER, *Journ. Linn. Soc. (Zool.)*, vol. 16, p. 526 (1, 2).—1888. "Challenger" Report, *Comatulæ*, p. 382 (1).—1891. HARTLAUB, *Nova Acta Acad. German.*, vol. 58, No. 1, p. 95 (3).

1. *Singapore*.—One magnificent specimen resembling the one from the Pelew Islands in the Copenhagen Museum.

2. *No Locality*.—A similar, but broken, specimen.

3. *Port Denison, Queensland (Actinometra brachymera Lütken, MS.)*.—One specimen.

4. *Jaluit, Marshall Islands; Hermsheim; September 5, 1888*.—One broken specimen; the centrodorsal is large, hemispherical, 6 mm. in diameter at the base; the cirri are XX, 17-20, 20 mm. long, stout; the proximal segments are about as long as broad, the distal one-third to one-half again as broad as long, perfectly smooth dorsally; there are about sixty arms about 130 mm. long; all the division series are 4(3+4); the division series are strongly rounded dorsally and well separated. This appears to be a dwarf specimen.

5. *Ekalin, St. Matthias Island; reef; Dr. G. Duncker*.—Two specimens; one is medium sized with about seventy arms; the dorsal surface of the division series and brachials is finely granular and very rough; the disk is 35 mm. in diameter; the other is smaller, with forty-eight arms about 115 mm. long; one of the IIBr series is 2, and bears externally a single IIIBr 2 series.

COMANTHUS PINGUIS (A. H. Clark)

1. $35^{\circ} 12' N. lat., 159^{\circ} 44' E. long.; 30$ fathoms.—One specimen; the division series are not so broad as in typical examples.
2. $35^{\circ} 07' N. lat., 139^{\circ} 44' E. long.; 21$ fathoms.—One specimen.

COMANTHUS SAMOANA (A. H. Clark)

Actinometra parvicirra 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 96 (1, 2).

1. *Tonga and Fiji*.—One specimen with thirty-nine arms.
2. *Samoa*.—Two specimens labeled *Actinometra trachygaster* Lütken; one has twenty-one arms, the single (external) IIIBr series being 2, all the other division series 4(3+4); the other is similar.
3. *Ruk, Caroline Islands*.—One specimen with twenty-three arms and cirri VIII, 11-12; the centrodorsal is especially small.
4. *Abrolhos Islands (Houtman's Rocks), Western Australia*.—One specimen with eighteen arms about 50 mm. long; the IIBr series are all 4(3+4); the cirri are about XXV, 17, 12 mm. long; the longest cirrus segments (the fourth or fifth) are twice as long as broad or slightly longer; the distal cirrus segments are twice as broad as long; the disk is thickly covered with small but prominent calcareous nodules of approximately equal size.

COMANTHUS ANNULATA (Bell)

Actinometra meyeri 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zool.), vol. 16, p. 525 (1).

Actinometra parvicirra 1888. P. H. CARPENTER, "Challenger" Report, Comatulæ, p. 338 (1).—1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 96 (2, 3).

1. *Australia*.—One dry specimen.
2. *Tonga and Fiji*.—One specimen with forty-four arms.
3. *Fiji*.—One typical specimen, the size of the individual in the Copenhagen Museum which I described as *C. intricata*; it has forty arms, all the IIIBr series being present.
4. *South Passage, Sharks Bay, Western Australia; 9 meters; Drs. Michaelsen and Hartmeyer; June 16, 1905*.—Nine specimens; one large individual has sixty-one arms 120 mm. long, and cirri VI, 8.5 mm. long, confined to the anterior semi-circumference of the centrodorsal; all the division series are 4(3+4); the color is dark brown, the division series and arm bases with uniformly distributed small equal sized light green spots; a second specimen has thirty-seven arms 120 mm. long and cirri IV, 9 mm. long; all the division series

are $4(3+4)$; the color is the same as in the preceding; a third has thirty-four arms 105 mm. long, and cirri IV, 8 mm. long; it is colored like the preceding; a fourth has forty-one arms 75 mm. long; the cirri are VIII, 14, 9 mm., long; there are three IIBr 2 series; the coloration is as described; a fifth has twenty-six arms of which the anterior are 85 mm. and the posterior 40 mm. long; the cirri are II, 6 mm. long; six of the IIBr series are 2 and four are $4(3+4)$; the color is plain dark brown; the remaining four specimens are small.

COMANTHUS PARVICIRRA (J. Müller)

Actinometra parvicirra 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 519 (1).—1888. "Challenger" Report, Comatulæ, p. 338, (1, 2, 3).—1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 96 (1, 2, 4, 5).—1900. PFEFFER, Abhandl. der Senck. natur. Gesell., vol. 25, p. 85 (6).

1. *Peru; Vierau*.—Four specimens, all of medium size; one has twenty-one arms; the IIBr series bearing the single (internal) IIIBr series is 2, all the other division series being $4(3+4)$; the cirri are IX (with some rudimentary), 16-17; another has twenty arms, with all the division series $4(3+4)$, and cirri VI, 16-17; a third has nineteen arms; five of the IIBr series are $4(3+4)$ and three are 2; a single IIIBr series is developed on the inner side of a post-radial series bearing two IIBr 2 series; the fourth specimen is smaller than the others; it has eighteen arms, with eight IIBr $4(3+4)$ series.

Carpenter and Hartlaub assumed that "Peru," the locality whence these specimens are said to have come, is the country of that name in South America; but the western coast of both South and North America is quite barren of crinoids except in very deep water and in the extreme south and extreme north. I have suggested that the "Peru" meant might be Peru or Francis Island situated in about $1^{\circ} 30'$ S. lat., 176° E. long., in the Gilbert or Kingsmill group. This species is known to occur in these islands. Professor Pfeffer and Dr. Michaelson tell me that the specimens collected by Vierau form part of a very old collection and that the localities as given are unreliable.

2. *Morcton Bay, Queensland*.—Three specimens; two of these have nineteen arms; the third has twenty-seven arms; all of the post-radial series but two are regenerating at the synarthry between the elements of the IBr series; one of the unregenerated post-radial series (the right posterior) has the IBr series $6(5+6)$, this bearing two IIBr $4(3+4)$ series.

3. *Sulu (Jolo) Archipelago*.—Two specimens, each with some of the arms greatly lengthened and attenuated.

4. *Lombok Strait*.—One specimen with thirty-seven arms and no cirri; this individual might equally well be referred to *C. annulata*.

5. *Tonga and Fiji*.—One medium sized specimen.

6. *Ternate*.—One specimen.

7. *Pitulu, Admiralty Islands; Dr. G. Duncker; October 12-13, 1908*.—One specimen with twenty-five arms, the longest 120 mm. long, and cirri IV, 12-13, 6.5 mm. long; eight of the IIBr series are 2, and two are 4(3+4); four of the IIIBr series are 4(3+4) and one is 2; two of the IIIBr series are developed externally and three are developed internally.

8. *Ekalin, St. Matthias Island; shore and reefs*.—One specimen with thirty-one arms and cirri IV, 10-11, 6.5 mm. long; all of the IIBr series are 2; two of the IIIBr series are 2.

Family ZYGOMETRIDÆ

ZYGOMETRA MICRODISCUS (Bell)

? *Hyponome sarsi* 1868. LOVÉN, Förhandl. Skand. Naturf. Christiania, X, p. liv (1).—1869. BILLINGS, Canadian Naturalist, vol. 4, No. 3, p. 270 (1).—1869. LÜTKEN, Canadian Naturalist, vol. 4, No. 3, p. 267 (1).—1869. LOVÉN, Ann. and Mag. Nat. Hist. (4), vol. 4, p. 159 (1).—1869. LOVÉN, Canadian Naturalist, vol. 4, p. 265 (1).—1869. LÜTKEN, Vidensk. Medd. fra den naturhist. Forening i København, 1868, p. 184 (1).—1872. WYVILLE THOMSON, Proc. Roy. Soc. Edinburgh, vol. 7, p. 417 (1).—1879. P. H. CARPENTER, Proc. Roy. Soc., vol. 28, p. 388 (1).—1883. PERRIER, Comptes Rendus, vol. 106, No. 7, p. 450 (1).—1883. P. H. CARPENTER, Ann. and Mag. Nat. Hist. (5), vol. 11, p. 336 (1).—1884. P. H. CARPENTER, Proc. Roy. Soc. Edinburgh, vol. 12, p. 369 (1).—1884. LOCKINGTON, Standard Natural History, vol. 1, p. 140 (1).—1891. P. H. CARPENTER, Journ. Linn. Soc. (Zool.), vol. 24, p. 45 (1).—1891. NEVIANI, Rivista Italiana di Scienze nat., ann. 11, fasc. 2, p. 6 (1).—1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 25 (1).

? *Hypomne sarsi* 1879. WACHSMUTH and SPRINGER, Proc. Acad. Nat. Sci. Philadelphia, 1879, p. 202 (1).—1879. WACHSMUTH and SPRINGER, Revision of the Palæocrinoidea, p. 28 (1).

1. *Cape York*.—A detached disk, the type of *Hyponome sarsi*.

Detached disks of species of this genus cannot with certainty be determined, but Carpenter believed it probable that this specimen should be referred to his *Antedon* (i. e., *Zygometra*) *multiradiata*, which is a synonym of the earlier *Antedon* (*Zygometra*) *microdiscus* of Bell.

2. *South Passage, Sharks Bay; 9 meters; Drs. Michaelsen and Hartmeyer; June 16, 1905*.—One specimen with fifty arms 140 mm. long, and cirri about XXXV, 30-31, stout, 25 mm. long; one IIBr₂ of a

IIBr 4(3+4) series bears instead of a pinnule a slightly undersized arm the first division series of which consists of five ossicles all apparently united by synarthry and none bearing pinnules; this carries two IVBr series, both 4(3+4); the arms have a knotty and irregular appearance, which is probably due to parasitization; P_1 is from 23 mm. to 25 mm. long, very stout, tapering gradually to a delicate tip, and composed of from twenty-five to twenty-seven segments.

ZYGOMETRA COMATA (A. H. Clark)

Zygometra comata 1911. A. H. CLARK, Australian Museum Memoir IV, p. 762 (footnote).

1. *Hong Kong; A. Wieler, 1888.*—One small specimen with twenty arms; I cannot see that it differs from specimens from Singapore.

EUDIOCRINIS VARIEGATUS (A. H. Clark)

1. *No Locality; C. Eberstein.*—One rather small and immature specimen, which may be described as follows:

The centrodorsal is thin discoidal with a flat dorsal pole 1 mm. in diameter; the cirri are arranged in a single irregular marginal row.

The cirri are XVII, 14-15, 5 mm. long; the fourth and fifth segments are the longest, very slightly longer than the proximal diameter; the second to the fifth are centrally constricted with widely flaring distal ends which project strongly dorsally; this rapidly decreases distally and disappears after the eighth.

The distal border of the radials is slightly swollen, smooth or finely beaded; the proximal border of the IBr_1 is slightly everted, and bears a small but prominent median tubercle; the distal edge is also everted, the eversion being thickened and slightly produced in the center; the proximal oblong brachials have the distal edges very slightly turned outward and slightly thickened in the center; the arms beyond the proximal discoidal brachials have a smooth dorsal line and apparently lack the usual zigzag carination.

The five arms are 40 mm. long.

The disk is completely plated.

The pinnules of the first pair are 3 mm. long and consist of nine segments which at first are short, becoming about as long as broad on the third and nearly three times as long as broad terminally; the first segment has a high rounded carinate process which is nearly half as high as the lateral diameter of the segment; the second has a carinate process which is not quite so high, and which has a straight distal border parallel to the median axis of the segment; the third

has a carinate process similar to that of the second, but smaller; the following segments are without carinate processes, and therefore appear more slender. The pinnules of the second pair are 4 mm. long and consist of eleven or twelve segments; they are stiffened, but only slightly enlarged; the first segment is twice as broad as the median length, and has the distal angle very slightly produced; the second is slightly broader than the median length, but not quite so broad as the first; the third is half again as long as broad, only about half as broad basally as the first; the fourth is similar to the third but longer, twice as long as broad; the following slowly increase in length to about three times as long as the proximal diameter, the terminal one or two being small as usual; the distal edges of the third and following are produced and spinous, the spines being especially long on the prismatic angles; the pinnules as a whole are rounded prismatic, and taper regularly from the third segment to the tip. The pinnules of the third pair are 3 mm. long and are composed of eleven segments; they resemble those of the second pair, but are more slender with more elongated outer segments. The pinnules of the fourth pair are very slender, weak and delicate, not stiffened, about 3 mm. long with ten or eleven segments which at first are short, becoming half again as long as broad on the third, twice as long as broad on the fourth and four times as long as broad terminally; the third and following have produced and spinous distal edges. The distal pinnules are exceedingly slender, 7 mm. long with fifteen or sixteen segments of which the third and following are greatly elongated with produced and spinous distal edges.

Family HIMEROMETRIDÆ

AMPHIMETRA PHILIBERTI (J. Müller)

1. *Kwala Cassan, Malay Peninsula; Ed. L. Mayer.*—Six specimens, all rather smaller than usual and apparently not quite fully grown; one has twenty-four arms 100 mm. long; one of the IIBr series is 2, all the other division series being 4(3+4); there are 32 or 33 cirrus segments of which the longest are very nearly as long as broad; another has twenty-two arms 100 mm. long; four of the IIBr series and two of the IIIBr series are 2, the latter both internal; the cirri have 33 or 34 segments; a third has twenty-two arms 95 mm. long; both the IIIBr series (one external and one internal) are 2, all the other division series being 4(3+4); the cirri are XXIII, 29-33, 23 mm. long; a fourth has twenty-seven arms 90 mm. long; one of the IIBr series is 2, the others being 4(3+4); six of the IIIBr series are

2, only one being $4(3+4)$; the cirri have 26-29 segments; a fifth has eighteen arms 85 mm. long; the eight IIBr series are $4(3+4)$; one ray has both the IIBr series missing; the cirri have 27 or 28 segments; one has the distal half regenerated; the sixth has twenty-one arms 80 mm. long; one of the IIBr series is 2, the other nine, and the single IIIIBr series, being $4(3+4)$; the cirri have 26-30 segments of which the longest are nearly as long as broad.

AMPHIMETRA SCHLEGELII (A. H. Clark)

1. *No Locality; C. Eberstein.*—One specimen, which may be described as follows:

The cirri are XV, 29-35, 20 mm. to 23 mm. long; the longer proximal segments are about as long as, or slightly longer than, broad; the distal segments are nearly twice as broad as their median length; the twelfth, thirteenth or fourteenth and following bear a long and prominent, rather broad, dorsal spine; the segments which bear the dorsal spines have the dorsal surface flattened so that there is a rather conspicuous rounded ridge along the boundary between the lateral and dorsal surfaces.

The radials have a finely beaded distal edge as is frequently the case in *A. philiberti*.

The twelve arms are 85 mm. long; one ray bears one IIBr $4(3+4)$ series, which carries (internally) a IIIIBr 2 series.

P_1 is small and slender, 6 mm. long with twenty-four segments which become about as long as broad on the fifth, the remainder being slightly longer than broad; the second-eighth bear a high broad finely spinous carinate process which rapidly decreases in height after the third; P_2 is 10 mm. long with twenty-five segments of which the fifth-seventh are about as long as broad and the distal are twice as long as broad; the second-ninth are diminishingly carinate, the outer border of the carination being convex on the second but parallel to the longitudinal axis of the segment on the remainder; the pinnule is evenly tapering and is proportionately larger than P_1 ; P_3 is 13 mm. long with twenty-four segments; it resembles P_2 , but the supplementary ridge is strongly indicated, and it becomes more distinctly triangular distally; P_4 is 7 mm. long with eighteen segments, the second-fifth with proportionately higher carinate processes than the corresponding segments of the preceding pinnules; P_5 is 4.5 mm. long with fourteen segments of which the second-fifth are very strongly and the sixth somewhat carinate; the following pinnules resemble P_5 ; the distal pinnules are slender, 7 mm. long with nineteen segments of which the outer are about twice as long as broad.

This species is closely related to *A. philiberti*, but it may be easily distinguished by the longer proximal cirrus segments, the longer and more prominent spines on the distal cirrus segments, and by the smaller number of arms. It is a considerably smaller and more delicate species than *A. philiberti*.

At the time I described *A. schlegelii* (Proc. Biol. Soc. Washington, vol. 21, 1908, p. 223) I had before me two specimens, one with ten, the other with thirteen arms, which were of the same size and general appearance; such differences as I found I considered as probably the result of individual variation. In this collection there are two specimens, one with ten the other with twelve arms which resemble the pair in the Copenhagen Museum.

The presence of the type of *A. laevipinna* and of a large series of *A. philiberti* (a species which I had not seen when I described *A. schlegelii*) shows clearly that the ten armed specimen in the original material and the one in the present lot are identical with Carpenter's *laevipinna*, while the twelve and thirteen armed specimens represent a distinct form, easily differentiated by the strong carination of the pinnules, related to *A. philiberti*.

The specimen which I selected as the type of *schlegelii* at the time of the original description happened to be the one with thirteen arms. Thus while the one with ten arms, originally considered as identical with it, must be referred to *laevipinna*, the name *schlegelii* is available for the thirteen armed specimen, and for the twelve armed example under consideration, which represents the same form.

Amphimetra schlegelii appears to be the northern representative of *A. philiberti*, just as *A. laevipinna* is the northern representative of the *discoidea* group of species.

AMPHIMETRA NEMATODON (Hartlaub)

Antedon nematodon 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 185 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 27, pl. 1, fig. 9 (1).

1. *Bowen, Queensland*.—One specimen, the type: there are thirty-eight arms about 105 mm. long; two of the cirri still *in situ* have 42 and 43 segments of which the twelfth and following bear dorsal spines; the longest cirrus segments are not quite so long as broad; in the outer two-thirds, or at least one-half, of the cirri the segments are twice as broad as long; the dorsal spines are rather small and slender, though sharp and prominent; the enlarged proximal pinnules are comparatively slender, smooth, not carinate; the division series

are narrow and rather widely separated; the brachials are extremely short, discoidal, with produced distal edges.

This species appears to be most closely related to *A. philiberti*, but it is very easily distinguished from that form by the absence of carination on the proximal pinnules and by having the IIIBr series 2 instead of 4(3+4).

AMPHIMETRA CRENULATA (P. H. Carpenter)

Antedon crenulata 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 507.

The type of this species is a dry specimen in the Hamburg Museum from the neighborhood of Borneo; I unfortunately overlooked it while at Hamburg, but from the original description there can be no doubt that it is the form which has commonly been known as *variipinna*. As this name is of the same date as *variipinna*, occurring on the next page of the same publication, and antedates all other names for the species, it is the name by which the form must henceforth be known.

AMPHIMETRA VARIIPINNA (P. H. Carpenter)

Antedon variipinna 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 506 (1).

Antedon brockii 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 183.—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 23, pl. 1, figs. 4, 12, 13; pl. 2, fig. 17.

1. *Canton, China; Werner*.—One specimen, the type of the species; this may be described as follows:

The centrodorsal is moderate in size with a slightly convex dorsal pole 2 mm. in diameter.

The cirri are about XX, 28-33, 17 mm. to 20 mm. long; the longer proximal segments are about as long as the distal diameter, sometimes very slightly longer; the outer segments are about one-third broader than long; the earlier segments have slightly thickened and prominent distal dorsal edges; the ninth to the twelfth (usually the latter) and following develop long and sharp dorsal spines.

The twenty-three arms were probably about 50 mm. long; three of the IIBr series are 2, and seven are 4(3+4); the three IIIBr series are all 2, and all are internally developed.

The distal edges of the third and following segments of the proximal pinnules are strongly everted and very finely spinous instead of being provided with broad lateral processes.

The disk is completely covered with a pavement of small irregular plates.

The longest pinnules have about twenty-two segments.

This species differs from *A. producta* in having long spines on the outer cirrus segments instead of a slight carination; it is also a stouter form than *producta*, the cirri especially being stouter and longer without the distal taper seen in those of *producta*. The lower pinnules are more cylindrical (less prismatic) than are those of *producta*, and the spinous eversion of the distal edge of the segments is not increased at the prismatic angles, but is uniform all around the dorsal side.

So far as I can see this specimen only differs from that described as *brockii* by Hartlaub in its smaller size.

AMPHIMETRA LÆVIPINNA (P. H. Carpenter)

Antedon lævipinna 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zool.), vol. 16, p. 502 (1).

Antedon milberti (part) 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 81 (1).

Himerometra schlegelii (part) 1908. A. H. CLARK, Proc. Biol. Soc. Washington, vol. 21, p. 223.

Amphimetra schlegelii (part) 1909. A. H. CLARK, Proc. Biol. Soc. Washington, vol. 22, p. 7.—Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 158.

1. *Canton, China; Werner*.—The ten arms are about 95 mm. long; the cirri are XI, 27-33, 23 mm. long, moderately slender; the longest proximal segments are slightly broader than long to about as long as broad; the short outer segments are about twice as broad as long; long, sharp and prominent dorsal spines are developed from the tenth or eleventh segments onward; the cirri have a very slight distal taper; the synarthrial tubercles are prominent, but broad and blunt, not produced as in *A. ensifer*.

This specimen is quite indistinguishable from the ten armed specimen in the type series of *A. schlegelii*, with which I was able to compare it directly; in size, as in other characters, there is the closest agreement.

2. *No Locality; C. Eberstein*.—One specimen closely resembling the type in every particular, but slightly smaller; the arms are 70 mm. long.

HIMEROMETRA MAGNIPINNA (A. H. Clark)

Antedon crassipinna (part) 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 185 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 32 (1).

1. *Cochin China*.—One magnificent specimen with forty-five arms 160 mm. long and cirri about XXX (with some undeveloped), 28-32, 35 mm. to 41 mm. long; the longest proximal cirrus seg-

ments are slightly broader than long; the cirri are moderately stout; there are no dorsal spines; the dorsal surface of the short distal segments is convex; the antepenultimate has a small tubercle which quickly becomes obsolete on the one or two preceding; P_p is 28 mm. long with thirty-three or thirty-four segments, very stout basally, tapering evenly to a delicate tip; the earlier segments are twice as broad as long, the following gradually increasing in length and becoming about as long as broad on the fourteenth, and twice as long as broad on the small terminal segments; the segments in the middle half of the pinnule have the distal dorsal edge slightly swollen and prominent; P_p is 26 mm. long with thirty-three segments, similar in every way to P_d ; P_1 is 18 mm. long with twenty-five segments, similar to the preceding but proportionately smaller; the cirri, centro-dorsal and division series are pinkish flesh color; the arms are slaty; the proximal pinnules and the outer portion of the middle and outer pinnules are pinkish.

2. *Isabela, Basilan, Province of Mindanao; Dr. H. Hallier; January 22, 1904.*—One broken specimen with forty arms, and cirri 32 mm. long with 32 segments of which the terminal fifteen have a minute submedian tubercle which increases in size distally; the distal edges of the segments of the proximal pinnules, which are large and very stout, are everted but not spinous; the IIBr series are 4(3+4); the IIIBr series are 4(3+4) externally and 2 internally, or all 4(3+4); the following division series, when present, are 4(3+4).

3. *Ekalin, St. Matthias Island; Dr. G. Duncker.*—One fragmentary specimen; the cirri and lower pinnules are very slightly stouter than in the preceding, the segments of the latter with less prominent distal ends.

4. *Pitilu, Admiralty Islands; Dr. G. Duncker.*—Three fine specimens with thirty-six, forty-four and forty-seven arms 130 mm. long.

HIMEROMETRA, Sp.

Antedon kraepelini 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 183 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 22, pl. 2, fig. 15 (1).

1. *Akyab, Arrakan Coast, Burma.*—This appears to be a small specimen of *H. robustipinna* with which it agrees in the absence of a thickening or eversion of the distal edges of the segments of the enlarged proximal pinnules. The lack of the pinnule tips and of the cirri prevent accurate determination.

CRASPEDOMETRA ACUTICIRRA (P. H. Carpenter)

Antedon acuticirra 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 509 (1).

Antedon australis 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 510.

Antedon ludovici 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 510 (2).—1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 29 (1, 2, 3).

Antedon bipartipinna 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 512 (3).

1. *No Locality*.—One specimen; there are twenty-six arms; the synarthrial tubercles are rather prominent; the distal edges of the brachials are rather strongly overlapping. This example is just like others which I have seen from the Andaman Islands and from other localities.

2. *Hong Kong*.—One specimen, undoubtedly representing the same species as the preceding.

3. *Hong Kong*.—One specimen with slightly smoother arms than the type of *acuticirra* (No. 1) but undoubtedly of the same species; the development of the synarthrial tubercles is similar; the specimen is rather smaller, and is purple in color.

Family STEPHANOMETRIDÆ

STEPHANOMETRA ECHINUS (A. H. Clark)

Himerometra echinus 1908. A. H. CLARK, Smiths. Miscell. Coll. (Quarterly Issue), vol. 52, part 2, p. 218.

Stephanometra coronata 1909. A. H. CLARK, Proc. U. S. Nat. Mus., vol. 36, p. 639.

1. *No Locality*.—Arm fragments.

STEPHANOMETRA OXYACANTHA (Hartlaub)

Antedon oxyacantha 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 178 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 55. pl. 3, figs. 35, 37 (1).

1. *Amboina; Dr. J. Brock*.—One specimen with thirty arms 140 mm. long; the centrodorsal is low hemispherical, 6 mm. in basal diameter; the dorsal pole is small, flat, 2.5 mm. in diameter; the cirrus sockets are arranged in three closely crowded irregular rows; the cirri resemble those of *S. monacantha* or *S. tuberculata*; the longer proximal segments are twice as long as broad or slightly longer; those in the outer third or half of the cirri are about as long as broad; this is a more robust form than *S. tuberculata* or *S. monacantha*, and P₂, P₃

and P_4 are similar; P_1 is 12 mm. long, slender, with twenty-one segments; P_2 is 13 mm. to 16 mm. long, enlarged, stiffened and spine-like, with thirteen or fourteen segments; P_3 is 13 mm. to 16 mm. long, similar in every way to P_2 , with twelve or thirteen segments; P_4 is 9 mm. long, similar to the preceding but proportionately smaller, with ten segments; P_5 is 6 mm. long, similar to P_4 but proportionately smaller, with ten segments; the following pinnules are small and weak, 4.5 mm. or 5 mm. in length, gradually increasing in size outwardly; the distal pinnules are 9 mm. long with twenty segments, very slender.

STEPHANOMETRA TUBERCULATA (P. H. Carpenter)

Antedon tuberculata 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 57 (1).

1. *Ruk, Caroline Islands*.—One specimen with thirty-one arms 85 mm. long; the cirri have 26-27 segments and are about 23 mm. long; the longest cirrus segments are usually not quite so long as broad, rarely as long as broad; the outermost nine to twelve are broader than long; the enlarged lower pinnules have ten or eleven segments. P_4 is more like the succeeding pinnules than in the specimen from the Admiralty Islands, and the shorter and somewhat stouter cirri with shorter segments give this individual a somewhat different appearance.

2. *Pitulu, Admiralty Islands; Dr. G. Duncker*.—One specimen with twenty-seven arms 95 mm. long; the cirri are XXX, 20-23, 25 mm. to 27 mm. long; the longest segments of the longer cirri are twice as long as the median diameter or somewhat longer; P_1 is 10 mm. or 11 mm. long, weak and slender, with seventeen or eighteen segments; P_2 is stout and spine-like, 10 mm. long with ten or eleven segments; P_3 is similar, 9 mm. to 10 mm. long with nine or ten segments; P_4 is 7 mm. long, smaller than the preceding, but stiffened; P_5 is 5 mm. long with ten segments; the following pinnules are similar, slightly smaller and weaker; the distal pinnules are very slender, 9 mm. long with eighteen or nineteen segments.

3. *Pelew Islands*.—One specimen with thirty arms 115 mm. long, and cirri 25 mm. to 30 mm. long with 20-23 segments of which the longer proximal are twice as long as broad and the shorter distal slightly longer than broad; the cirri are moderately slender and very long as in the specimen from Pitulu, though not quite so slender as in that individual; P_1 is 13 mm. long, slender and flagellate, with twenty-six segments; P_2 is 15 mm. long, very stiff and spine-like, but slightly

more slender than usual, with thirteen segments; P_3 is 12 mm. long with eleven segments and resembles P_2 ; P_4 is 9 mm. long with eleven segments, resembling P_3 but much more slender.

STEPHANOMETRA MONACANTHA (Hartlaub)

Antedon monacantha 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 179 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 59, pl. 3, figs. 33, 38 (1).

Antedon militaris HARTLAUB, MS. (1).

1. *Mortlock Island, Carolines*.—One specimen.

The specimen recorded by Hartlaub from Torres Strait appears to be nearer *S. indica* than *S. monacantha*.

Family PONTIOMETRIDÆ

PONTIOMETRA ANDERSONI (P. H. Carpenter)

Antedon andersoni 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 78, pl. 3, fig. 36 (1).

1. *Pelew Islands*.—One medium sized specimen.

2. *Cebu, Philippines*.—One medium sized specimen.

3. *Sulu (Jolo)*.—Arm fragments.

Family MARIAMETRIDÆ

OXYMETRA ERINACEA (Hartlaub)

Antedon erinacea 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 177 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 52, pl. 3, fig. 29 (1).

1. *Cebu, Philippines; Capt. Ringe*.—The centrodorsal is large and hemispherical as in *Selenometra finschii*, almost entirely covered by by cirrus sockets; the dorsal pole is very small, irregular in shape, slightly concave.

The cirri number XXX-XXXV. The proximal cirrus segments are about as long as broad, after the middle of the cirrus gradually decreasing in length so that those in the outer portion are twice as broad as long; the shorter segments in the distal half have the distal dorsal edge thickened and everted and very finely spinous, this eversion gradually becoming more and more triangular in end view, the spinosity concurrently becoming gradually restricted to the lateral part of the eversion, and on the terminal segments becoming a single smooth sharp spine.

The fifty-one arms are 115 mm. long; their arrangement on the rays is in 3, 2; 2, 3 order so that the normal number of arms

($[3+2+2+3] \times 5$) is fifty. The structure of the division series and of the arm bases is exactly as in *S. finschii*; the division series are strongly convex with perfectly straight sides.

The segments of the enlarged lower pinnules are all short, about as long as broad, of uniform size; these pinnules are stiffened, though scarcely so much so as those of the species of *Stephanometra*, and the tip, though sharp, ends in the normal manner. The pinnules are more slender than those of *Stephanometra* and are evenly tapering.

This species is most nearly related to that which I recently described under the name of *Selenometra tenuicirra*, which has similarly stiffened and enlarged proximal pinnules; but in *tenuicirra* the pinnules are stouter proximally and more delicate distally so that they taper less regularly, and they are considerably shorter; and the cirri are very much longer with more numerous segments of which the distal are much longer.

From the published description and figure I assumed that this form was allied to the species of *Stephanometra* with which it was associated by Hartlaub and, as it differed materially from all the forms which I had grouped in that genus, I suggested the generic name *Oxymetra* for it. Examination of the specimen, however, shows that it has nothing to do with the species of *Stephanometra*, but is closely related to the species which I have grouped in the genus *Selenometra*, especially to *S. tenuicirra*.

Now the generic name *Oxymetra* (Proc. Biol. Soc. Washington, vol. 22, 1909, p. 13) with *Antedon erinacea* Hartlaub as the type has precedence over the generic name *Selenometra* (Proc. U. S. Nat. Mus., vol. 39, 1911, p. 541) with *Antedon finschii* Hartlaub as the type, so that all the species heretofore assigned to the genus *Selenometra* must be transferred to the genus *Oxymetra*, and the name *Selenometra* must be relegated to the synonymy of *Oxymetra*.

DICHROMETRA FLAGELLATA (J. Müller)

Antedon flagellata 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 73 (1).

1. *Pelew Islands*.—One specimen with about forty arms about 140 mm. long; the centrodorsal is large, low hemispherical, 7 mm. in diameter at the base and 3 mm. in diameter at the concave dorsal pole; the cirrus sockets are arranged in three closely crowded irregular rows; the cirri are about XL, 27-29, 25 mm. long; the longer proximal segments are about as long as broad; dorsal spines, which are rather low and blunt, are developed from the tenth or twelfth onward; the

cirri are, as usual, rather stout; the division series and arm bases are strongly convex and rugged; P_3 is the longest, about 15 mm. long with about twenty segments.

2. *Pitilu*, *Admiralty Islands*; Dr. G. Duncker.—One specimen with twenty-eight arms 150 mm. long; the longest cirri have 32 or 33 segments, dorsal spines being developed from the eleventh or twelfth onward; P_3 is 15 mm. long with twenty-eight or twenty-nine segments. This specimen is intermediate in character between the two at Leyden upon which Müller based the names *flagellata* and *elongata*, though rather nearer the latter.

DICHROMETRA FLAGELLATA var. **AFRA**, new variety

Antedon flagellata 1899. LUDWIG, Senck. naturforsch. Ges., vol. 21, Heft 4, p. 538 (Reef opposite harbor of Lamu, Zanzibar).

Dichrometra sp. 1911. A. H. CLARK, Proc. U. S. Nat. Mus., vol. 40, p. 27 (two headings; Cape St. André, Madagascar; Zanzibar).—1911. A. H. CLARK, Bull. du muséum d'hist. nat., No. 4, 1911, p. 254 (Cap Saint-André, Madagascar).

1. *Madagascar*; C. Moll.—The centrodorsal is low hemispherical, 4 mm. in diameter at the base; the dorsal pole is flat, 2.5 mm. in diameter; the cirrus sockets are arranged in two irregular marginal rows.

The cirri are about XX, 23-29, 15 mm. to 18 mm. long; the first segment is very short, the following gradually increasing in length to the fifth or sixth which is about as long as broad and the sixth-ninth or seventh-tenth which are the longest, slightly longer than broad; the following gradually decrease in length, those in the outer half being slightly broader than long; the ninth or tenth and following bear prominent blunt dorsal spines of moderate size.

There are twenty-nine arms about 85 mm. long; IIIBr series are developed externally; the division series are broad with the ventrolateral edges of the segments extended laterally as a thin narrow border the outer edge of which is parallel to the axis of the division series; synarthrial and articular tubercles are not developed.

P_1 is 8 mm. long with from twenty-one to twenty-five segments, slender, delicate and flagellate; the first segment is twice as broad as long, the third about as long as broad, and those in the outer half twice as long as broad; the pinnule tapers rather rapidly in the first four segments, more gradually from that point onward. P_2 is 9.5 mm. to 10 mm. long, with from twenty-two to twenty-five segments, similar to P_1 but stouter and tapering more evenly. P_3 is 10 mm. long with from twenty-two to twenty-four segments, similar to P_2 and

about of the same size. The following pinnules are small. The distal pinnules are very slender, 8 mm. long with twenty segments. The enlarged lower pinnules are slender and flagellate, of the type seen in typical *flagellata*.

This form differs from typical *flagellata* much as *Capillaster multiradiata* var. *coccodistoma* differs from true *C. multiradiata*. It is smaller and more delicate, with fewer arms, and lacks the characteristic rugosity of the arm bases and the prominent synarthrial tubercles. P_2 and P_3 are proportionately less enlarged and more delicate, and are not greatly longer than P_1 .

DICHROMETRA PALMATA (J. Müller)

1. *Gimsah Bay, African coast of the Gulf of Suez; Dr. R. Hartmeyer.*—One fine specimen with twenty-nine arms 120 mm. long and cirri XXVII, 21-24; the dorsal pole of the centrodorsal is 3 mm. in diameter, slightly concave.

DICHROMETRA PROTECTUS (Lütken)

Antedon lepida 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 176 (1).

Antedon equipinna 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zool.), vol. 16, p. 504 (2).

Antedon imparipinna 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zool.), vol. 16, p. 505 (3).—1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 63 (2, 3, 4).

Antedon palmata (part) 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 49 (1).

Antedon brevicumcata 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 68 (5).

1. *Tonga and Fiji.*—Two small specimens.

2. *No Locality.*—Two specimens; the larger has the centrodorsal broad, thin discoidal, the cirrus sockets arranged in two irregular rows; the bare dorsal pole is 4.5 mm. in diameter; the cirri are about XXXVII, 22-28 (usually nearer the latter), 20 mm. to 23 mm. long; the forty arms are 20 mm. to 23 mm. long; P_2 has about thirty segments and is about 17 mm. long, moderately slender; it is greatly enlarged on the outside of the rays and nearly as much so on the innermost side of the IIBr series; the segments in the outer half of the cirri have a low sharp narrow median carination; the smaller specimen had probably between twenty-five and thirty arms; P_2 is slightly more slender than usual, resembling that in the other individual; the cirri have 22-23 segments.

3. *No Locality*.—Two typical specimens; one of them has rather long proximal pinnules, the other has them rather short.

4. *Hong Kong*.—One specimen.

5. *Mortlock Island, Carolines*.—Two specimens, each with thirty arms 80 mm. long; there are 22 or 23 cirrus segments; P_2 is from 10 mm. to 12 mm. long with from twenty-six to thirty-seven segments, rather slender; there is no apparent enlargement on the outer arms, but the outer pinnules are much longer, reaching 18 mm.

6. *No Locality*.—One specimen; P_2 on the outer arms is exceptionally long.

7. *Isabela, Basilan, Province of Mindanao; Dr. H. Hallier*.—One specimen; the dorsal pole of the centrodorsal is 3 mm. in diameter; the centrodorsal is thin discoidal, bearing cirrus sockets in two irregular marginal rows; the cirri are XXIV, 26-29, 23 mm. to 25 mm. long; the pinnulation agrees with that of the type of *aquipinna*, and this is in every way very similar to that specimen.

DICHROMETRA GYGES (Bell)

Antedon gyges 1884. BELL, "Alert" Report, p. 160, pl. 12, figs. B, B a, b.

Antedon reginæ 1884. BELL, "Alert" Report, p. 160, pl. 12, figs. A, A a.

Antedon tenera 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 180 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 66 (1).

1. *Port Denison, Queensland*.—One specimen.

2. *Port Denison, Queensland*.—One specimen with about forty-three arms about 85 mm. long and cirri XLII, 24-27, 17 mm. long; P_2 is 18 mm. long, very slender, with thirty-three segments; on the innermost side of the IIBr series P_2 is nearly as large as on the outer side, but elsewhere it is small; on some of the arms P_3 resembles P_2 ; the proximal pinnules are less carinate than usual.

3. *Boxen, Queensland*.—One specimen, smaller than the preceding.

Family COLOBOMETRIDÆ

PETASOMETRA, new genus

This new genus is related to *Decametra* and to *Cyllometra*. The arms are from ten to twenty or more in number, the IIBr series being 4(3+4), rarely 2. P_a is always absent. P_1 is as long as, and similar to, P_2 ; the following pinnules are shorter.

Genotype.—*Antedon clara* Hartlaub, 1890.

PETASOMETRA HELIANTHOIDES, new species

1. *South Passage, Sharks Bay, 9 meters; Drs. Michaelsen and Hartmeyer; June 16, 1905.*—One fine specimen, which may be described as follows:

Centrodorsal thin discoidal, with a broad flat dorsal pole 4 mm. in diameter; cirrus sockets arranged in a single regular closely crowded marginal row.

Cirri XIX, 28-31, 20 mm. to 22 mm. long; the cirrus segments are subequal, about twice as broad as long, the basal shorter, the last five or six becoming somewhat longer; the dorsal surface of the segments is broad and flat; the second has the distal dorsal edge produced and bluntly serrate; on the following this serrate ridge becomes more and more deeply crescentic, on the fourteenth and following becoming a median straight finely, and rather bluntly, serrate transverse ridge appearing as a minute spine in lateral view; opposing spine large, the apex subterminal, arising from the entire dorsal surface of the penultimate segment, rising to a height about equal to one-half of the diameter of the penultimate segment; owing to the closely crowded condition of the cirrus sockets the first three segments of the cirri are sharply flattened laterally as in related forms.

The radials are concealed in the median line, but are visible as low triangles in the angles of the calyx; the IBr_1 are very short, about six times as broad as long, the proximal and distal edges parallel to each other, and the lateral edges parallel to the longitudinal axis of the ossicle, not in lateral contact; axillaries very broadly pentagonal, from two to three times as broad as long, the lateral edges about two-thirds as long as those of the IBr_1 , turned slightly outward and therefore making a slight angle with the longitudinal axis; the lateral corners of the IBr_1 and of the IBr axillary are rounded off; there are ten $IIBr$ 4(3+4) series and two $IIIBr$ 4(3+4) series, both of the latter developed on the same $IIBr$ series; the division series are strongly rounded dorsally without lateral borders, resembling those of *Heterometra savignii*.

The twenty-two arms are 85 mm. long; the first two brachials are subequal, slightly wedge-shaped, about four times as broad as the median length; the first is internally united for the proximal two-thirds, beyond this point diverging at a right angle; the first syzygial pair (composed of the third and fourth brachials) oblong, two and one-half times as broad as long; the next four brachials are short, approximately oblong, about four times as broad as long, the follow-

ing obliquely wedge-shaped, two and one-half times as broad as long, becoming less obliquely wedge-shaped distally.

P_n always absent; P_b 11 mm. to 12 mm. long with from twenty-seven to twenty-nine segments of which the first four or five are broader than long and the remainder about as long as broad, slightly longer than broad terminally; the pinnule is moderate in size, smooth, evenly tapering and very delicate distally; P_1 10 mm. long with twenty-two segments, resembling P_b but very slightly more slender; P_2 is 10 mm. long with twenty-five segments, resembling P_1 ; P_3 is 6 mm. long with nineteen segments, smaller and weaker than the preceding; the following pinnules are similar to P_3 ; the distal pinnules are 11 mm. long, slender, with twenty-nine segments which are short, scarcely half again as long as broad.

The color is light yellowish, with the dorsal pole of the centrodorsal (except for a central spot) and the articulations dark brown.

This species differs from *P. clara* of the Moluccas in its much greater number of arms (twenty-two instead of from ten to twelve), in the greater number of cirrus segments, and in its longer and more numerous segmented proximal pinnules.

OLIGOMETRA SERRIPINNA (P. H. Carpenter)

Antedon serripinna 1891. HARTLAUB, Nova Acta Acad. German., vol. 58, No. 1, p. 82 (1).

1. *Tonga Islands*.—Seven specimens; one of these has the cirri XXIII, 21, the segments terminally becoming nearly as long as broad; the centrodorsal is thin discoidal, the cirrus sockets, which are oblong, two and one-half to three times as high as broad, arranged in a single regular marginal row; the dorsal pole is slightly concave, 3 mm. in diameter; P_2 is 7 mm. long with fifteen segments of which the fifth is the longest, twice as long as broad; there is a very slight spinous production of the distal edges of the segments. Another specimen also has 21 cirrus segments which distally are nearly as long as broad; P_2 has from fifteen to eighteen segments of which the basal are flattened exteriorly; the distal edges of the third and following segment are slightly produced and spinous. In a third specimen the arms are about 60 mm. long; the cirri are 15 mm. long with 20-21 segments; P_1 has from ten to thirteen segments; P_2 has twelve segments, which have no perceptible production of the distal edges. A fourth specimen is interesting in possessing eleven arms, one IIBr 1 series being present; P_1 has sixteen segments. The remaining three are similar to those described.

These specimens possess in general the characters of the form from southeastern Africa which I called *occidentalis*, and possibly should be recorded under that name. They have but the merest trace of the character from which *scrripinna* gets its name, though this is not entirely absent as in *japonica*.

The distribution of this general type of *scrripinna*—southeastern Africa, Lesser Sunda Islands and Tonga—is curiously parallel to that of the variation of *Stephanometra monacantha* in the direction of *S. indica*—southeastern Africa, Ceylon, Lesser Sunda Islands, Torres Strait.

Oligometra caledoniæ from New Caledonia and *O. japonica* from Japan represent the extremes of the smooth pinnuled variation from the *O. scrripinna* stock.

2. *Fuchow, Province of Fokien, China; Consul S. Siemssen; December 18, 1905.*—One specimen; there are 23-24 cirrus segments which become nearly as long as broad distally; P_2 is 7 mm. long with eighteen segments which possess only a slight trace of lateral processes; the second-fourth segments of the earlier pinnules are carinate.

Family TROPIOMETRIDÆ

TROPIOMETRA AFRA (Hartlaub)

Antedon afra 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai, 1890, p. 172 (1).
—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 86, pl. 5, figs. 50, 52 (1).

1. *Bowen, Queensland.*—One specimen, the type of the species.

TROPIOMETRA MACRODISCUS (Hara)

1. *Misaki, Japan; 30-50 fathoms; Alan Owston.*—One specimen purple in color and resembling the specimens from Japan in the U. S. National Museum and in the Copenhagen Museum.

2. *Misaki, Japan; 30-50 fathoms; Alan Owston.*—One specimen, slightly smaller than the preceding.

I am now convinced that I was wrong in placing Hara's *macrodiscus* under the synonymy of Hartlaub's *afra*; *macrodiscus* is a stouter and larger form than *afra* with longer and heavier cirri and longer brachials. A glance at the cirri alone is sufficient to distinguish them.

TROPIOMETRA PICTA (Gay)

Antedon carinata (part) 1882. P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, p. 502 (5).

1. *Santos, Brazil.*—Ten specimens.

2. *Rio de Janeiro, Brazil.*—One large specimen.

3. *Off the mouth of the Amazons* ($0^{\circ} 25' S. lat., 46^{\circ} 44' W. long.$).—Eleven specimens.
4. *Among the Baleiro Islands, off the harbor of Victoria, province of Espirito Santo, Brazil.*—Seven fine specimens.
5. *No Locality.*—Two specimens.

TROPIOMETRA CARINATA (Lamarck)

Antedon carinata (part) 1882. P. H. CARPENTER, *Journ. Linn. Soc. (Zoöl.)*, vol. 16, p. 502 (1).

1. *Mauritius.*—Two dry specimens.

TROPIOMETRA ? ENCRINUS (A. H. Clark)

Antedon carinata (part) 1882. P. H. CARPENTER, *Journ. Linn. Soc. (Zoöl.)*, vol. 16, p. 502 (1).

1. *Java.*—Four specimens. Unfortunately I overlooked these specimens while at Hamburg. They probably belong to *T. encrinus*, though there is a possibility that they may be referable to *T. indica*. At any rate they cannot belong either to *T. picta* or to *T. carinata*, or to the larger forms of the *T. afra* group.

Family CALOMETRIDÆ

NEOMETRA MULTICOLOR (A. H. Clark)

1. *Okinoze, Japan; 55 fathoms; Alan Oveston, October 27, 1901.*—One typical specimen with twelve arms, and one small twelve armed example.

Family ANTEDONIDÆ

Subfamily ANTEDONINÆ

ANTEDON PETASUS (Danielssen and Koren)

1. *Tromsø, Norway.*—Two specimens.
2. *Norway.*—Two specimens.

ANTEDON BIFIDA (Pennant)

1. *White Island, Scilly Islands.*—Two specimens.
2. *Spain.*—Two specimens.
3. *Cezimba, Portugal; A. Grceff, January 18, 1880.*—Three specimens; one of these has the arms about 80 mm. long and the cirri about XXX, 11-13, distally flattened and curved; another is similar, the cirri having 13 segments; the third is small.

In the perisomic areas between the IBr_1 there are prominent rhombic groups of rather solid perisomic plates resembling those figured for Scottish specimens by W. B. Carpenter.

ANTEDON HUPFERI (Hartlaub)

Antedon hupferi 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 171 (1).—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 88, pl. 5, figs. 53, 59 (1).

1. *Wapu, Ivory Coast (West Africa)*; 21 fathoms; blue mud; Capt. Hupfer, December 5, 1887.—One specimen, the type of the species; this may be described as follows:

The centrodorsal is thin, with a rather broad dorsal pole 1 mm. in diameter, very slightly concave; the cirrus sockets are arranged in two irregular rows.

The cirri are XXVI, 14-16, 12 mm. to 14 mm. long, intermediate in character between those of *Antedon bifida* and those of *A. mediterranea*, though slightly nearer the former; on the short outer segments the dorsal profile is perfectly straight, on the longer centrally constricted segments very slightly concave; the longest proximal segments are from two to two and one-half times as long as the proximal diameter; the short outer segments are usually half again as long as broad, becoming slightly longer on the last three; the opposing spine is minute, terminal, and sharp; the longer earlier segments are moderately constricted so that the outer, which are slightly flattened laterally, appear broader in lateral view; but the difference is comparatively slight.

The arm structure resembles that of *A. bifida*.

The perisomic areas between the IBr series are occupied by triangular masses of rather solid perisomic plates.

P₁ has eighteen segments of which the first is about as broad as long, the second slightly longer than broad, the third slightly over twice as long as broad, and the remainder three times as long as broad; the third and following have very slightly produced and very finely spinous distal edges; the pinnule is very long, though not especially stout; P₂ and the following pinnules are very much shorter.

The disk bears a very few small calcareous nodules, more numerous on the base of the anal tube than elsewhere.

2. *Gorée, Ivory Coast*; 13 fathoms; Capt. Hupfer, May, 1891.—One small specimen.

ANTEDON MEDITERRANEA (Lamarck)

Antedon roscum Hamburg Mus., MS. (4).

1. *Nice*.—One specimen.

2. *Naples*.—One specimen.

3. *Sicily; Krohn*.—One specimen.

4. *Mediterranean Sea*.—One specimen.

EUANTEDON, new genus

Centrodorsal low hemispherical, resembling that of *Antedon mediterranea* or *A. adriatica*, bearing about thirty cirri.

Cirri long, rather slender, all the segments longer than broad, the earlier two to four times as long as broad, the outer slightly longer than broad; in general resembling those of the Mediterranean species of *Antedon*.

Arm structure as in the Mediterranean species of *Antedon*; synarthrial tubercles may be moderately developed.

P_1 slender with less than twenty-five segments, shorter than the cirri, somewhat stiffened; all the segments except the basal are elongated; P_2 about half as long as P_1 , but longer than P_3 , resembling P_1 .

Genotype.—*Antedon moluccana* A. H. Clark, 1912.

Euatedon differs from *Antedon* in having P_2 resembling P_1 and intermediate in size between P_1 and P_3 ; and in having P_1 composed of much longer segments than the corresponding pinnule in *Antedon*. It differs from *Mastigometra* in having P_1 shorter than instead of much longer than the cirri, stiffened instead of flagellate, and composed of fewer segments.

EUANTEDON SINENSIS, new species

1. ? *Coast of China* (labeled, in Chinese characters, "very deep water").—One specimen, which may be described as follows:

Cirri about XXX, 15-17, the longest probably 13 mm. to 15 mm. long; the longest segments in the proximal portion are from two to two and one-half times as long as broad; the outer segments are only very slightly shorter; the cirri resemble those of *Antedon adriatica* in general appearance; the dorsal proximal and distal edges of the segments are slightly thickened in the outer segments as in *Antedon mediterranea* and in *A. adriatica*.

The arm structure resembles that of *A. adriatica*; the distal inter-syzygial interval is three oblique muscular articulations. The arms are about 60 mm. long.

P_1 is broken in all cases; but it is longer and stouter than P_2 ; the first segment is short, the second slightly longer than broad, the third slightly over twice as long as broad, and the following about three times as long as broad; the distal edges of the third and following segments are slightly produced; P_2 is from 6 mm. to 6.5 mm. long with nine or ten segments of which the second is about as long as broad, the third nearly twice as long as broad, and the following increase in length so that the outer are about four times as long as

the median diameter; the third and following have slightly produced finely spinous distal edges; the following pinnules are small and weak.

This species is closely related to *Euantedon moluccana*; it is somewhat larger than the type (and only known specimen) of that form, and shows the following differences; the cirrus segments are proportionately only about half as long, with both the proximal and distal dorsal edges thickened and prominent, the entire dorsal surface in *E. moluccana* being straight and smooth; there is much less difference in proportions between the proximal and terminal cirrus segments than in *E. moluccana*; the proximal pinnules are essentially the same in the two forms, but in *E. moluccana* the component segments are longer and the distal edges are smooth and not produced; the synarthrial tubercles are less prominent than in *E. moluccana*.

IRIDOMETRA NANA (Hartlaub)

Antedon nana 1890. HARTLAUB, Nachr. Ges. Göttingen, Mai 1890, p. 170 (1).
—1891. Nova Acta Acad. German., vol. 58, No. 1, p. 89 (1).

1. *Tonga Islands*.—One specimen.

Subfamily ZENOMETRINÆ

LEPTOMETRA CELTICA (Barrett and McAndrew)

1. "*Porcupine*" *Station No. 13*.—Three specimens.

LEPTOMETRA PHALANGIUM (J. Müller)

1. *Naples*.—Three specimens.

2. *Tunis, 50-100 fathoms*.—Three specimens.

Subfamily HELIOMETRINÆ

HELIOMETRA GLACIALIS (Leach)

1. *Greenland*.—Two large and handsome specimens.

2. *East Spitzbergen; IV. Kükenthal*.—Twelve specimens.

SOLANOMETRA MAGELLANICA (Bell)

Antedon eschrichtii var. *magellanica* 1882. BELL, Proc. Zoöl. Soc. London, 1882, p. 651.

Antedon rhomboidea 1888. P. H. CARPENTER, "Challenger" Report, Comatule, p. 148.—1895. HARTLAUB, Bull. Mus. Comp. Zoöl., vol. 27, No. 4, p. 138 (1).

Heliometra magellanica 1911. A. H. CLARK, Bull. du mus. d'hist. nat., No. 4, 1911, p. 257.

1. *Smyth Channel, Straits of Magellan; Dr. H. Rehberg*.—One specimen, resembling others at hand from the vicinity of Cape Horn.

2. *Puerto Bueno, Smyth Channel; Capt. R. Paessler, October 25, 1893.*—One specimen.

HATHROMETRA PROLIXA (Sladen)

1. *East Spitzbergen; Römer and Schaudinn dredging stations 23-24, 32, 126-130.*—Six specimens.

Family PENTACRINITIDÆ

ISOCRINUS DECORUS (Wyville Thomson)

1. *Barbados.*—One specimen.

METACRINUS ROTUNDUS P. H. Carpenter

1. *Japan.*—One specimen.
2. *Sagami Bay, Japan.*—One specimen.

LIST OF THE PUBLISHED PAPERS DEALING WHOLLY OR IN PART WITH THE CRINOIDS IN THE COLLECTION OF THE HAMBURG MUSEUM.

1868. LOVÉN, SVEN, Om *Hyponome sarsi*. Förhandl. Skand. Naturf. Christiania, 1868, vol. 10, pp. 159-160.
1869. LÜTKEN, C. F., *Hyponome sarsi*, a recent Australian Echinoderm closely allied to the paleozoic Cystidea, described by Professor Lovén; with some Remarks on the Mouth and Anus in the Crinoidea and Cystidea. Canadian Naturalist (N. S.), vol. 4, pp. 267-270.*
1882. CARPENTER, PHILIP HERBERT, The Comatulæ of the Hamburg Museum. Journal of the Linnean Society (Zoölogy), vol. 16, pp. 501-526.
1888. CARPENTER, PHILIP HERBERT, "Challenger" Report, Comatulæ. Zoölogy, vol. 26 (Part 60).
1890. HARTLAUB, CLEMENS, Beitrag zur Kenntniss der Comatuliden-Fauna des indischen Archipels (vorläuf. Mitth.). Nachrichten von der königl. Gesellschaft der Wissenschaften und der Georg Augusts Universität zu Göttingen, Mai 1890, pp. 168-187.
1891. HARTLAUB, CLEMENS, Beitrag zur Kenntniss der Comatuliden-Fauna des Indischen Archipels. Nova Acta der Ksl. Leop.-Carol. Deutschen Akademie der Naturforscher, vol. 58, No. 1, pp. 1-120.
1895. HARTLAUB, CLEMENS, Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut.-Commander Z. L. Tanner, U. S. N., commanding. XVIII. Die Comatuliden. Bulletin of the Museum of Comparative Zoölogy at Harvard College, vol. 27, No. 4, pp. 120-152.

* For references to additional papers on the subject of this supposed recent Cystidea, see the synonymy under *Zygometra microdiscus*, p. 11.