

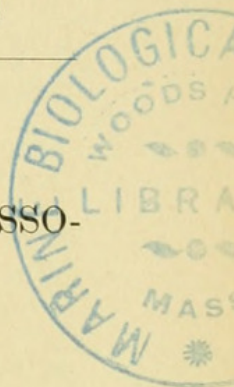
PROCEEDINGS  
OF THE  
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A REVISION OF THE CRINOID FAMILIES THALASSO-  
METRIDÆ AND HIMEROMETRIDÆ.

BY AUSTIN HOBART CLARK.

In my first revision of the unstalked crinoids (Smiths. Miscell. Coll., Quarterly Issue, L, pp. 343-364; Bull. Mus. Comp. Zool., LI, No. 8, p. 245), I was, through lack of material, unable to arrive at a true understanding of the interrelations of the specific groups which I called collectively *Antedon*, and various other groups which I segregated into the "genera" *Himerometra*, *Thalassometra*, and *Charitometra*. These genera were sufficiently definite and well marked to serve as units, and I therefore had no hesitation in considering them as such until further material was available upon which to base a more detailed study. This was soon possible in the case of "*Antedon*," and that genus was promptly resolved into its component specific groups (these Proceedings, XXI, pp. 125-136); but the other genera, from a lack of adequately representative material, proved more difficult; of "*Himerometra*" especially, I was only acquainted with a very small proportion of the very numerous species. The receipt of a very interesting collection from the Hawaiian Islands, and of the extensive Japanese collection deposited by Mr. Frank Springer threw considerable light on a number of hitherto obscure points in regard to "*Thalassometra*" and "*Charitometra*"; more recently, through the kindness of Dr. Th. Mortensen, I have been able to study the magnificent collection belonging to the University of Copenhagen, and the U. S. Bureau of Fisheries has entrusted to me the collections made by the steamer *Albatross* among the Philippine Islands, so that I now have been able to examine all of the important types referred to *Himerometra*.

The new genera described herein are based upon obvious external characters, in order that they may be readily recognized





and identified from ordinary museum material; in many cases, as with the larger divisions, the best characters are found in the musculature, studied from the point of view of skeletal muscle insertions, and in the internal structure of the centro-dorsal; but it has seemed best to omit a discussion of these features from preliminary diagnoses, though I shall consider them in detail later, especially in reference to the fossil comatulids, in which often only the centro-dorsal and the radials are preserved.

The family Thalassometridæ falls into two approximately equal divisions, in one of which all the species have short, stout, and smooth cirri, and a slender first pinnule composed of very numerous short joints; and in the other long, comparatively slender, and spiny cirri, and a stout first pinnule, composed of enlarged joints. In the latter the proximal cirrus joints, for a variable distance from the centro-dorsal, are rounded, spineless, and with a dull surface, and usually comparatively dark in color; then comes a "transition" joint, which is similar to those preceding for most of its length, but distally has a highly polished surface, is light in color, and bears a small dorsal spine or tubercle; beyond this "transition" joint the joints are shorter, highly polished, and bear dorsal spines, and the cirrus is more slender than in the proximal portion. This group thus appears to have the cirri of the other modified, not by a simple increase in the number of joints, but by the addition of a series of a different type of joint beyond the penultimate joint of the former (corresponding to the "transition" joint of the latter). This increased cirrus length is correlated, as is commonly the case among the comatulids, with an increase in the size of the lower pinnules (though here affecting only the first) and the result is an animal of radically different appearance. I propose to group the forms with short, stout, smooth cirri and slender many-jointed first pinnule together under the designation of *Charitometrinæ*, while those with long, comparatively slender, spiny cirri, and long and stout first pinnule may be taken as composing the sub-family *Thalassometrinæ*.

This modification of the cirri and lower pinnules is not by any means confined to the Thalassometridæ; it is equally marked in the Zygometridæ, where it separates *Eudiocrinus* and *Catoptometra* from *Zygometra*, and, with more or less modification, in certain sections of the Himerometridæ.



I have used great care in the selection of the types of the new genera described herein. The types are, wherever possible, the first species to have been described, and the commonest species; but in cases where the original description is deficient, or the identification doubtful, I have taken one of the later species, where circumstances permitted one considered as a synonym of the first described. Preference has always been given to species at hand to guard against the possibility of nomenclatorial disturbance through misconception of species not personally known to me, as so much trouble has arisen in other groups because of certain species being supposed by authors to be one thing, but on examination proving to be something quite different.

## FAMILY HIMEROMETRIDÆ.

## KEY TO THE INCLUDED GENERA.

- $a^1$   $P_1$  greatly elongated,  $P_2$  and following pinnules extremely short, only about one-fifth as long as  $P_1$ ; cirri long and stout, with about 80 joints; anal tube very long and slender; rays rounded and very widely separated (1) *Pontiometra*.
- $a^2$   $P_2$  resembling  $P_1$  equal in size, or larger; anal tube stout, not especially long; rays never very widely separated.
- $b^1$  no pinnule on the fourth (epizygal) brachial (i. e.,  $P_a$  absent).
  - $c^1$  cirri long with more than 35 joints; all the pinnules long and stiff, none of the proximal pinnules greatly longer than the others (2) *Colobometra*.
  - $c^2$  cirri short, with less than 30 joints; distal pinnules soft and delicate; one or two of the proximal pinnules much larger and stiffer than the others (3) *Cyllometra*.
- $b^2$  a pinnule on the fourth (epizygal) brachial (i. e.  $P_a$  present).
  - $c^1$  middle and distal brachials extremely short and oblong; 1 Br and lower brachials strongly convex dorso-ventrally, appearing swollen.
    - $d^1$  1 Br and first two brachials in apposition for their entire length; synarthrial tubercles strongly developed;  $P_1$  smaller and more slender than  $P_2$ ; 10–20 arms (4) *Amphimetra*.
    - $d^2$  1 Br and division series rounded, and widely separated laterally; synarthrial tubercles not developed;  $P_1$  resembling  $P_D$  and  $P_P$  and larger than  $P_2$ ; more than 25 arms (5) *Himerometra*.
  - $c^2$  middle and distal brachials wedge-shaped or triangular, not particularly short; 1 Br, further division series, and lower brachials not swollen.
    - $d^1$  10 arms; cirri short and stout, the component joints sub-equal, usually squarish, sometimes broader than long; opposing spine median, erect; joints of lower pinnules with more or less developed keels or lateral processes (6) *Oligometra*.



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$d^2$  more than 10 arms; opposing spine, when present, sub-central to sub-terminal, more or less directed forward.

$e^1$  cirrus joints all much broader than long, sub-equal; cirrus spines paired;  $P_2$  greatly enlarged and stiff (7) *Cenometra*.

$e^2$  distal cirrus joints shorter than (or longer than) the proximal, the latter at least as long as broad; dorsal cirrus spines single, or absent.

$f^1$  cirri stout basally, tapering gradually to a point distally; terminal claw nearly straight (8) *Craspedometra*.

$f^2$  cirri not tapering distally.

$g^1$  one or more of the proximal pinnules very stiff, straight, sharp-pointed, and spine-like, though not especially enlarged; lateral processes on the 1 Br and further division series (9) *Stephanometra*.

$g^2$  proximal pinnules always taper distally to a slender and delicate tip; no lateral processes on the 1 Br and further division series.

$h^1$  11 Br 4 (3 + 4);  $P_D$  smaller than  $P_1$ ;  $P_2$  the longest; arm division very irregular (10) *Heterometra*.

$h^2$  11 Br and subsequent division series 2; arm division regular (11) *Dichrometra*.

SUPPLEMENTARY KEY TO GENERA WITH TEN ARMED REPRESENTATIVES.

$a^1$  no pinnule on the fourth (epizygal) brachial (i. e.,  $P_a$  absent).

$b^1$  cirri long, with more than 35 joints; all the pinnules long and stiff, none of the proximal pinnules greatly longer than the others (2) *Colobometra*.

$b^2$  cirri short, with less than 30 joints; distal pinnules soft and delicate; one or two of the proximal pinnules much longer and stiffer than the others (3) *Cyllometra*.

$a^2$  a pinnule on the fourth (epizygal) brachial (i. e.,  $P_a$  present).

$b^1$  middle and distal brachials extremely short and discoidal; 1 Br and lower brachials swollen (4) *Amphimetra*.

$b^2$  middle and distal brachials wedge-shaped or triangular, not particularly short (6) *Oligometra*.

SUPPLEMENTARY KEY TO GENERA WITH 11 BR 4 (3+4).

$a^1$   $P_D$  larger and longer than  $P_1$ , which, in turn, is larger and longer than  $P_2$  (5) *Himerometra*.

$a^2$   $P_D$  smaller and weaker than  $P_1$ , which, again, is smaller and weaker than  $P_2$ .

$b^1$  cirri uniform, not tapering distally; distal cirrus joints not so long as broad; opposing spine present.

$c^1$  middle and distal brachials exceedingly short, discoidal; 1 Br and lower brachials swollen (4) *Amphimetra*.

$c^2$  middle and distal brachials not especially short, more or less obliquely wedge-shaped; 1 Br and lower brachials not swollen (10) *Heterometra*.

$b^2$  cirri tapering distally; distal cirrus joints twice as long as broad; no opposing spine (8) *Craspedometra*.



SUPPLEMENTARY KEY TO GENERA WITH II BR 2.

$a^1$   $P_1$  greatly elongated;  $P_2$  and following pinnules extremely short, of uniform length; cirri long and stout, with about 80 joints

(1) *Pontiometra*.

$a^2$   $P_2$  resembling  $P_1$  in size, or larger; cirri short, with less than 50 joints.

$b^1$  no pinnule on the fourth (epizygal) brachial (i. e.,  $P_a$  absent)

(3) *Cyllometra*.

$b^2$  a pinnule on the fourth (epizygal) brachial (i. e.,  $P_a$  present).

$c^1$  cirrus joints all much broader than long, sub-equal; cirri stout; cirrus spines paired;  $P_2$  greatly enlarged, the component joints with overlapping and spinous distal ends (7) *Cenometa*.

$c^2$  proximal cirrus joints longer than the distal, longer than broad;  $P_2$  enlarged, though not greatly different from one or two neighboring pinnules, which may equal or even exceed it;  $P_2$  has smooth joints.

$d^1$  one or more of the proximal pinnules very stiff, straight, sharp-pointed, and spine-like, though not especially enlarged; 1 Br and division series with lateral processes

(9) *Stephanometra*.

$d^2$  proximal pinnules, though enlarged, taper evenly to a slender and delicate tip; 1 Br and division series without lateral processes

(11) *Dichrometra*.

1. **Pontiometra** A. H. Clark.

The species belonging to this genus is:

*Pontiometra andersoni* (P. H. Carpenter).

2. **Colobometra** gen. nov.

*Genotype*.—*Antedon perspinosa* P. H. Carpenter, 1881.

Centro-dorsal discoidal, more or less thickened, usually with a slightly concave polar area; cirrus sockets arranged in one, sometimes two, closely crowded, alternating rows.

Cirri xv-xxv, 35-60, the joints with prominent and overlapping distal ends thickly set with fine spines; distal cirrus joints about twice as broad as long, always shorter than the proximal, which may be not quite so long as broad to somewhat longer than broad; prominent dorsal spines, usually paired, developed in the distal half or two-thirds of the cirri. The cirri are equal to about one-fourth of the arm length.

Radials visible in the angles of the calyx, but usually concealed in the median line; 1 Br<sub>1</sub> rounded dorsally, entirely separate, decreasing slightly in diameter anteriorly, twice or three times as broad as long; 1 Br<sub>2</sub> pentagonal, nearly twice as broad as long to nearly as long as broad; both these joints have slight marginal projections, and are widely free laterally.

Arms 10; first eight or nine brachials almost oblong, about twice as broad as long, then becoming triangular; about twice as broad as long, then wedge-shaped, though without any especial increase in length until near the extremity of the arm where they become almost as long as broad, though remaining obliquely wedge-shaped. The brachials have projecting



and spiny overlapping distal edges, which become very marked after the second syzygy.

*Pa* absent; *P*<sub>1</sub> not especially long, and not stiffened, evenly tapering, and rather slender distally, the component joints squarish or rather longer than broad; following lower pinnules rather long, sub-equal, slightly enlarged, and very stiff, the elongated component joints with overlapping and spinous distal ends; middle and distal pinnules not very different in length from the proximal, but more slender; they are stiffened and flattened laterally, with moderately long joints which have projecting and spinous distal ends.

*Color* (in spirits).—Flesh color to deep purple, the costals and lower brachials usually with a darker lateral line, the arms after the second syzygy with numerous and thickly set, rather narrow, bands of darker.

*Distribution*.—Port Denison (near Bowen), Queensland, to Amboina, New Guinea (Jobie), Singapore and the Philippine Islands.

*Depth*.—Littoral, but occurring down to 20 fathoms.

The species included in this genus are:

*Colobometra perspinosa* (P. H. Carpenter)

“ *suavis* (A. H. Clark).

\* 3. **Cyllometra** A. H. Clark.

The species remaining in this genus as restricted are:

*Cyllometra albopurpurea* A. H. Clark

“ *anomala* A. H. Clark

“ *claræ* (Hartlaub)

“ *impinnata* (P. H. Carpenter)

“ *informis* (P. H. Carpenter)

“ *manca* (P. H. Carpenter)

“ *tigrina* (A. H. Clark).

4. **Amphimetra** gen. nov.

*Genotype*.—*Comatula* (*Alecto*) *milberti* J. Müller, 1846.

Centro-dorsal hemispherical or more or less discoidal, the moderately large polar area flat, slightly convex, or slightly concave; cirrus sockets arranged in one to three crowded, more or less alternating, marginal rows.

Disk often more or less plated.

Cirri XIII-XXX, 25-50, short, varying from slender and tapering to very stout. The component joints may be sub-equal, all very short, or all longer than broad, or the proximal joints may be longer than broad, the distal short; dorsal spines are usually (though not always) developed, at least distally; but, though prominent, they are never very large.

Arms 10 to 20; but the division series, when developed, are very irregular in occurrence; II Br 4 (3+4); III Br 2, developed interiorly in 1, 2, 2, 1 order; I Br and lower brachials (including division series) in lateral apposition, and more or less “wall-sided”; I Br, division series, and proximal brachials rather strongly convex longitudinally as well as transversely, giving them a characteristic swollen appearance, like the corre-



sponding joints in *Himerometra*; brachials all short, at first discoidal, then more or less wedge-shaped, becoming very short and regularly discoidal in the outer half of the arm as in *Himerometra*; synarthrial tubercles prominent, sometimes excessively developed.

$P_1$  small and slender, with numerous short joints;  $P_2$ ,  $P_3$ , or both, elongate, rather large basally, but tapering, and slender distally; the distal ends of the outer joints may be produced into broad lateral expansions, and the proximal joints may be carinate.

*Color* (in spirits).—White to dark reddish brown, purple, or violet; ashey gray, white, or pale flesh color blotched or banded with purple (light or dark) or yellowish brown; pale flesh color, the perisome and pinnules brown or deep violet.

*Distribution*.—Ceylon to the Mergui Archipelago, Sumatra, and Singapore, Port Denison, Port Molle, the Arafura Sea and Aru Islands, Ceram, the Philippines, Borneo, and northward to Canton and Japan.

*Depth*.—Littoral, and down to at least 32, possibly 36 fathoms.

Though well marked in regard to the generic characters, the genus *Amphimetra* presents exceptional difficulties in the elucidation of the interrelations of its component species, and no satisfactory synopsis of them has up to the present been published. The species at present known are:

*Amphimetra anceps* (P. H. Carpenter)

“ *ensiformis* (A. H. Clark)

“ *laevissima* (J. Müller)

“ *milberti* (J. Müller)

“ *mölli* (A. H. Clark)

“ *producta* (A. H. Clark)

“ *schegelia* (A. H. Clark)

? “ *tessellata* (J. Müller)

“ *variipinna* (P. H. Carpenter).

##### 5. *Himerometra* A. H. Clark.

The species belonging to this genus as restricted are:

*Himerometra bartschi* A. H. Clark

“ *crassipinna* (Hartlaub)

“ *kraepelini* (Hartlaub)

“ *magnipinna* A. H. Clark

“ *martensi* (Hartlaub)

“ *persica* A. H. Clark

“ *robustipinna* A. H. Clark

? “ *philiberti* (J. Müller).

##### 6. *Oligometra* A. H. Clark.

The species of this genus are:

*Oligometra adeonæ* (Lamarck) *Oligometra imbricata* A. H. Clark

“ *bidens* (Bell) “ *japonica* (Hartlaub)

“ *caribbea* A. H. Clark “ *pinniformis* (P. H. Carpenter)

“ *carpenteri* (Bell) “ *pulchella* A. H. Clark

“ *gracilicirra* A. H. Clark “ *serripinna* (P. H. Carpenter).



7. **Cenometra** gen. nov.

*Genotype*.—*Himerometra unicornis* A. H. Clark, 1908.

Centro-dorsal of moderate size, rather thick, discoidal, the dorsal pole strongly concave; cirrus sockets arranged in one or two closely crowded alternating marginal rows.

Cirri xv-xx, 30-45, stout, between one-fifth and one-sixth the length of the arms; cirrus joints subequal, all about twice as broad as long; all the joints with prominent distal ends, giving the cirri a strongly serrate appearance dorsally; joints of the outer half or two-thirds with paired tubercles or small spines.

Radials just visible, separated distally; i Br<sub>1</sub> entirely free laterally, rounded dorsally, two or three times as broad as long; i Br<sub>2</sub> little, if any, longer than the first costals; ii Br always, iii Br and iv Br sometimes, present, all 2, the last two developed only on the outer sides of each i Br series; synarthrial tubercles not developed; division series and first brachials bearing externally stout lateral processes as in *Stephanometra*, progressively decreasing in size.

Arms 20 to 30; first eight or nine brachials approximately oblong, about twice as broad as long, then becoming wedge-shaped, about twice as broad as long, and distally less obliquely wedge-shaped. The brachials have projecting and finely spinous distal ends. The second syzygy is at a considerable distance from the calyx, varying from between the fourteenth and fifteenth to between the ninety-second and ninety-third, but usually in the vicinity of the thirtieth brachial.

P<sub>2</sub> very large, stout and stiff, with twelve to twenty joints, most of which are a little longer than broad, and have projecting and finely spinous distal ends; P<sub>1</sub> is slender and weak, tapering, but with at least as many joints as P<sub>2</sub>; P<sub>3</sub> and the following pinnules are slender and weak, smaller than P<sub>1</sub>; distal pinnules nearly as long as P<sub>2</sub>.

*Color* (in spirits).—Light grayish blue, with very numerous small round red-brown spots, cirri yellow-brown; or reddish-brown, the cirri yellow-brown; P<sub>2</sub> is always light yellow-brown.

*Distribution*.—Ceylon, eastward to Amboina and the Philippine Islands, and northward to the Gulf of Tonkin.

*Depth*.—Littoral, and down certainly to 29, and possibly to 36 fathoms.

The described species belonging to this genus are:

*Cenometra abbotti* (A. H. Clark)

“ *bella* (Hartlaub)

“ *brunnea* (Hartlaub)

“ *unicornis* (A. H. Clark).

8. **Craspedometra** gen. nov.

*Genotype*.—*Antedon acuticirra* P. H. Carpenter, 1882.

Centro-dorsal a large thick disk with a flat or slightly convex dorsal surface, the cirrus sockets usually in a single marginal row, rarely in two irregular rows.



Cirri xv-xxv, 35-60, long and slender, stout basally, distally tapering gradually to a point; cirrus joints very short basally, becoming gradually longer, and longest terminally; dorsal spines or carination absent; no opposing spine; terminal claw long (about as long as the penultimate joint) and nearly straight. The cirri are over one-third, and often nearly one-half the arm length.

Radials more or less completely concealed; i Br<sub>1</sub> very short, united laterally; i Br<sub>2</sub> short, free laterally; ii Br 4 (3 + 4); iii Br 2, rarely 4 (3 + 4); iv Br 2; the division series are usually very irregular on different rays. i Br and division series rounded dorsally, well separated laterally, with often a slight prominence of the synarthrial articulations.

Arms 26 to 35, long, moderately slender; first eight brachials approximately oblong (the first two wedge-shaped), two or three times as broad as long, then becoming obliquely wedge-shaped or triangular, but of the same proportions, distally becoming less obliquely wedge-shaped, and almost (though never quite) oblong in the distal half of the arm.

P<sub>D</sub> stout basally, but becoming slender in the distal half, all the joints short, the broad lower joints carinate; P<sub>1</sub> similar, but longer; P<sub>2</sub> long and rather stout, but gradually tapering distally, composed of very numerous short joints, those in the basal half being carinate; P<sub>3</sub> similar, but longer and rather stouter, reaching to about half the cirrus length, composed of numerous joints; following pinnules decreasing in length and stoutness, the distal pinnules being only about one-third as long as the elongate proximal pinnules. The carination of the basal joints of the lower pinnules is traceable to about the end of the proximal third of the arm.

*Color* (in spirits).—Nearly white, with traces of deep violet; flesh-colored, the perisome brown; light brown; deep purple, almost black; or purplish brown.

*Distribution*.—Sydney, New South Wales, northward to Amboina, Singapore and Hong Kong.

*Depth*.—Littoral.

Lack of material has prevented my confirming or disproving Hartlaub's disposition of the described species of this genus; I therefore list all of the nominal species referable to this genus which have been described:

- |                                 |                    |
|---------------------------------|--------------------|
| <i>Craspedometra acuticirra</i> | (P. H. Carpenter)  |
| “ <i>australis</i>              | (P. H. Carpenter)  |
| “ <i>bipartipinna</i>           | (P. H. Carpenter)  |
| “ <i>ludovici</i>               | (P. H. Carpenter). |

## 9. *Stephanometra* gen. nov.

*Genotype*.—*Antedon monacantha* Hartlaub, 1890.

Centro-dorsal moderate to small, discoidal with sloping sides, or sub-hemispherical, the dorsal polar area small, usually flat or slightly convex, more rarely slightly concave; cirrus sockets arranged in one and a partial second to two and a partial third closely crowded alternating rows.



Cirri xv-xxxv, 15-25, rather small and weak, scarcely reaching one-fifth of the arm length; proximal cirrus joints (except the basal) somewhat longer than the distal, but the latter never much broader than long; cirri usually strongly carinate distally, rarely spiny.

1 Br and division series dorsally rounded, the synarthrial tubercles sometimes slightly developed, always well separated laterally, the outer edges of the joints furnished with more or less developed ventro-lateral tubercular prominences or lateral flanges.\*

Arms 12 to 31; first seven to nine brachials approximately oblong (the first two wedge-shaped), about twice as broad as long, then becoming triangular or very obliquely wedge-shaped, broader than long, and distally wedge-shaped, and in the terminal portion of the arm, as long as, or even rather longer than, broad, though remaining moderately oblique.

$P_2$  the longest, stout, very stiff and spine-like, tapering to a sharp point, with comparatively few joints (not over eighteen), most of which are much elongated;  $P_1$  is usually somewhat shorter than  $P_2$  with more numerous and shorter joints, more slender and more flexible, but it is occasionally similar to  $P_2$ ;  $P_3$  usually, and often one or two of the following pinnules are of the same character as  $P_2$ , but of decreasing length; the distal pinnules are slender, delicate, and flexible, not so long as  $P_2$ .

*Color* (in spirits).—Yellow or white, with narrow bands of red-brown or blackish-brown at the articulations; sometimes deep violet or almost black, or yellow or reddish with darker bands at the articulations.

*Distribution*.—Island of Rodriguez, eastward to the Nicobar Islands, Singapore, Amboina, Torres Straits, the Banda Sea, Fiji, the Tonga Islands, the Carolines, and the Philippines.

*Depth*.—Littoral, extending downward to 21 fathoms.†

The described species belonging to this genus are:

<i>Stephanometra acuta</i>	(A. H. Clark)
“	<i>echinus</i> (A. H. Clark)
“	<i>indica</i> (Smith)
“	<i>monacantha</i> (Hartlaub)
“	<i>oxyacantha</i> (Hartlaub)
“	<i>spicata</i> (P. H. Carpenter)
“	<i>spinipinna</i> (Hartlaub)
“	<i>tenuipinna</i> (Hartlaub)
“	<i>tuberculata</i> (P. H. Carpenter).

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\*Absent in the type of *Antedon spinnipinna*; but this is evidently a very young specimen.

NOTE.—A second large specimen of this species, received since the above was put in type, has the lateral flanges developed as usual.

†Dr. Carpenter records *S. tuberculata* from 210, 255, or 610 fathoms, near Kandavu, Fiji, but the shallowest of these is so much below the lowest certain record for any species of the family that the record must be considered doubtful, on the basis of our present knowledge.



10. *Heterometra* gen. nov.

*Genotype*.—*Antedon quinduplicava* P. H. Carpenter, 1888.

Centro-dorsal discoidal, thin to moderately thick, the dorsal polar area sometimes flat, but usually more or less convex, the sides sloping, the cirrus sockets arranged in one and a partial second to two and a partial third closely crowded alternating rows.

Cirri xvii-xxx, 20-37, about one-fourth the length of the arms; proximal cirrus joints (except the basal) slightly longer than broad, becoming broader than long distally; distal cirrus joints always sharply carinate, and usually developing more or less prominent spines.

Radials but slightly, when at all, visible; i Br<sub>1</sub> short, more or less united, but always free distally, rarely reaching a length of one-half the width; i Br<sub>2</sub> pentagonal, half again to twice as long as the i Br<sub>1</sub>, rounded dorsally, widely free laterally; i Br and division series smooth laterally, without marginal projections; ii Br 4 (3+4), rarely 2; iii Br (when present) always 2. The development of ii Br and iii Br series is irregular, some of the i Br series being always better supplied than the others.

Arms 11 to 28, though usually rather less than 20; first few brachials discoidal, then obliquely wedge-shaped or triangular, much broader than long, gradually becoming less obliquely wedge-shaped, sometimes almost oblong, and short, though they are never excessively short and discoidal as in *Himerometra*.

P<sub>D</sub> shorter and more slender than P<sub>1</sub>, which, in turn, is shorter and more slender than P<sub>2</sub>, the last being the largest pinnule on the arm; lower pinnules stout basally, tapering gradually to a slender and more or less flagellate tip; the enlarged lower part usually more or less stiffened, this stiffening becoming less and less distally. Distal pinnules always much shorter than the enlarged proximal pinnules, usually not much more than one-half as long.

*Color* (in spirits).—Light brown to chocolate brown, the perisome usually darker; light grayish brown; blackish brown, with a tinge of reddish; dull orange, broadly banded with white.

*Distribution*.—Red Sea eastward (Muscat; Kurrachee; Ceylon; Bay of Bengal) to Amboina and the Philippine Islands.

*Depth*.—Littoral, extending down to 24 fathoms.

The described species referable to this genus are:

- Heterometra affinis* (Hartlaub)
- “ *bengalensis* (Hartlaub)
- “ *brockii* (Hartlaub)
- “ *quinduplicava* (P. H. Carpenter)
- “ *reynaudi* (J. Müller)
- “ *savignii* (J. Müller).

From the two other genera which have the ii Br series 4 (3+4) *Heterometra* may be very readily distinguished. *Himerometra* always has the brachials exceedingly short and discoidal, usually a much larger number of arms, and P<sub>D</sub> longer and stouter than P<sub>P</sub> or P<sub>1</sub>, which, again, are longer and stouter than the succeeding pinnules; the iii Br series, always



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present, are inwardly 2, outwardly 4 (3+4), whereas in *Heterometra* they are always 2. *Amphimetra* has the same excessively short discoidal brachials as *Himerometra*, whereby it is very easily differentiated from *Heterometra*, though the III Br series are 2, and  $P_D$  is smaller than  $P_1$  as in the latter.

11. **Dichrometra** gen. nov.

*Genotype*.—*Alecto flagellata* J. Müller, 1841.

Centro-dorsal moderate or small, low-hemispherical or discoidal, the bare polar area small, slightly convex, flat, or slightly concave, the sides sloping; cirrus sockets arranged in two or three crowded, alternating, marginal rows.

Cirri XX-XL, 17-52 (usually 20-30), rather slender and weak, from one-sixth to about two-fifths the length of the arms, the distal joints always somewhat shorter than the proximal (except the basal), though never very short, sharply carinate, or furnished with more or less prominent spines, which, however, are never so long as the opposing spine.

Radials usually concealed, sometimes slightly visible; division series always 2, the component joints without lateral processes, though sometimes rather sharply carinate ventro-laterally, never very widely separated, usually more or less in apposition and laterally flattened.

Arms 25 to 43, supernumerary axillaries being always developed exteriorly in regard to the I Br axillary; first two brachials wedge-shaped, the longer side out; following five or six oblong, about twice as broad as long, then becoming triangular or very obliquely wedge-shaped, about twice as broad as long, then becoming less obliquely wedge-shaped distally, and slightly longer, though even the terminal joints have oblique ends and are scarcely, if any, longer than broad.

Proximal pinnules much elongated, though not especially enlarged, and flagellate, occasionally somewhat stiffened basally, with twenty-five or more joints, squarish or slightly longer than broad;  $P_1$  always shorter and more slender than  $P_2$ , the latter being less than, equal to, or longer than,  $P_3$ ;  $P_2$  usually somewhat, occasionally very much, larger, on the outer arms of each ray than on the inner; the distal pinnules are short, never so long as the elongated proximal pinnules.

*Color* (in spirits).—Various shades of yellow, yellowish, reddish, or blackish brown, or grayish to deep purple or violet, often more or less mottled with darker or with yellow or white. The long lower pinnules and cirri are usually lighter than the remaining portions of the animal.

*Distribution*.—Madagascar northward to the Red Sea, eastward along the coasts of India, Ceylon, and northern Australia to the coast of China, Japan, Fiji, the Philippines, the Tonga and the Marshall Islands.

*Depth*.—Littoral, and extending downward to at least 28 fathoms.\*

The species referable to this genus are:

\* Chadwick records *D. okelli* from a station at which the recorded depth was  $11\frac{1}{2}$ -36 fathoms; Carpenter records *D. occulta* from a depth of 210, 255, or 610 fathoms; but additional confirmation of even the lowest of these last is needed.



*Dichrometra articulata* (J. Müller)

- “ *bimaculata* (P. H. Carpenter)
- “ *brevicuneata* (P. H. Carpenter)
- “ *elongata* (J. Müller)
- “ *flagellata* (J. Müller)
- “ *gracilipes* (A. H. Clark)
- “ *grandis* (A. H. Clark)
- “ *gyges* (Bell)
- “ *heliaster* (A. H. Clark)
- “ *klunzingeri* (Hartlaub)
- “ *marginata* (P. H. Carpenter)
- “ *occulta* (P. H. Carpenter)
- “ *okelli* (Chadwick)
- “ *palmata* (J. Müller)
- “ *protectus* (Lütken)
- “ *regalis* (P. H. Carpenter)
- “ *reginæ* (Bell)
- “ *subcarinata* (A. H. Clark)
- “ *subtilis* (Hartlaub)
- “ *tenera* (Hartlaub).

The following species belonging to this family I have not been able to place satisfactorily, through lack of material for comparison; the first appears to be most closely related to *Pontiometra andersoni*, and the diagnosis of that genus may have to be altered for its reception; the second appears to represent a distinct generic type, for which the name **Oxymetra** would be appropriate.

*Antedon finschii* Hartlaub

*Antedon erinacea* Hartlaub.

FAMILY THALASSOMETRIDÆ.

SUB-FAMILY THALASSOMETRINÆ.

KEY TO THE INCLUDED GENERA.

*a*<sup>1</sup> Calyx and arm bases spinous, the latter rounded dorsally.

*b*<sup>1</sup> genital pinnules expanded; brachials with single long overlapping median spines; *P*<sub>1</sub> long, but not enlarged (12) *Stylometra*.

*b*<sup>2</sup> genital pinnules styloform, not expanded; brachials rounded dorsally; spines when present on the brachials, two or more in number; *P*<sub>1</sub> long and greatly enlarged (13) *Thalassometra*.

*a*<sup>2</sup> Calyx and arm bases smooth.

*b*<sup>1</sup> 1 Br strongly carinate.

*c*<sup>1</sup> *P*<sub>1</sub> only slightly larger than *P*<sub>2</sub>; arms strongly carinate throughout (14) *Stenometra*.

*c*<sup>2</sup> *P*<sub>1</sub> much longer than *P*<sub>2</sub>; arms rounded, not carinate (15) *Stiremetra*.

*b*<sup>2</sup> 1 Br not carinate.

*c*<sup>1</sup> less than 30 cirrus joints; genital pinnules short; usually less than twenty arms; lateral flattening of rays not marked (16) *Parametra*.



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$c^2$  more than 40 cirrus joints; genital pinnules moderately long; twenty or more arms; rays and division series sharply flattened laterally (17) *Cosmiometra*.

(12) **Stylometra** A. H. Clark.

The species belonging to this genus, in addition to an undescribed form from the Caribbean Sea, is :

*Stylometra spinifera* (P. H. Carpenter).

(13) **Thalassometra** A. H. Clark.

The species remaining in this genus as restricted are :

*Thalassometra agassizii* (Hartlaub)

“ *aster* (A. H. Clark)

“ *bispinosa* (P. H. Carpenter)

“ *echinata* (P. H. Carpenter)

“ *gigantea* (A. H. Clark)

“ *hawaiiensis* (A. H. Clark)

“ *multispina* (P. H. Carpenter)

“ *pergracilis* (A. H. Clark)

“ *pubescens* (A. H. Clark)

“ *villosa* (A. H. Clark).

14. **Stenometra** gen. nov.

*Genotype*.—*Antedon quinquecostata* P. H. Carpenter, 1888.

Centro-dorsal small, truncated-conical or more or less columnar, the cirrus sockets arranged in ten definite columns of two or three each, each column separated from its neighbors by more or less developed ridges, those situated interradially being usually more prominent than the others.

Cirri xx-xxxv, 50-90, long and slender; first few joints very short, then becoming much longer than wide, but becoming short again in the distal half, and very short toward the end of the cirrus; middle and distal joints bearing prominent dorsal spines. The cirri are from about half to two-thirds or more of the arm length.

Disk moderately or well plated; plating on the brachial and pinnule ambulacra well developed.

Ends of basal rays visible as dorso-ventrally elongate tubercles in the angles of the calyx; radials short or concealed in the median line, but always more or less visible in the angles of the calyx; when visible in the median line, with a more or less sharp median keel, and usually more or less strongly denticulate lateral (sometimes also anterior) edges; i Br<sub>1</sub> very short, sharply carinate; i Br<sub>2</sub> large, rhombic, sharply carinate; ii Br and iii Br (when present) 2, sharply carinate like the i Br.

Arms 10 to 21, strongly compressed and sharply carinate throughout their whole length, the median distal edge of the brachials being prominent, produced into a long overlapping spine in the outer half of the arms.



P<sub>1</sub> longer than P<sub>2</sub>, though not especially enlarged; following pinnules shorter, with the basal joints less carinate; distal pinnules as long as, or rather longer than, P<sub>1</sub>.

*Color*.—Bright yellow, sometimes more or less banded or blotched with white; cirri lighter in color than the arms.

*Distribution*.—Ki Islands northward to Japan.

*Depth*.—80 to 142, possibly to 152 fathoms.

The species referable to this genus are:

- Stenometra conifera* (Hartlaub)
- “ *diadema* (A. H. Clark)
- “ *hana* (A. H. Clark)
- “ *quinquecostata* (P. H. Carpenter).

# 15. *Stiremetra* gen. nov.

*Genotype*.—*Antedon acutiradia* P. H. Carpenter, 1888.

Centro-dorsal hemispherical or bluntly conical, the dorsal pole more or less papillose; cirrus sockets in one or two rows, and in two columns in each radial area, though the columns are not especially marked off.

Cirri xv-xxv, 40-50, cirrus joints proximally longer than broad, but becoming very short in the distal half, the joints in the distal two-thirds at least, sometimes all of the joints, bearing prominent dorsal spines.

Radials concealed; 1 Br<sub>1</sub> very short, band-like, deeply incised in the median line; 1 Br<sub>2</sub> large, rhombic or shield-shaped, with a strong posterior projection incising the 1 Br<sub>1</sub>, and a strong median keel.

Arms 10; first two brachials sharply carinate, but following brachials rounded dorsally; in the distal two-thirds of the arm the brachials developing prominent median overlapping spines, though not appearing to be much compressed laterally. The 1 Br and lower brachials are in close apposition and are sharply flattened laterally.

P<sub>1</sub> much larger than P<sub>2</sub>, with large lower joints which are rather strongly carinate.

*Color* (in spirits).—“Light brownish-white.”

*Distribution*.—Kermadec Islands and Port Jackson, to Fiji.

*Depth*.—630 to 1350 fathoms.

The included species are:

- Stiremetra acutiradia* (P. H. Carpenter)
- “ *breviradia* (P. H. Carpenter)
- “ *spinicirra* (P. H. Carpenter).

# 16. *Parametra* gen. nov.

*Genotype*.—*Antedon orion* A. H. Clark, 1907.

Centro-dorsal hemispherical or thick-discoidal, moderate or rather small, the marginal cirri arranged in one or two rows, and approximately in two or three columns in each radial area.

Cirri ix-xxv, 15-27, up to the fifth to the seventh joint rounded, stout, smooth, and with a dull surface, then becoming laterally compressed, polished, and bearing low dorsal spines; cirri only one-sixth or one-seventh of the arm length.



Disk scantily to moderately plated; ambulacra well plated.

Radials concealed; 1 Br<sub>1</sub> short, three or more times as broad as long; 1 Br<sub>2</sub> low-triangular or widely rhombic, twice as broad as long in the median line; 11 Br 2, but the full series rarely developed.

Arms 10 to 20; first brachial short, slightly wedge-shaped; second larger, irregularly quadrate, much broader than long; following brachials to the tenth or twelfth oblong or slightly wedge-shaped, over twice as broad as long, then becoming triangular or very obliquely wedge-shaped much broader than long, gradually increasing in length, though remaining very oblique distally. The 1 Br, 11 Br, and proximal part of the arms are very deep, evenly rounded dorsally, compressed laterally; but the division series and arms are not in lateral apposition; the depth of the brachials gradually decreases distally. The dorsal surface of the arms may be quite smooth, or there may be a faint trace of carination basally, gradually increasing distally, so that the terminal portion of the arms is strongly compressed and strongly carinate, the brachials with forward-projecting overlapping spines.

P<sub>1</sub> the longest, but not especially stout, scarcely larger than P<sub>2</sub>, though somewhat more carinate basally; following pinnules decreasing gradually in length to P<sub>4</sub> or P<sub>6</sub>, which is about two-thirds the length of P<sub>1</sub>, with nine to twelve joints which are rather broad; distal pinnules slightly longer than P<sub>1</sub>.

*Color*.—Bright lemon yellow to cadmium orange, the dull portion of the cirri green, the polished light yellow; sometimes the arms may be grayish, yellow distally.

*Distribution*.—Ki and Philippine Islands, northward to southern Japan and eastward to the Hawaiian Islands.

*Depth*.—82 to at least 192 fathoms.

The species included in this genus are:

*Parametra compressa* (P. H. Carpenter)

“ *fisheri* (A. H. Clark)

“ *orion* (A. H. Clark).

#### 17. *Cosmiometra* gen. nov.

*Genotype*.—*Thalassometra komachi* A. H. Clark, 1908.

Centro-dorsal moderate or small, the cirrus sockets arranged in two rows, and in two or three more or less regular columns in each radial area, closely crowded or more or less separated.

Cirri XVIII–XXV, 35–60, long, moderately stout, with a well marked transition joint from the seventh to the sixteenth, proximal to which the joints are smooth, rounded in cross-section, with a dull surface, distal to which they are highly polished, flattened, and furnished with prominent dorsal spines; proximal cirrus joints (except the basal) much longer than broad, distal joints very short. The longer cirri are about one-third of the arm length.

Disk scantily or moderately plated, well plated along the ambulacra; brachial and pinnule ambulacra well plated.



Ends of the basal rays visible as tubercles in the interradyal angles. Radials only visible in the angles of the calyx, sometimes entirely hidden; I Br<sub>1</sub> very short, bandlike or more or less crescentic; I Br<sub>2</sub> rhombic, over twice as broad as long; II Br 2, always present in the full series; III Br 2, developed 2, 1, 1, 2, not always present. The I Br, division series, and lower rachials are in very close apposition and very sharply flattened against each other; these joints also have the edges all around slightly everted; synarthral tubercles broad and rounded, not prominent; I Br and division series with a low broadly rounded more or less linear tubercle on their component joints.

Arms 20 to 30, moderately deep and compressed, but rounded dorsally and never carinate; first ten brachials oblong, about twice as broad as long (the first two wedge-shaped), then triangular, broader than long, soon becoming as long as broad, and in the terminal portion of the arm wedge-shaped, and more or less elongate; the brachials have more or less prominently overlapping and finely spinous distal edges.

P<sub>1</sub> considerable longer, and stouter, than P<sub>2</sub>, though not especially enlarged; following pinnules decreasing to about two-thirds the length of P<sub>1</sub>, then slowly increasing in length distally, the distal pinnules being rather longer than P<sub>1</sub>.

*Color* (in spirits).—"White with faint patches of brown here and there," to uniform dark brown.

*Distribution*.—Sahul Bank, north Australia, northward and northeastward to Japan and the Hawaiian Islands.

*Depth*.—The only records are for Hawaiian species, which were taken between 319 and 355 fathoms.

Included species:

- Cosmiometra crassicirra* (A. H. Clark)
- “ *delicata* (A. H. Clark)
- “ *komachi* (A. H. Clark)
- “ *woodmasoni* (Bell).\*

I am unable to properly place the following species belonging to this sub-family, because of a lack of material upon which to base comparisons, and inability to grasp the characters *in toto* from the published diagnoses.

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\* It is possible that "*Antedon adriani*," which was brought back by the "Discovery," belongs to this sub-family, though there are grounds for believing it to be a member of the Tropicometridæ. The proved occurrence of either of these families so far south would be of the greatest interest in its bearing on zoogeography. Unfortunately, neither the diagnosis nor the figure (which differ radically from each other) affords any clue to the family, generic, or specific relationships of the form; it is certain, however, that it can not have much in common with *Helometra glacialis*, with which it is compared; it does not belong in the same family.

It is to be hoped that "*Antedon adriani*" will soon be adequately described and figured and that "*Promachocrinus kerguelenensis*" (*sic*) and "*Antedon australis*" will be reidentified, especially the "young" of the latter, which possibly belong to a different genus from the larger ones. Some clue should have been given as to which of the two "*Antedon australis*" described by Carpenter is meant, though the supposition is that it is the later one.



*Antedon duplex* P. H. Carpenter

“ *flava* Kœhler

“ *incerta* P. H. Carpenter

“ *latipinna* P. H. Carpenter

“ *lusitanica* P. H. Carpenter

“ *magnicirra* Bell

“ *porrecta* P. H. Carpenter

“ *valida* P. H. Carpenter.

SUB-FAMILY CHARITOMETRINÆ.

KEY TO THE INCLUDED GENERA.

- a*<sup>1</sup> 1 Br and lower brachials with the dorso-lateral edge produced or everted, forming a thin flange-like border.
- b*<sup>1</sup> 1 Br with the proximal dorsal edges also produced; genital pinnules greatly and abruptly expanded; 1 Br and brachials rounded dorsally, without ornamentation (18) *Pæcilometra*.
- b*<sup>2</sup> 1 Br with only the dorso-lateral edges produced; genital pinnules very regularly expanded, and evenly tapering; 1 Br and lower brachials with the dorsal surface rugose or tubercular, and with a more or less indicated rounded median line (19) *Glyptometra*.
- a*<sup>2</sup> 1 Br and lower brachials with no production of the dorso-lateral edge.
- b*<sup>1</sup> third and fourth joint of the genital pinnules broad and nearly flat on the outer side, but the fifth joint smaller.
- c*<sup>1</sup> less than 12 cirrus joints; 1 Br and arm bases diverging at a wide angle, so that the lower part of the animal is broad and rounded (20) *Strotometra*.
- c*<sup>2</sup> more than 15 cirrus joints; 1 Br and arm bases diverging at a relatively small angle, so that the lower part of the animal appears conical (21) *Charitometra*.
- b*<sup>2</sup> genital pinnules evenly, and only slightly, expanded.
- c*<sup>1</sup> lower and middle pinnules approximately the same in length.
- d*<sup>1</sup> cirri large and stout, with eighteen or more joints (22) *Pachylometra*.
- d*<sup>2</sup> cirri weak and slender, with sixteen or less joints (23) *Chlorometra*.
- c*<sup>2</sup> lower pinnules over twice as long as the middle pinnules (24) *Crinometra*.

18. ***Pæcilometra*** A. H. Clark.

The nominal species belonging to this genus are:

*Pæcilometra acæla* (P. H. Carpenter) *Pæcilometra scalaris* (A. H. Clark).

19. ***Glyptometra*** gen. nov.

*Genotype*.—*Antedon tuberosa* P. H. Carpenter, 1888.

Centro-dorsal thick discoidal, sometimes almost columnar, the cirrus sockets in one, or one and a more or less complete second, crowded marginal rows; when in two rows, the tendency is toward a columnar, rather than an alternating arrangement.



Cirri xv-xxx, 13-21, smooth and stout, about one-sixth of the arm length; first few joints short, the remainder subequal, slightly longer than wide, to half again as long as wide; distal joints with a slight prominence of the median part of the distal dorsal edge; opposing spine small, or reduced to a tubercle, terminally situated; terminal claw about as long as the penultimate joint, stout and moderately curved.

Disk more or less completely plated; brachial and pinnule ambulacra well plated.

Ends of basal rays visible as small tubercles in the interradian angles; radials, and often more or less of the 1 Br<sub>1</sub>, concealed; 1 Br<sub>1</sub>, when visible, very short and band-like; 1 Br<sub>2</sub> very broad, rhombic, three times as broad as long; 1 Br and lower brachials in very close lateral apposition, and very sharply flattened, the dorso-lateral edge being everted and more or less produced into a thin flange-like border, which may persist as far as the sixteenth brachial. The 1 Br series and lower brachials have a rounded median dorsal tubercle or blunt keel, the remainder of the dorsal surface of the joints being coarsely and irregularly rugose or covered with moderately large tubercles; the edges of the joints, especially the 1 Br series and first two brachials, are usually more or less, sometimes very strongly, crenulate.

Arms 10 (one record of 11, 11 Br 2), the brachials after the fourth obliquely wedge-shaped, much broader than long, soon becoming triangular, about as long as broad; distal ends of brachials slightly prominent.

P<sub>1</sub> longer than P<sub>2</sub>, slender, becoming flagellate distally, composed of twenty to forty short joints; P<sub>2</sub> not quite so long with fewer joints, of which the basal eight or nine are somewhat expanded laterally; following pinnules at first slightly shorter, then slowly increasing in length; basal two-thirds of the earlier pinnules much expanded, this expansion tapering gradually away distally so that the end of the pinnule is flagellate; this expansion occupies progressively less and less of the pinnule distally, and finally disappears. The distal pinnules are as long as, or slightly longer than, P<sub>1</sub>.

*Color* (in life).—Yellow, large specimens becoming brown.

*Distribution*.—Philippine Islands northward and northeastward to southern Japan and the Hawaiian Islands.

*Depth*.—319 to 451 fathoms.

Included species:

*Glyptometra lata* (A. H. Clark)      *Glyptometra lateralis* (A. H. Clark)  
    *Glyptometra tuberosa* (P. H. Carpenter).

## 20. *Strotometra* gen. nov.

*Genotype*.—*Antedon hepburniana* A. H. Clark, 1907.

Centro-dorsal low-hemispherical or discoidal, with a rather large roughened dorsal pole; cirrus sockets marginal, in a single row.

Cirri x-xv, 10-15, short and stout, one-seventh to one-sixth of the arm length, the component joints (except the basal two) subequal, squarish, or slightly longer than wide; no dorsal spines; opposing spine very small, terminally situated.



Ends of basal rays visible as small interradyal tubercles; radials slightly visible, or concealed; 1 Br<sub>1</sub> short, band-like, in lateral contact, and laterally flattened; 1 Br<sub>2</sub> broad, rhombic, three times as broad as long, with a low blunt median keel; 1 Br and first four or five brachials laterally flattened.

Arms 10; lower brachials oblong, the first two with a blunt median keel, becoming wedge-shaped, about twice as broad as long, or rather broader, after the fifth, soon becoming very oblique or triangular, about as long as broad, and rather longer in the distal portion of the arm. The brachials all have rather prominent distal edges.

P<sub>1</sub> slender, evenly tapering, with ten to fifteen short squarish joints; P<sub>2</sub> similar, or rather shorter, with about six joints, of which the third and fourth are much expanded; following pinnules similar to the last; distally the pinnules are moderately slender, somewhat longer than P<sub>1</sub>.

*Color*.—Bright yellow.

*Distribution*.—Ki Islands, northward to the Korean Straits.

*Depth*.—100 to 140 fathoms.

Included species:

*Strotometra hepburniana* (A. H. Clark)

“ *parvipinna* (P. H. Carpenter).

## 21. *Charitometra* A. H. Clark.

The species belonging to this genus as restricted are:

*Charitometra basicurva* (P. H. Carpenter)

“ *incisa* (P. H. Carpenter).

## 22. *Pachylometra* gen. nov.

*Genotype*.—*Antedon distincta* P. H. Carpenter, 1888.

Centro-dorsal a thick disk or a truncated hemisphere, the cirrus sockets arranged in two closely crowded rows, and in usually fairly definite columns, three columns to each radial area; the central column, however, may be wholly or partially absent.

Cirri xx-L (usually xx-xxx), 18-25, large and stout, the component joints subequal, though slightly shorter in the distal portion, where the cirrus is slightly compressed; the most proximal joints are, of course, short; dorsal spines not developed, but the dorsal edge of the distal joints sometimes more or less carinate, and the dorsal distal ends sometimes slightly prominent; opposing spine small, tubercular, or absent; terminal claw about as long as the penultimate joint, stout, moderately curved.

Disk usually fairly completely plated, rarely scantily plated; ambulacra well plated.

Ends of basal rays usually visible as small tubercles in the angles of the calyx; radials concealed, or at most slightly visible in the angles of the calyx over the ends of the basal rays; 1 Br<sub>1</sub> very short, band-like or crescentic, deeply incised by a rounded posterior process from the 1 Br<sub>2</sub>, which rises usually to more or less of a broad rounded tubercle; 1 Br<sub>2</sub> rhombic, more than twice as broad as long, the rounded posterior angle



more or less produced, incising the first costals; II Br usually 4 (3 + 4), more rarely 2; generally both types occur in every specimen, but the former in the majority; III Br, when present, 2 (1 + 2), developed interiorly in 1, 2, 2, 1 order. The I Br, further division series, and lower brachials are in close apposition, and are sharply flattened laterally; they are somewhat convex dorsally, and occasionally so much so as to expose the distal edge of  $P_D$ .

Arms 10 to 33, but usually 20 or over, rounded dorsally, and laterally compressed in the proximal third; first twelve or fourteen brachials oblong, about twice as broad as long, then becoming triangular, nearly as long as broad, and in the terminal portion of the arm obliquely wedge-shaped and longer than broad.

$P_D$  and  $P_1$  slender, composed of twenty to forty short joints;  $P_2$  about the same size, with slightly larger joints; following pinnules with larger joints, some of which are laterally expanded to protect the genital glands; this expansion is never excessive, and is often slight; it is always regular and even, beginning gradually and dying away more gradually toward the distal portion of the pinnule, which last is always delicate. The pinnule following  $P_1$  may remain of the same length as  $P_1$  for some time, may increase slightly in length, or there may be a slight decrease to  $P_3$ , after which they increase again; the distal pinnules are comparatively short, not exceeding  $P_1$  in length, and usually somewhat shorter.

*Color*.—Clear yellow to brownish yellow or yellow-brown; calyx and arm bases to the first syzygy often much darker than the rest of the animal.

*Distribution*.—East London, South Africa, eastward through the Indian Ocean to the Sahul Bank, the Meangis, Kermadec, and Ki Islands, northward to the Philippines and Japan.

*Depth*.—140 to 630 fathoms; most commonly found below 300 fathoms.\*

Included species:

- Pachylometra angusticalyx* (P. H. Carpenter)
- “ *distincta* (P. H. Carpenter)
- “ *flexilis* (P. H. Carpenter)
- “ *inæqualis* (P. H. Carpenter)
- “ *patula* (P. H. Carpenter)
- “ *robusta* (P. H. Carpenter)
- “ *sclateri* (Bell)
- “ *smithi* (A. H. Clark).

### 23. *Chlorometra* gen. nov.

*Genotype*.—*Antedon garrettiana* A. H. Clark, 1907.

Centro-dorsal subconical, moderate or small, the cirrus sockets in one or two more or less definite columns in each radial area.

Cirri xv, 16–18, nearly one-third of the arm length; first three joints

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\*One species is doubtfully recorded from near Kandavu, Fiji, in 255, 610, or 210 fathoms, and from the same locality in 1350 fathoms; the first is too uncertain to be depended upon, the second is so much deeper than the lowest unquestionable record that further evidence is needed before it can be accepted.



short, the remainder about one-third longer than broad, remarkably uniform; later joints somewhat carinate dorsally; opposing spine very small, terminally situated.

Ends of basal rays concealed or more or less prominent in the interradial angles; radials visible all around, moderately long; I Br short and broad, in close apposition and sharply flattened laterally, with low elongated median tubercles on each joint; II Br 2, rarely present; first nine or ten brachials short, discoidal or wedge-shaped, over twice as broad as long, then becoming obliquely wedge-shaped or triangular, as long as broad, gradually becoming wedge-shaped again and longer than broad distally. The lower discoidal brachials have a slightly indicated blunt dorsal keel, the remainder have rather prominent distal ends.

P<sub>1</sub> longer than P<sub>2</sub>, slender, with about twenty approximately square joints; following pinnules somewhat stouter, gradually decreasing in length, then gradually increasing again distally to the length of P<sub>1</sub>. The genital pinnules are slender, with no expansion of the joints.

*Color*.—Light yellow, or yellowish white, slightly tinged with brownish.

*Distribution*.—Meangis Islands, northward to Korea.

*Depth*.—95 to 500 fathoms.

Included species:

*Chlorometra aculeata* (P. H. Carpenter)

“ *garrettiana* (A. H. Clark).

#### 24. *Crinometra* gen. nov.

*Genotype*.—*Comatula brevipinna* Pourtalès, 1868.

This genus is the Caribbean representative of *Pachylometra*, with which it agrees in most of its characters. The arms are ordinarily 20 to 30, the II Br series 4 (3 + 4) or 2, some species usually all 4 (3 + 4) others all 2, but the majority mixed, the III Br series 2 (1 + 2) developed interiorly in 1, 2, 2, 1 order. The whole animal is robust, the calyx and arm bases large and broad, the cirri stout, as in *Pachylometra*. It differs markedly from *Pachylometra*, however, in the great length of the proximal, and shortness of the middle and distal pinnules, and in the very strong carination of the former. The pinnules decrease rapidly in length from P<sub>1</sub> to P<sub>6</sub> or P<sub>7</sub>, the remaining pinnules being not quite half as long as P<sub>1</sub>, the distal pinnules no longer than those in the middle of the arm; the genital pinnules are more abruptly expanded than are those of *Pachylometra*, and the brachials are more strongly overlapping, while a very strong tuberculous ornamentation is usually developed basally.

*Color*.—Yellow, the calyx and arm bases frequently yellow brown; large specimens are more or less brownish.

*Distribution*.—Gulf of Mexico, and northern part of the Caribbean Sea.

*Depth*.—101 to 270 fathoms.\*

Included species:†

*Pachylometra brevipinna* (Portalès)

“ *imbricata* (A. H. Clark).

\* According to Carpenter.

† There are also several additional undescribed species.





Clark, Austin Hobart. 1909. "A revision of the crinoid families Thalassometridae and Himerometridae." *Proceedings of the Biological Society of Washington* 22, 1–22.

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