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It follows, therefore, that the quantity

$$\frac{H^2}{G} = \frac{(ac - b^2)^2}{a^2d - 3abc + 2b^3}$$

is an invariant for the given cubic and its aberrancy curve.

If we seek the common points of intersection of the two cubics, we find on subtracting the equations

$$(ax + b)^3 = 0$$

which shews that the two cubics have only one common point of intersection which is the point of inflexion for both; the coordinates of the point are

$$x = -\frac{b}{a}, \quad y = \frac{G}{a^2}$$

## VI.—*Natural History Notes from H. M. Indian Marine Survey Steamer* 'Investigator,' *Commander* Alfred Carpenter, R. N., D. S. O., *commanding.*—No. 15. *Descriptions of seven additional new Indian Amphipods.*—*By* G. M. Giles, M. B., F. R. C. S., *late Surgeon-Naturalist to the Survey.*

[Received and Read November 6th, 1889.]

(With Plate II.)

Before proceding to the description of the species now described, I have to make a correction in my last paper read on February 1st, 1888.

In that communication, I described, under the name of *Concholestes dentallii*, gen. et sp. nov., a curious corophiid which inhabits deserted dentalium shells; remarking that I believed that such a habit had not beeu previously noted in an amphipod. I find, however, I was in error in this matter, as, while searching for references to species which might be identical with those described in the present paper, I came across a description of a Norwegian species which is certainly congeneric and, like the Indian species, inhabits deserted dentalium shells. Sars (Forh. Vidensk.-Selsk. Christiania, 1882, No. 18, pp. 113, Part VI, fig. 7) describes this species as *Siphonœcetes pallidus*.

I do not see, however, how either Sars' or my species can be included in *Siphonœcetes* without unduly straining Kroyer's definition of the genus in Nat. Tidskr. I, p. 491. In the two species under consideration, the 1st and 2nd gnathopoda, instead of being subequal, present a very marked difference of size; and again, the eighth thoracic appendages are very long, instead of the 6th, 7th, and 8th being "very short." My species too wants the double hook to the single ramus of the last

abdominal appendage, having indeed no rami, and, as far as I can make out, Sars' species agrees in these particulars also.

It appears to me therefore preferable that Sars' species should stand as *Concholestes pallidus* (Sars).

While, however, certainly congeneric, the two species are without doubt specifically distinct, mine differing from *C. pallidus* in the even more marked disproportion between the second and third thoracic appendages, and in the third having a much better developed subchela, which is formidably armed with two strong teeth, as also in having the excessive length of the eighth less marked.

### Melita cotesi, n. sp., Pl. II, Fig. 1.

This species is allied to *M. leonis* and *M. formosa* described by Murdoch, P. U. S. Nat. Mus., VII, pp. 521.

It illustrates the danger of naming a species from what may, at first sight, appear a very prominent peculiarity. In a previous communication, I described a *Melita* which I named *megacheles* on account of the large size of the subchela of the second gnathopod, which appeared larger proportionally than that of any species which I could find described. Our present find, however, out-herods Herod in this particular, and fearing to use any superlative appellation, lest another even more formidably armed should turn up, I name it after Mr. Cotes of the Indian Museum, but for whose kindness in undertaking the wearisome work of searching through references while I was at sea, this series of papers on Indian Amphipoda would have been greatly delayed in appearance.

About 7 mm. long; semitransparent, with minute reddish dots scattered over the whole surface, and an especially large patch on the propodite and basipodite of the second gnathopod.

*Head* small, no larger than an average thoracic segment; eye small, round, placed in the angle between antennules and antennæ.

*Thorax* forms more than half the length of the body; coxal plates rather narrow, especially the hinder ones.

*Abdomen* relatively small, the hinder edge of each segment save the last shewing more or less distinctly three dentations on either side of the middle line.

*Antennules* nearly as long as the head and thorax, the peduncle, the second joint of which is considerably the longest, forming rather the shorter half; appendix three-jointed.

*Antennæ* rather shorter, the peduncle, whose first three joints are very short, having the last two joints so long that the entire peduncle forms at least two-thirds of the length of the organ.

*Maxillipedes* moderately large, subpediform.

The 2nd of the *thoracic appendages* small, barely subchelate. The 3rd of the left side is enormously developed. The propodite alone as long as the first five segments of the thorax and wider than the depth of the body including the coxal plates. The inferior border smooth with one broad lunate projection. The dactylo-podite proportionally large. The appendage of the left side barely subchelate and but little larger than the second appendage. The 4th small, and the 5th almost minute. The 6th, 7th, and 8th large, the seventh being the largest and as long as the head and thorax, while the eighth falls but little short of it.

The *gill plates* are exceptionally large.

The *abdominal appendages* are small, but call for no special remarks, being in every way normal and typical of the genus.

Hab. Andaman Islands, in shallow water.

### Phoxus uncirostratus, n. sp., Pl. II, Fig. 2.

This species was dredged in 5—10 fathoms off the "Seven Pagodas" on the Madras coast on a sandy bottom.

It is about 5 mm. in length and of a uniform dirty white colour.

The *head* is small, the arched and excavated rostrum considerably exceeding the head proper in length. The former is long and pointed, and is bent down at the tip so as to form a distinct hook, a feature in which it appears to differ from all the previously described members of the genus.

The *thorax* is large, forming nearly half the entire body length, and this portion of the body, excluding the coxal plates, is depressed rather than compressed. The first four coxal plates are very large, exceeding their corresponding segments in depth, the fourth being of exceptional size; they, besides being the deepest, are of great width, exceeding in this diameter the length of any two of the thoracic segments; the three hindermost coxal plates, on the other hand, are exceptionally small.

The *abdomen* is of moderate size, its first four segments being of nearly equal length, while the last two are extremely small.

The *telson* is small and cleft, and is furnished with a few fine hairs.

The *antennule* is as long as the head and first thoracic segment together, the peduncle forming rather the shorter portion of the organ. Its first joint is very long and stout, but is almost completely hidden under the excavated lower surface of the rostrum, the remaining two joints of the peduncle being short, and comparatively slight. The flagellum consists of 14—16 short articuli, and is but little longer than

its appendage, which consists of about twelve joints, and almost exactly equals the peduncle in length.

The *antenna* is subequal to the antennule in length, and is quite equally divided into peduncle and flagellum, the first of the five joints of the former being hidden beneath the rostrum.

The *gnathites* are small and weak, the mandibles being quite simple, and armed with a small cutting and a serrated masticatory tubercle; its appendage is two-jointed, and but feebly armed with hairs.

The maxillæ are proportionally somewhat stouter, and have their rami armed with a number of very stout curved spines.

The maxillipedes are of considerable size, and pediform.

The *gnathopoda* are small, not more than twice as long as the depth of their corresponding coxæ; both are of similar form, subchelate, with the palm oblique, and defined by a large triangular process, but the hinder pair is somewhat the larger.

The fourth and fifth *thoracic appendages* are of the usual ambulatory type, are subequal, and but little exceed the gnathopoda in length. The sixth and seventh resemble each other in form, being stoutly built and laterally armed with strong spines; the seventh, however, is the longer, equalling the entire thorax in length, while the sixth is but as long as its first six segments. The eighth is the shortest of the thoracic appendages, and is of peculiar form, its basipodite being expanded into a broad oval plate which projects downwards behind the distal articulation of the appendage, so as almost to reach the level of the point of the dactylopodite.

The first three *abdominal appendages* are rather small, but quite of the usual type. Of the last three, the fifth is the shortest. It and the fourth are armed with numerous stout, almost hooked spines; their rami are nearly equal. The sixth is peculiar in having its outer ramus distinctly two-jointed, while the inner ramus is considerably shorter than the first joint of the outer; both rami are armed with a brush of stout hairs.

Although I carefully dissected the head of one specimen, I could make out no trace of eyes.

### Ampelisca daleyi, n. sp., Pl. II, Fig. 3.

A single specimen of this species was dredged in 7 fathoms, off the Seven Pagodas, on the Madras coast. Unfortunately the specimen was accidentally destroyed, but not before I had made a drawing.

It differs considerably from its congener previously obtained in Indian waters (*A. lepta* from 107 fathoms) in being a larger and much more robust form, in the minuteness of its superior antennæ, and in

the comparative shortness of the limbs, and appears to most nearly resemble *A. australis*, Haswell, from which, however, it differs in the comparative length of the joints of the thoracic appendages.

My specimen was 11 mm. long; of a pale brown colour liberally marked with patches of a deep brown.

The *head* is small and oval, the two pairs of simple eyes being placed respectively opposite the origins of the antennules and antennæ.

The *thorax* forms more than half the body length, its four anterior segments increase progressively in length, but the three hinder are subequal and longer than any of the other segments, thoracic or abdominal. The first four coxal plates are deeper than their corresponding segments, the fourth being the deepest, and also exceptionally broad. The fifth coxal plate has an anterior lobe of moderate depth, and has the hinder border of the posterior lobe subdivided by a notch into two lobules, of which the upper is the smaller.

The *abdomen* forms rather more than one-third of the entire body length, its first three segments are subequal in length, and each is as long as the remaining three together. Their depth is moderate, not exceeding that of the thoracic segments with their attached coxæ.

The *telson* is small, squamiform, and deeply cleft.

The *antennule* is very minute, being barely as long as the head and first thoracic segment; the first joint of the peduncle is moderately stout, but the remaining two joints can barely be distinguished from the articuli of the flagellum, especially the third, which but little exceeds them in length. The peduncle forms about one-third of the entire length of the organ.

The *antenna* is more than twice as long as the antennule. Its first two joints are short and moderately stout, while the distal three are very long and slender, the third being the longest and the fifth the shortest; the flagellum is composed of a number of long slender articuli, but was broken off, so that the entire length could not be ascertained.

The *gnathites* are completely hidden beneath the opaque first coxal plate.

The second and third *thoracic appendages* (gnathopoda) are small, and have the propodite merely dilated without forming a true subchela. The third is somewhat the larger. The fourth and fifth are of similar form, but the fifth is a little the larger, the fourth being as long as the head and first four thoracic segments. In both, the meropodites are peculiarly long and the carpopodites very short. The last three are remarkable in having their dactylopodites curved backwards, instead of forwards, as is usually the case. The sixth and seventh have the

basipodites much enlarged, especially the latter. Their meropodites are short and their dactylopodites remarkably long and slender, the seventh, which is the longer, is subequal in length to the fourth. The eighth is peculiar in having its posterior border provided with a flat plate which reaches considerably below the articulation with the ischiopodite; the ischio- mero- and carpopodites are subequal, the propodite comparatively long and slender, and the dactylopodite minute.

The first three *abdominal appendages* are of the usual type, and the last three equally biramous and of progressively smaller size, the sixth being proportionally smaller than in nearly any member of the genus, except *A. propinqua*, Boeck., which differs, however, in a number of other points.

LYSIANASSA WOOD-MASONI, n. sp., Pl. II, Fig. 4.

This species was dredged from a coral sand bottom in 17 fathoms in Macpherson's Strait, Andaman Islands.

The animal is 8 mm. long, semitransparent, and colourless, with the exception of the eye, which is of a deep purple tint.

The *head* is small, having, in profile, an irregularly pentagonal outline. The large compound eye occupies the greater part of its anterior half, and the border articulating with the antennule is marked by two notches with a tubercle between them.

The *thorax* forms rather more than half the entire body length, its segments increasing regularly in dimensions from before backwards. All the coxal plates are deep, the fourth, however, markedly exceeding the others. The lower borders of the last three present a notch for the articulation of their corresponding basipodite.

The first three *abdominal segments* are large and subequal; the fourth, nearly as long, but much less in depth; and the last two very small.

The *telson* is laminar and notched.

The *antennule* is as long as the first four thoracic appendages. Its peduncle forms but a third of its length, the first joint being large and having its lower border produced distally into a sort of process, while the last two are extremely short. There is a very minute appendage consisting of four articuli. The first joint of the flagellum is much larger than those that succeed it, approaching the first joint of the peduncle in length. It bears on its lower border a brush of long silky hairs.

The *antenna* is as long as the thorax: its peduncle forms but one-fourth of its length, and consists of two subequal, very short basal, and three, also subequal, somewhat longer, distal joints. The flagellum is made up of a large number of short articuli.

A single specimen only having been obtained, the *gnathites* could not be closelyexamined.

The 2nd of the *thoracic appendages* is very small, not as long as the antennule, and imperfectly subchelate. The 3rd is nearly twice as long as the 2nd, but is scarcely at all stouter, and is provided with an obliquely palmed subchela, the dactylopodite being minute and much curved. The 4th and 5th are ordinary ambulatory legs, moderately stout and subequal to each other, and equal to the 3rd in length. The 6th is barely as long as the 1st gnathopod, and is remarkable for its basipodite, which is of nearly circular outline and very deeply serrate on its posterior border. The 7th is nearly as long as the 2nd gnathopod, and its basipodite has a tendency to the same form as that of the 6th. Its basipodite is rather broader than long, but its borders are quite smooth. The distal joints of each of the last three thoracic appendages are armed with closely set, sharp, short spines.

There is nothing remarkable about the first three *abdominal appendages*, and the last three are equally biramous, armed both on propodite and rami with short, stout spines. The 4th is the longest of the three, and the 5th, the smallest, while the 6th is remarkable for its short, stout, almost spherical propodite, and for the size of its rami, which are larger in all respects than those of the preceding abdominal appendages.

### Anonyx indicus, n. sp., Pl. II, Fig. 5.

The present species was dredged in 5—10 fathoms off the Seven Pagodas, Madras, on the same occasion as *Phoxus uncirostratus*. In colour it is of a pale earthy white, and it measures about 5 mm. in length.

The *head* is small and oblong, its anterior upper part carrying the large compound eyes.

The *thorax* and *abdomen* are subequal in length, but the abdomen is much the deeper and stouter.

The *thoracic segments* increase somewhat in length and depth from before backwards, but are everywhere narrow. The first four coxal plates are large, the fourth being the largest, and are each nearly twice as deep as their corresponding segments. The last three are markedly smaller and are much narrower than their segments.

The first three *abdominal segments* are large in all dimensions; the fourth is as long as the seventh thoracic segment, and the last two very short indeed.

The *telson* is laminar and double.

The *antennule* is short, the peduncle, which forms the larger half of its length, being barely as long as the head. Its first joint is

nearly spherical, and exceeds a good deal in length either of the remaining two pieces, of which the distal is somewhat the smaller. The flagellum is composed of 12 or 14 short articuli, and its appendage, which is about half its length, of a smaller number of slighter, but otherwise closely similar, pieces.

The *antenna* is slighter but somewhat longer than the antennule. In the female, the flagellum but little exceeds that of the antennule, but, in the male, it often forms a lash of considerable, but variable, length.

The *gnathites* are small and feebly armed, the mandibles having but a simple chisel-like cutting plate, and a two-jointed appendage, and the maxillepedes being small and not pediform.

The first of the *gnathopods* is short, stout, and subchelate, the palm being but somewhat oblique and the dactylopodite short and strong. The second is much longer than the first, but is very slender. Its propodite resembles that of the first in general outlines, but the dactylopodite is so small that it might easily be overlooked, forming only a small extremely hooked claw projecting from the middle of the distal extremity of the propodite. It was only, however, after a repeated and very troublesome examination that I succeeded in getting a clearly uninjured specimen of the appendage to project beyond the coxal plates. In length the second gnathopod almost equals the first six segments of the thorax.

The fourth and fifth *thoracic appendages* are subequal to each other, but shorter and slenderer than any of the other appendages; they are quite of the usual ambulatory type. The sixth, seventh, and eighth closely resemble each other in form, but differ considerably in length, all three having the posterior border of their basipodites provided with very broad and strong buttress-like plates, and the remaining articulations broad and strong; while, however, the eighth is as long as the head and thorax, the seventh is about two-thirds and the sixth a little over one-half this length.

The first three *abdominal appendages* are of medium size and of the usual type. The last three are biramous, the rami of each being equal. The fourth is much larger than the fifth, the sixth still smaller, the entire length of the last only equalling that of the propodite of the fourth.

### Parapleustes pictus, n. sp., Pl. II, Fig. 6.

This species appears to answer best to the genus *Parapleustes* proposed by Buchholz (Zweite deutsche nord polar Fahrt, 1866—1870, p. 337) for a species (much resembling the present) which was dredged off

the east coast of Greenland. Our species was dredged in 30 fathoms, in Manner's Straits, Andaman Islands. Found crawling upon a *Pennatula*, the pink and white colours of which are almost exactly imitated in the amphipod.

The distribution of the colouring varies in different specimens. In one, the head and body as far as the fourth thoracic segment and the entire abdomen were pink, while the remaining middle zone of the body was of an opaque glistening white. In another, the distribution was almost reversed, the pink forming a broad band in the middle of the animal. In a third it was almost confined to the hinder part of the body. In all, however, the tints were the same, the pink parts having a uniform transparent character diversified by minute opaque spots of a darker tint, while the white was remarkable for its dead opacity.

The largest specimen measured about 7 mm., the smallest little more than 2 mm.

The *head* is rather long and cylindrical, its anterior half being almost completely covered by the eyes, which are of a pink colour, deeper than any other part of the body.

The remainder of the length of the body is almost exactly divided between *thorax* and *abdomen*, the latter, however, being much the deeper. The segments of the thorax are of nearly equal length throughout, but the more posterior are much the deeper. In the abdomen the third segment is considerably the longest, while the second exceeds the rest in depth, as well as all, save the third, in length.

The fourth abdominal segment is nearly as long as the first, but very narrow, while the last two are very small in all dimensions.

The *telson* is simple and squamiform, equalling in length the protopodite of the sixth abdominal appendage. It is armed with a few fine hairs.

The first four *coxal plates* are very deep and broad, the fourth being the largest, the last three comparatively small. Spence Bate (Ann. Nat. Hist. Ser. 3, Vol. I, p. 362, 1858), in his definition of the genus, states that the "Coxa of the second pair of pereiopoda" (fourth coxal plate) is "very deeply excavated upon the upper part of the posterior margin to receive the coxæ of the third pair of periopoda." This is, however, more apparent than real, at any rate in the present species; the appearance being the optical expression of the fact that the fifth coxal plate overlaps the fourth as well as the sixth, the upper part of the former not being remarkably excavated, but narrowing uniformly to its articulation with the pleuron of its segment.

The *antennule* has a three-jointed peduncle not exceeding the head and first thoracic appendage in length. The first joint is somewhat

longer than the second, while the third is very short. The flagella of both antennæ vary somewhat in length in various specimens, the number of articuli, however, remaining about the same, the increase being gained by an elongation of all the pieces. In the specimen figured the flagellum but slightly exceeds the peduncle in length, but in others it was considerably longer. There is no appendage to the flagellum.

The first three joints of the peduncle of the *antenna* are very short and, except the end of the third, hidden beneath the excavated cephalon. The last two joints equal in length the first two of the antennule. The flagellum also varies in length, but is always about a third shorter than that of the antennule.

The *gnathites* were not dissected out, but a mandibular appendage was distinguished, and it could be seen that the maxillipeds are small but pediform.

The two pairs of *gnathopoda* closely resemble each other alike in size and form. Both are feebly subchelate, with the palm oblique, the propodite forming about one-third of the entire length exclusive of the dactylopodite. Their carpo- mero- and ischiopodites are shorter than their breadth, while the basipodites form nearly a half of the length of the appendage exclusive of the dactylopodite.

The 4th and 5th *thoracic appendages* are of the usual ambulatory type, are subequal to each other, and, in length, to the gnathopoda, each being as long as the head and first five thoracic somites. They are very slender and closely resemble each other in all particulars. The 6th, 7th, and 8th closely resemble each other in all points save in size, each being stoutly built and having the basipodite provided with a strong buttress-like plate along the posterior border. The 7th and 8th are subequal, being as long as the thorax and the first two abdominal segments, but the sixth is about one-sixth shorter.

The first three *abdominal appendages* are small, but quite of the usual type. The last three are biramous, with equal rami; the fourth being the longest and the sixth the shortest of the three. The fourth and fifth have their rami armed with stout spines, while the sixth has only fine hairs.

### Cyrtophium andamanense, n. sp., Pl. II, Fig. 7.

Taken in the surface net at Port Mouat, Andaman Islands. Only a single specimen was obtained and this was swimming free, nor could any trace of a tube he found; probably this had got destroyed by the wash of the tide.

The animal is about 3 mm. long and of a dirty white colour, sparely sprinkled with minute dark brown spots.

Its nearest allies appear to be *C. orientale*, Dana, and *C. cristatum*, Thomson, from the former of which it differs in its superior antenna being proportionally smaller, in the comparative shortness of the dactylopodite of the second gnathopod, and in the details of the armature of the hinder pleopoda; and from the latter in both pairs of antennæ being proportionally smaller and in wanting any marked crest on the hinder part of the thorax.

The *head* is subquadrate, rather deeper than long, its length forming only one-eighth of the entire body length.

The small *eye* is placed on a prominence opposite the origin of the antenna.

The *thorax* is long, forming three-sevenths of the entire length. Its segments are long and slender, the anterior and posterior ones being larger than those at its mid length, and the fifth segment exceptionally small.

The *abdomen* is small and, like the thorax, slender. Its first three segments are rather shorter than average thoracic segments. The fourth, though narrow, is longer than the others, while the fifth and sixth are extremely small.

The *telson* is small and laminar, and is armed with a few short, stiff hairs.

The *antennule* is fully as long as the head and first four thoracic segments. More than three-fourths of its length are formed by the peduncle; the first joint of which, though very stout, is shorter than either of its two other joints, while the second is considerably the longest. There is a minute secondary appendage, consisting of four short joints. The flagellum is only as long as the first joint of the peduncle; it too consists of four joints, the first of which forms quite half its length. The entire inferior surface of the appendage is armed with closely placed long hairs.

The *antenna* is as long as the head, thorax, and first two abdominal segments; it is very stoutly built and adapted for climbing. The first three joints of its peduncle are short and together as long as the flagellum, while the two distal joints are subequal, and form two-thirds of the entire length of the organ. The flagellum consists of two stout long joints, which are armed with strong hooked spines. The entire lower surface of the peduncle being furnished with long stiff hairs, like those on the superior antenna. Its last joint is armed with two pairs of stout, hooked spines, and by a hooked terminal nail.

The *gnathites* could not be closely examined, but it could be seen that the mandibular appendage is large and clawed, and that the maxilliped is exceptionally large and pediform.

The first of the *gnathopods* is small, being no longer than the first two joints of the peduncle of the superior antenna; nearly half its length is made up by the basipodite. The articulation between the ischiopodite and meropodite is very oblique, and the appendage appears to consist of but five pieces, owing probably to the dactylopodite being fused with the propodite, the subchela being formed between these and the dilated carpopodite. The second is very much larger than the first, being nearly as long as the head and entire thorax; it, however, resembles it closely in general form, and like it is composed of but five pieces.

The fourth and fifth *thoracic appendages* are subequal and exactly similar, and have the distal extremities of their articuli dilated so as to admit of very free flexion, but are otherwise of the usual ambulatory type. In length they nearly equal the first six thoracic segments. The sixth, seventh, and eighth much resemble the fourth and fifth but are stouter built, and, while the sixth is only subequal to them, the seventh is as long as the antennule, and the eighth as long as the antennule except the last joint of the flagellum.

The first three *abdominal appendages*, though of the usual type, are exceptionally small. The fourth is as long as the last joint of the peduncle of the antennule, its propodite forming half its length. Its rami are unequal, the outer being hardly more than half the length of the inner, both rami and peduncle being armed with stout spines. The fifth is only two-thirds the length of the fourth, but is stouter; like the fifth, its rami are unequal and spinose. The sixth is reduced to a rudimentary tubercle, armed with one or two spines.

## EXPLANATION OF PLATE II.

Fig. 1. *Melita cotesi*, × 20; 1*a*, 2nd and 3rd right thoracic appendages, × 10.

Fig. 2. *Phoxus uncirostratus*, × 15; 2*a*, mandible and appendage, × 30; 2*b*, the maxillæ, × 120; 2*c*, the 6th abdominal appendage, × 30.

Fig. 3. *Ampelisca daleyi*, × 7.

Fig. 4. *Lysianassa wood-masoni*, × 10.

Fig. 5. *Anonyx indicus*, × 12·5; 5*a*, distal joints of 3rd thoracic appendage, × 50.

Fig. 6. *Parapleustes pictus*, × 15.

Fig. 7. *Cyrtophium andamanense*, × 25; 7*a*, flagellum of inferior antennæ, × 30; 7*b*, last three abdominal segments with appendages, × 30.

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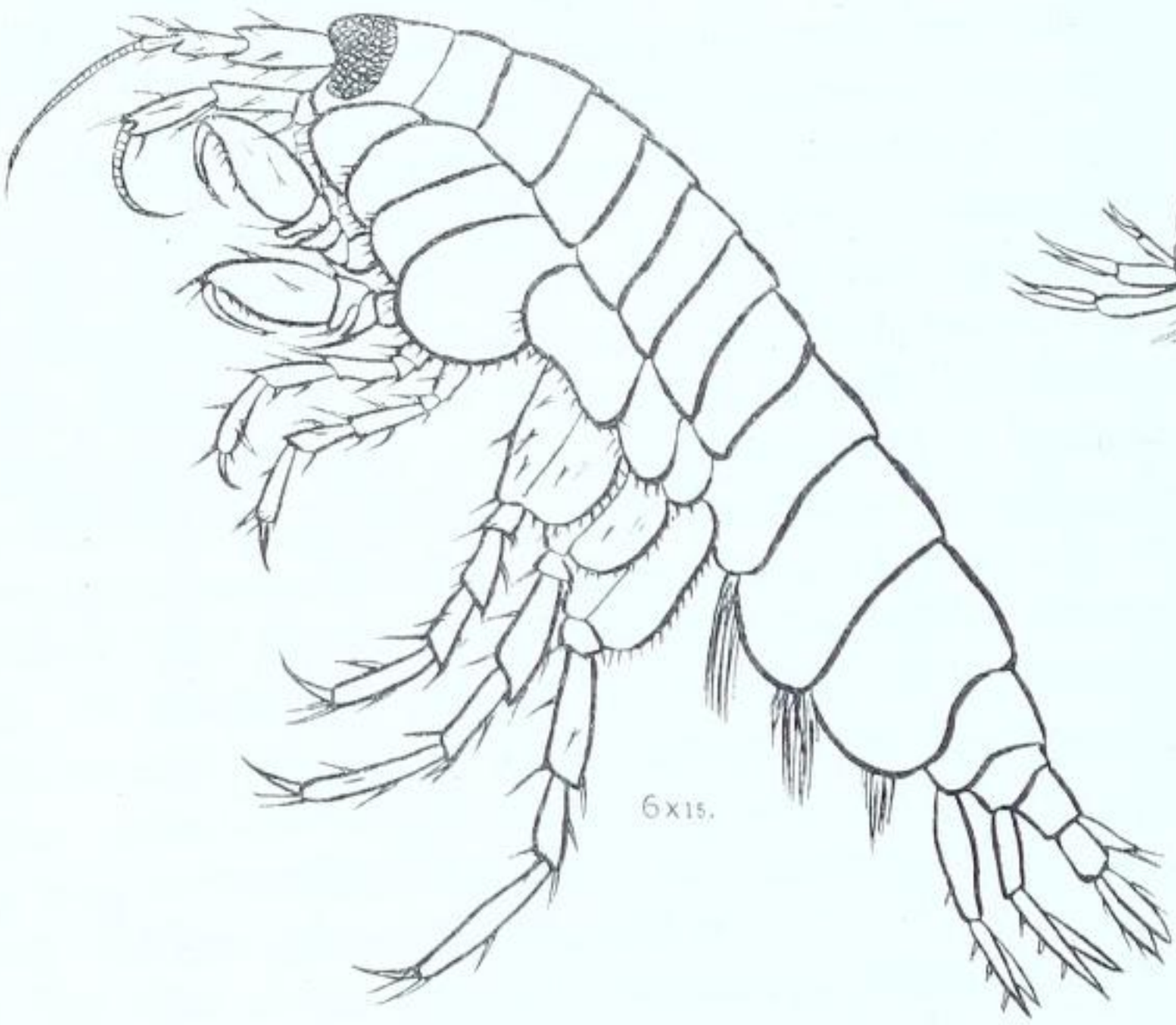

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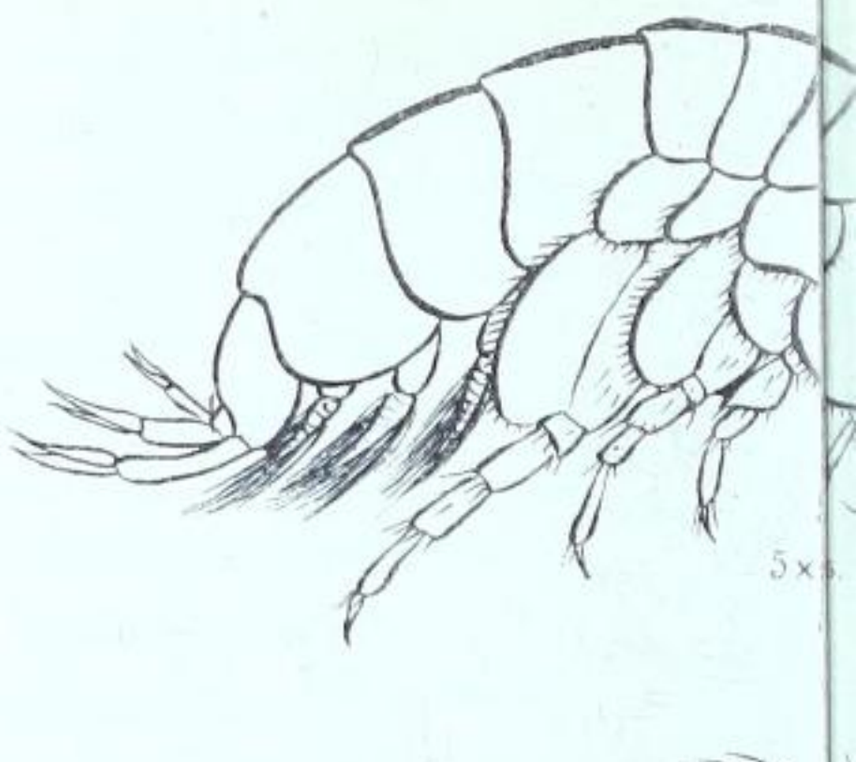

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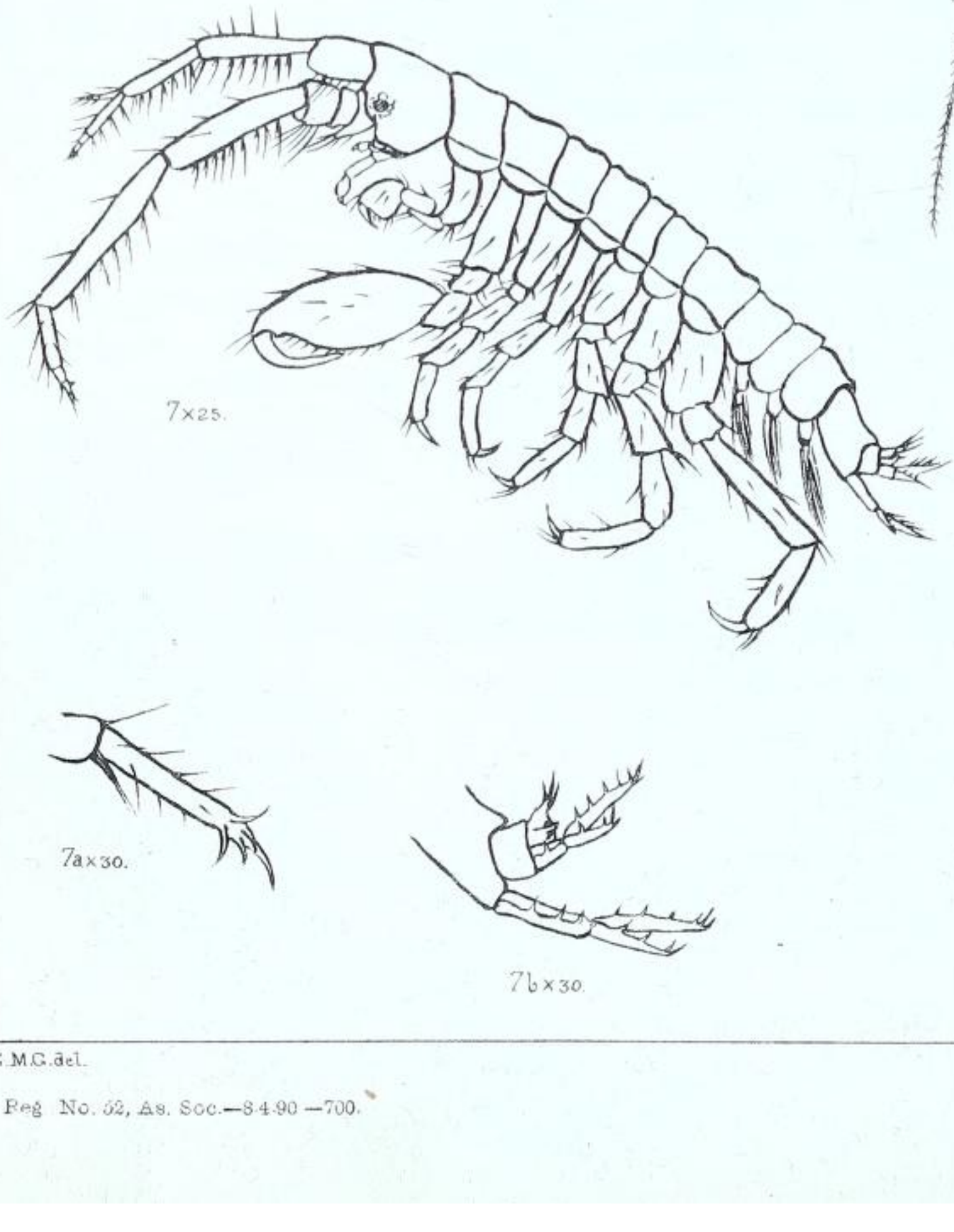

7x25.



7a x 30.



7b x 30.

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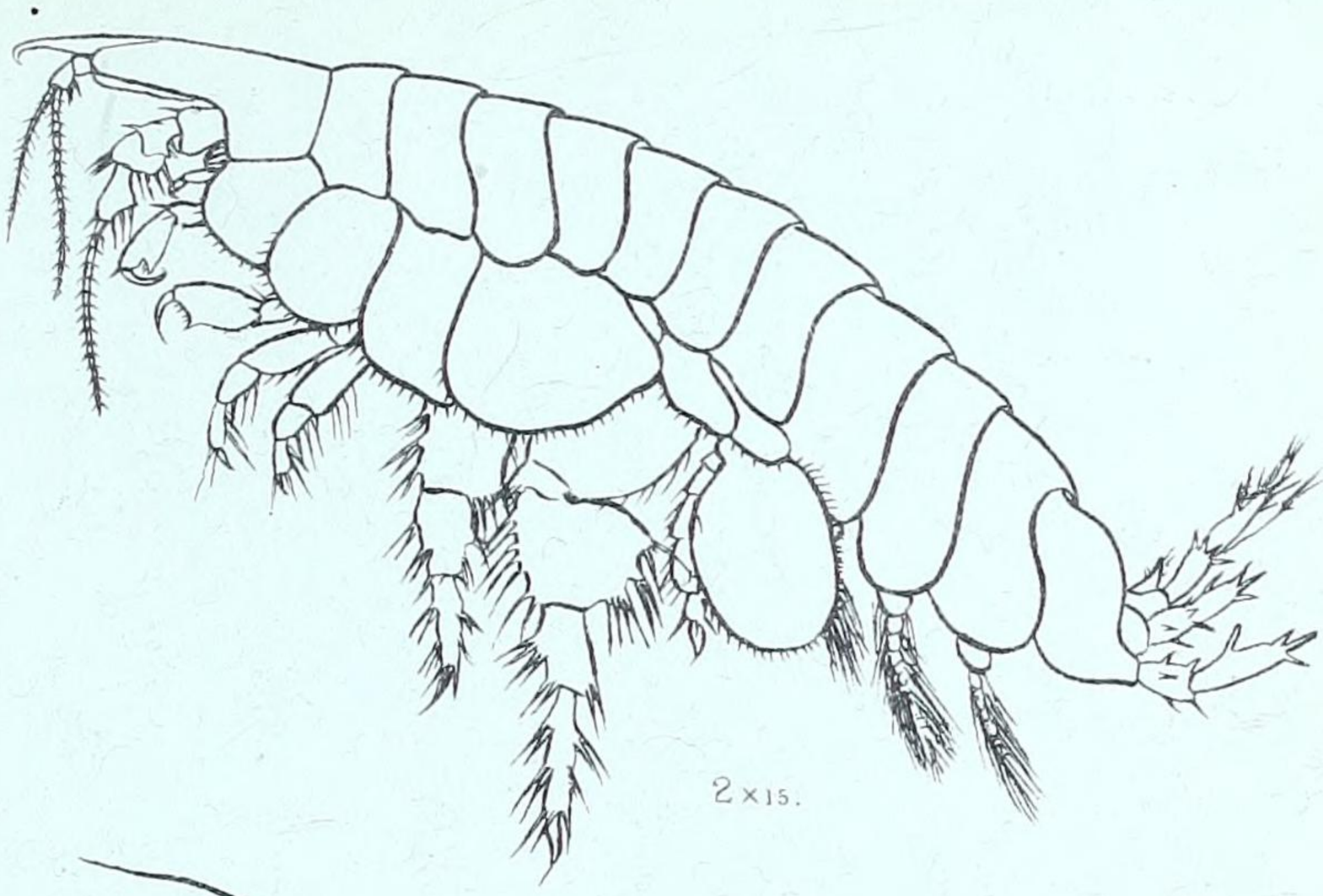

2 x 15.

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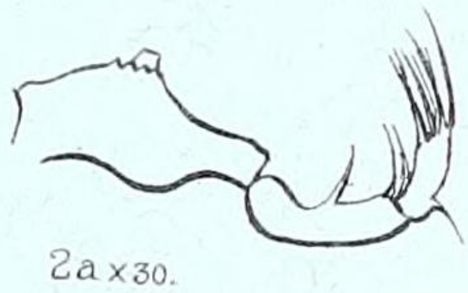

2a x 30.

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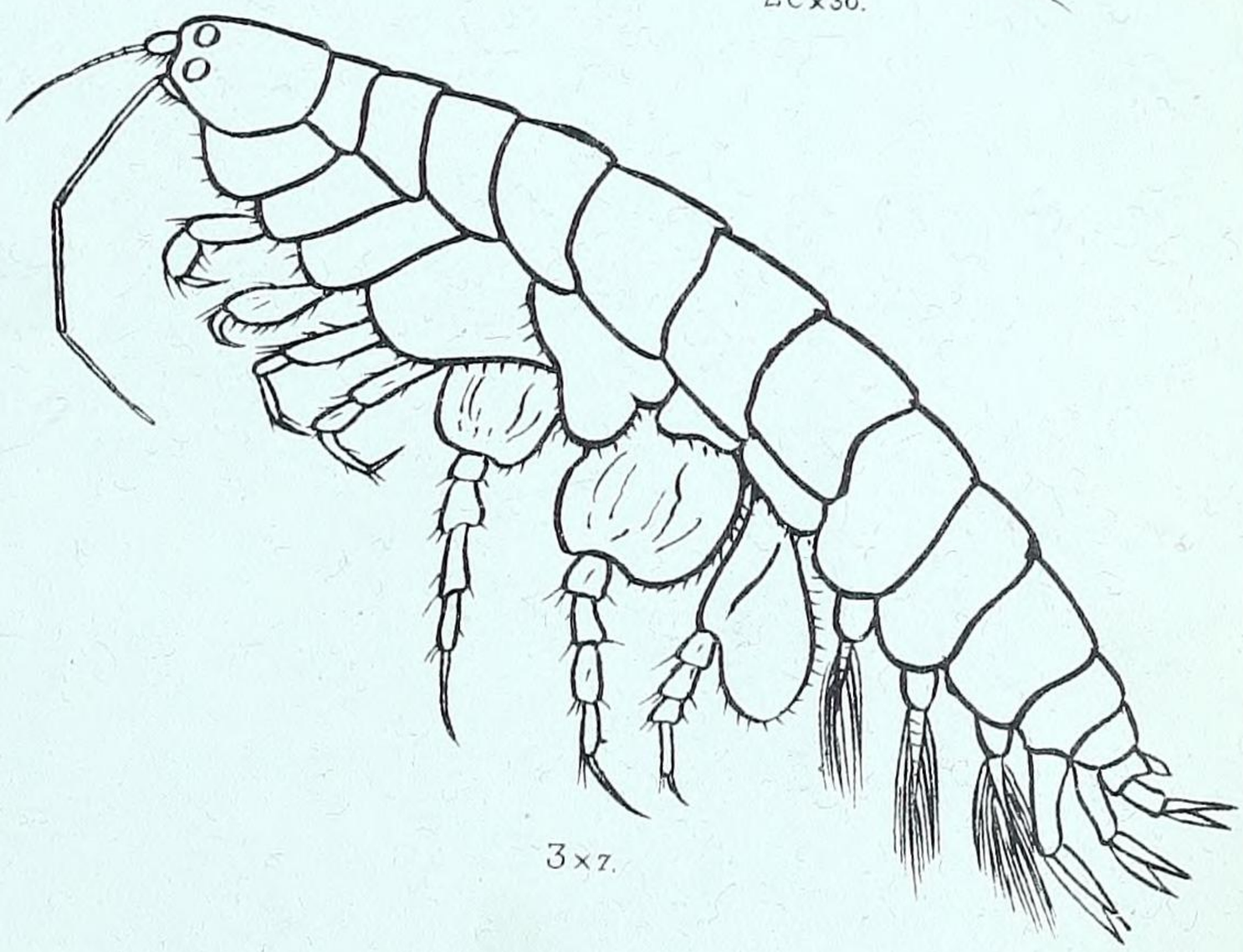

3 x 7.

10.

Photo-litho., S. I. O., Calcutta.

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NATURAL HISTORY

**The following text is generated from uncorrected OCR.**

**[Begin Page: Page 63]**



It follows, therefore, that the quantity

W (ac - J2)3

O aH-3abc+2b*

is an invariant for the given cubic and its aberrancy curve.

If we seek the common points of intersection of the two cubics,

we find on subtracting the equations

(ace + bf> =

which shews that the two cubics have only one common point of intersection which is the point of inflexion for both ; the coordinates of the point are

b G

® - - --, y--k

a a*

VI. — Natural History Notes from H. M. Indian Marine Survey Steamer 'Investigator,' Commander Alfred Carpenter, R. N, D. S. O., commanding. — No. 15. Descriptions of seven additional neiv Indian Amphipods. — By G. M. Giles, M. B., F. R. C. S., late Surgeon-Natu-

ralist to the Survey.

[Received and Read November 6th, 1889.]

(With Plate II.)

Before proceding to the description of the species now described, I have to make a correction in my last paper read on February 1st, 1888.

In that communication, I described, under the name of Ooncholestes dentallii, gen. et sp. nov., a curious corophiid which inhabits deserted dentalium shells ; remarking that I believed that such a habit had not beeu previously noted in an amphipod. I find, however, I was in eri'or in this matter, as, while searching for references to species which might be identical with those described in the present paper, I came across a description of a Norwegian species which is certainly congeneric and, like the Indian species, inhabits deserted dentalium shells. Sars (Forh. Vidensk.-Selsk. Christiania, 1882, No. 18, pp. 113, Part VI, fig. 7) describes this species as Siphonoecetes pallidas.

I do not see, however, how either Sars' or my species can be included in Siphonoecetes without unduly straining Kroyer's definition of the genus in Nat. Tidskr. I, p. 491. In the two species under consideration, the 1st and 2nd gnathopoda, instead of being subequal, present a very marked difference of size ; and again, the eighth thoracic appendages are very long, instead of the 6th, 7th, and 8th being " very short." My species too wants the double hook to the single ramus of the last

abdominal appendage, having indeed no rami, and, as far as I can make out, Sars' species agrees in these particulars also.

It appears to me therefore preferable that Sars' species should stand as Goncholestes pallidus (Sars).

"While, however, certainly congeneric, the two species are without doubt specifically distinct, mine differing from 0. pallidus in the even more marked disproportion between the second and third thoracic appendages, and in the third having a much better developed subchela, "which is formidably armed with two strong teeth, as also in having the excessive length of the eighth less marked.

Melita cotesi, n. sp., PL II, Fig. 1.

This species is allied to M. leonis and M. formosa described by Murdoch, P. IT. S. Nat. Mus., VII, pp. 521.

It illustrates the danger of naming a species from what may, at first sight, appear a very prominent peculiarity. In a previous communication, I described a Melita which I named megacheles on account of the large size of the subchela of the second gnathopod, which appeared larger proportionally than that of any species which I could find described. Our present find, however, out-herods Herod in this

particular, and fearing to use any superlative appellation, lest another even more formidably armed should turn up, I name it after Mr. Cotes of the Indian Museum, but for whose kindness in undertaking the wearisome work of searching through references while I was at sea, this series of papers on Indian Amphipoda would have been greatly delayed in appearance.

About 7 mm. long ; semitransparent, with minute reddish dots scattered over the whole surface, and an especially large patch on the propodite and basipodite of the second gnathopod.

Head small, no larger than an average thoracic segment ; eye small, round, placed in the angle between antennules and antennas.

Thorax forms more than half the length of the body ; coxal plates rather narrow, especially the hinder ones.

Abdomen relatively small, the hinder edge of each segment save the last shewing more or less distinctly three dentations on either side of the middle line.

Antennules nearly as long as the head and thorax, the peduncle, the second joint of which is considerably the longest, forming rather the shorter half ; appendix three-jointed.

Antennce rather shorter, the peduncle, whose first three joints are very short, having the last two joints so long that the entire peduncle forms at least two-thirds of the length of the organ.

**[Begin Page: Page 65]**



Maxillipedes moderately large, subpediform.

The 2nd of the thoracic appendages small, barely subchelate. The 3rd of the left side is enormously developed. The propodite alone as long as the first five segments of the thorax and wider than the depth of the body including the coxal plates. The inferior border smooth with one broad lunate projection. The dactylo-podite proportionally large. The appendage of the left side barely subchelate and but little larger than the second appendage. The 4th small, and the 5th almost minute. The 6th, 7th, and 8th large, the seventh being the largest and as long as the head and thorax, while the eighth falls but little short of it.

The gill plates are exceptionally large.

The abdominal appendages are small, but call for no special remarks, being in every way normal and typical of the genus.

Hab. Andaman Islands, in shallow water.

Phoxus uncirostratus, n. sp., PL II, Pig. 2.

This species was dredged in 5 — 10 fathoms off the " Seven Pagodas " on the Madras coast on a sandy bottom.

It is about 5 mm. in length and of a uniform dirty white colour.

The head is small, the arched and excavated rostrum considerably exceeding the head proper in length. The former is long and pointed, and is bent down at the tip so as to form a distinct hook, a feature in which it appears to differ from all the previously described members of the genus.

The thorax is large, forming nearly half the entire body length, and this portion of the body, excluding the coxal plates, is depressed rather than compressed. The first four coxal plates are very large, exceeding their corresponding segments in depth, the fourth being of exceptional size ; they, besides being the deepest, are of great width, exceeding in this diameter the length of any two of the thoracic segments ; the three hindermost coxal plates, on the other hand, are exceptionally small.

The abdomen is of moderate size, its first four segments being of nearly equal length, while the last two are extremely small.

The telson is small and cleft, and is furnished with a few fine hairs.

The antennule is as long as the head and first thoracic segment together, the peduncle forming rather the shorter portion of the organ. Its first joint is very long and stout, but is almost completely hidden under the excavated lower surface of the rostrum, the remaining two joints of the peduncle being short, and comparatively slight. The

flagellum consists of 14 — 16 short articuli, and is but little longer than

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**[Begin Page: Page 66]**



its appendage, which consists of about twelve joints, and almost exactly equals the peduncle in length.

The antenna is subequal to the antennule in length, and is quite equally divided into peduncle and flagellum, the first of the five joints of the former being hidden beneath the rostrum.

The gnathites are small and weak, the mandibles being quite simple, and armed with a small cutting and a serrated masticatory tubercle ; its appendage is two-jointed, and but feebly armed with hairs.

The maxillae are proportionally somewhat stouter, and have their rami armed with a number of very stout curved spines.

The maxillipecles are of considerable size, and pediform.

The gnatlwpoda are small, not more than twice as long as the depth of their corresponding coxas ; both are of similar form, subchelate, with the palm oblique, and defined by a large triangular process, but the hinder pair is somewhat the larger.

The fourth and fifth thoracic appendages are of the usual ambulatory type, are subequal, and but little exceed the gnathopodain length. The sixth and seventh resemble each other in form, being stoutly built and laterally armed with strong spines ; the seventh, however, is the longer, equalling the entii'e thorax in length, while the sixth is but as long as its first six segments. The eighth is the shortest of the thoracic appendages, and is of peculiar form, its basipodite being expanded into a broad oval plate which projects downwards behind the distal articulation of the appendage, so as almost to reach the level of the point of the dactylopodite.

The first three abdominal appendages are rather small, but quite of the usual type. Of the last three, the fifth is the shortest. It and the fourth are armed with numerous stout, almost hooked spines ; their rami are nearly equal. The sixth is peculiar in having its outer ramus distinctly two-jointed, while the inner ramus is considerably shorter than the first joint of the outer ; both rami are armed with a brush of stout hairs.

Although I carefully dissected the head of one specimen, I could make out no trace of eyes.

Ampelisca daleyi, n. sp., PI. II, Fig. 3.

A single specimen of this species was dredged in 7 fathoms, off the Seven Pagodas, on the Madras coast. Unfortunately the specimen was accidentally destroyed, but not before I had made a di-awing.

It differs considerably from its congener previously obtained in

Indian waters {A. lepta from 107 fathoms) in being a larger and much more robust form, in the minuteness of its superior antennae, and in

**[Begin Page: Page 67]**



the comparative shortness of the limbs, and appears to most nearly resemble A. australis, Haswell, from which, however, it differs in the comparative length of the joints of the thoracic appendages.

My specimen was 11 mm. long ; of a pale brown colour liberally marked with patches of a deep brown.

The head is small and oval, the two pairs of simple eyes being placed respectively opposite the origins of the autennules and antennae.

The thorax forms more than half the body length, its four anterior segments increase progressively in length, but the three hinder are subequal and longer than any of the other segments, thoracic or abdominal. The first four coxal plates are deeper than their corresponding segments, the fourth being the deepest, and also exceptionally broad. The fifth coxal plate has an anterior lobe of moderate depth, and has the hinder border of the posterior lobe subdivided by a notch into two lobules, of which the upper is the smaller.

The abdomen forms rather more than one-third of the entire body length, its first three segments are subequal in length, and each is as

long as the remaining three together. Their depth is moderate, not exceeding that of the thoracic segments with their attached coxse.

The telson is small, squamiform, and deeply cleft.

The antennule is very minute, being barely as long as the head and first thoracic segment ; the first joint of the peduncle is moderately stout, but the remaining two joints can barely be distinguished from the articuli of the flagellum, especially the third, which but little exceeds them in length. The peduncle forms about one-third of the entire length of the organ.

The antenna is more than twice as long as the antennule. Its first two joints are short and moderately stout, while the distal three are very long and slender, the third being the longest and the fifth the shortest ; the flagellum is composed of a number of long slender articuli, but was broken off, so that the entire length could not be ascertained.

The gnathites are completely hidden beneath the opaque first coxal plate.

The second and third thoracic appendages (gnathopoda) are small, and have the propodite merely dilated without forming a true subchela. The third is somewhat the larger. The fourth and fifth are of similar form, but the fifth is a little the larger, the fourth being as long as the head and first four thoracic segments. In both, the meropodites are peculiarly long and the carpopodites very short. The last three

are remarkable in having their dactylopodites curved backwards, instead of forwards, as is usually the case. The sixth and seventh have the

**[Begin Page: Page 68]**



basipodites much enlarged, especially the latter. Their meropodites are short and their dactylopodites remarkably long and slender, the seventh, which is the longer, is subequal in length to the fourth. The eighth is peculiar in having its posterior border provided with a flat plate which reaches considerably below the articulation with the ischiopodite ; the ischio- mero- and carpopodites are subequal, the propodite comparatively long and slender, and the dactylopodite minute.

The first three abdominal appendages are of the usual type, and the last three equally biramous and of progressively smaller size, the sixth being proportionally smaller than in nearly any member of the genus, except A. propingua, Boeck., which differs, however, in a number of other points.

Lysianassa wood-masoni, n. sp., PL II, Fig. 4.

This species was dredged from a coral sand bottom in 17 fathoms in Macpherson's Strait, Andaman Islands.

The animal is 8 mm. long, semitransparent, and colourless, with the exception of the eye, which is of a deep purple tint.

The head is small, having, in profile, an irregularly pentagonal outline. The large compound eye occupies the greater part of its anterior half, and the border articulating with the antennule is marked by two notches with a tubercle between them.

The thorax forms rather more than half the entire body length, its segments increasing regularly in dimensions from before backwards. All the coxal plates are deep, the fourth, however, markedly exceeding the others. The lower borders of the last three present a notch for the articulation of their corresponding basipodite.

The first three abdominal segments are large and subequal ; the fourth, nearly as long, but much less in depth ; and the last two very email.

The telson is laminar and notched.

The antennule is as long as the first four thoracic appendages.
Its peduncle forms but a third of its length, the first joint being large and having its lower border produced distally into a sort of process, while the last two are extremely short. There is a very minute appendage consisting of four articuli. The first joint of the flagellum is much larger than those that succeed it, approaching the first joint of the peduncle in length. It bears on its lower border a brush of long silky hairs.

The antenna is as long as the thorax : its peduncle forms but one-fourth of its length, and consists of two subequal, very short basal,

and three, also subequal, somewhat longer, distal joints. The flagellum is made up of a large number of short articuli.

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A single specimen only having been obtained, the gnathites could not be closelyexamined.

The 2nd of the thoracic appendages is very small, not as long as the antennule, and imperfectly subchelate. The 3rd is nearly twice as long as the 2nd, but is scarcely at all stouter, and is provided with an obliquely palmed subchela, the dactylopodite being minute and much curved. The 4th and 5th are ordinary ambulatory legs, moderately stout and subequal to each other, and equal to the 3rd in length. The 6th is barely as long as the 1st gnathopod, and is remarkable for its basipodite, which is of nearly circular outline and very deeply serrate on its posterior border. The 7th is nearly as long as the 2nd gnathopod, and its basipodite has a tendency to the same form as that of the 6th. Its basipodite is rather broader than long, but its borders are quite smooth. The distal joints of each of the last three thoracic appendages are armed with closely set, sharp, short spines.

There is nothing remarkable about the first three abdominal appendages, and the last three are equally biramous, armed both on propodite and rami with short, stout spines. The 4th is the longest of the three, and the 5th, the smallest, while the 6th is remarkable for its short,

stout, almost spherical propodite, and for the size of its rami, which are larger in all respects than those of the preceding abdominal appendages.

Anonts indicus, n. sp., PI. II, Fig. 5.

The present species was dredged in 5 — 10 fathoms off the Seven Pagodas, Madras, on the same occasion as Phoxus uncirostratus. In colour it is of a pale earthy white, and it measures about 5 mm. in length.

The head is small and oblong, its anterior upper part carrying the large compound eyes.

The thorax and abdomen are subequal in length, but the abdomen is much the deeper and stouter.

The thoracic segments increase somewhat in length and depth from before backwards, but are everywhere narrow. The first four coxal plates are large, the fourth being the largest, and are each nearly twice as deep as their corresponding segments. The last three are markedly smaller and are much narrower than their segments.

The first three abdominal segments are large in all dimensions ; the fourth is as long as the seventh thoi'acic segment, and the last two very short indeed.

The telson is laminar and double.

The antennule is short, the peduncle, which forms the larger half of its length, being barely as long as the head. Its first joint is

**[Begin Page: Page 70]**



nearly spherical, and exceeds a good deal in length either of the remaining two pieces, of which the distal is somewhat the smaller. The flagellum is composed of 12 or 14 short articuli, and its appendage, which is abont half its length, of a smaller number of slighter, but otherwise closely similar, pieces.

The antenna is slighter but somewhat longer than the antennule. In the female, the nagellum but little exceeds that of the antennule, but, in the male, it often forms a lash of considerable, but variable, length.

The gnathites are small and feebly armed, the mandibles having but a simple chisel-like cutting plate, and a two-jointed appendage, and the maxillepedes being small and not pediform.

The first of the gnathopods is short, stout, and subchelate, the palm being but somewhat oblique and the dactylopodite short and strong. The second is much longer than the first, but is very slender. Its propodite resembles that of the first in general outlines, but the dactylopodite is so small that it might easily be overlooked, forming only a small extremely hooked claw projecting from the middle of the

distal extremity of the propodite. It was only, however, after a repeated and very troublesome examination that I succeeded in getting a clearly uninjured specimen of the appendage to project beyond the coxal plates. In length the second gnathopod almost equals the first six segments of the thorax.

The fourth and fifth thoracic appendages are subequal to each other, but shorter and slenderer than any of the other appendages ; they are quite of the usual ambulatory type. The sixth, seventh, and eighth closely resemble each other in form, but differ considerably in length, all three having the posterior border of their basipodites provided with very broad and strong buttress-like plates, and the remaining articulations broad and strong ; while, however, the eighth is as long as the head and thorax, the seventh is about two-thirds and the sixth a little over one-half this length.

The first three abdominal appendages are of medium size and of the usual type. The last three are biramous, the rami of each being equal. The fourth is much larger than the fifth, the sixth still smaller, the entire length of the last only equalling that of the propodite of the fourth.

Parapleustes picttjs, n. sp., PI. II, Fig. 6.

This species appears to answer best to the genus Parapleustes proposed by Buchholz (Zweite deutsche nord polar Fahrt, 1866 — 1870, p. 337) for a species (much resembling the present) which was dredged off

the east coast of Greenland. Our species was dredged in 30 fathoms, in Manner's Straits, Andaman Islands. Found crawling upon a Pennatula, the pink and white colours of which are almost exactly imitated in the amphipod.

The distribution of the colouring varies in different specimens. In one, the head and body as far as the fourth thoracic segment and the entire abdomen were pink, while the remaining middle zone of the body was of an opaque glistening white. In another, the distribution was almost reversed, the pink forming a broad band in the middle of the animal. In a third it was almost confined to the hinder part of the body. In all, however, the tints were the same, the pink parts having a uniform transparent character diversified by minute opaque spots of a darker tint, while the white was remarkable for its dead opacity.

The largest specimen measured about 7 mm., the smallest little more than 2 mm.

The head is rather long and cylindrical, its anterior half being almost completely covered by the eyes, which are of a pink colour, deeper than any other part of the body.

The remainder of the length of the body is almost exactly divided between thorax and abdomen, the latter, however, being much the

deepei*. The segments of the thorax are of nearly equal length throughout, but the more posterior are much the deeper. In the abdomen the third segment is considerably the longest, while the second exceeds the rest in depth, as well as all, save the third, in length.

The fourth abdominal segment is nearly as long as the first, but very narrow, while the last two are very small in all dimensions.

The telson is simple and squamiform, equalling in length the protopodite of the sixth abdominal appendage. It is armed with a few fine hairs.

The first four coxal plates are very deep and broad, the fourth being the largest, the last three comparatively small. Spence Bate (Ann. Nat. Hist. Ser. 3, Vol. I, p. 362, 1858;, in his definition of the gemis, states that the " Coxa of the second pair of pereiopoda " (fourth coxal plate) is " very deeply excavated upon the upper part of the posterior margin to receive the coxas of the third pair of periopoda." This is however, moi'e apparent than real, at any rate in the present species ; the appearance being the optical expression of the fact that the fifth coxal plate overlaps the fourth as well as the sixth, the upper part of the former not being remarkably excavated, but narrowing uniformly to its articulation with the pleuron of its segment.

The antennule has a three-jointed peduncle not exceeding the head and first thoracic appendage in length. The first joint is somewhat

longer than the second, while the third is very short. The flagella of both antennae vary somewhat in length in various specimens, the number of articuli, however, remaining about the same, the increase being gained by an elongation of all the pieces. In the specimen figured the flagellum but slightly exceeds the peduncle in length, but in others it was considerably longer. There is no appendage to the flagellum.

The first three joints of the peduncle of the antenna are very short and, except the end of the third, hidden beneath the excavated cephalon. The last two joints equal in length the first two of the antennule. The flagellum also vaines in length, but is always about a third shorter than that of the antenuule.

The gnathites were not dissected out, but a mandibular appendage was distinguished, and it could be seen that the maxillipeds are small but pediform.

The two pairs of gnathopoda closely resemble each other alike in size and form. Both are feebly subchelate, with the palm oblique, the propodite forming about one-third of the entire length exclusive of the dactylopodite. Their carpo- mero- and ischiopodites are shorter than their breadth, while the basipodites form nearly a half of the length of the appendage exclusive of the dactylopodite.

The 4th and 5th thoracic appendages are of the usual ambulatory

type, are subequal to each other, and, in length, to the gnathopoda, each being as long as the head and first five thoracic somites. They are very slender and closely resemble each other in all particulars. The 6th, 7th, and 8th closely resemble each other in all points save in size, each being stoutly built and having the basipodite provided with a strong buttress-like plate along the posterior border. The 7th and 8th are subequal, being as long as the thorax and the first two abdominal segments, but the sixth is about one-sixth shorter.

The first three abdominal appendages are small, but quite of the usual type. The last three are biramous, with equal rami ; the fourth being the longest and the sixth the shortest of the three. The fourth and fifth have their rami armed with stout spines, while the sixth has only fine hairs.

Ctetophium andamanense, n. sp., Pl. II, Fig. 7.

Taken in the surface net at Port Mouat, Andaman Islands. Only a single specimen was obtained and this was swimming free, nor could any trace of a tube he found ; probably this had got destroyed by the wash of the tide.

The animal is about 3 mm. long and of a dirty white colour, sparely sprinkled with minute dark brown spots.

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Its nearest allies appear to be 0. orientate, Dana, and 0. cristatum, Thomson, from the former of which it differs in its superior antenna being proportionally smaller, in the comparative shortness of the dactylopodite of the second gnathopod, and in the details of the armature of the hinder pleopoda ; and from the latter in both pairs of antennas being proportionally smaller and in wanting any marked crest on the hinder part of the thorax.

The head is subquadrate, rather deeper than long, its length forming only one-eighth of the entire body length.

The small etje is placed on a prominence opposite the origin of the antenna.

The thorax is long, forming three-sevenths of the entire length. Its segments are long and slender, the anterior and posterior ones being larger than those at its mid length, and the fifth segment exceptionally small.

The abdomen is small and, like the thorax, slender. Its first three segments are rather shorter than average thoracic segments. The fourth, though narrow, is longer than the others, while the fifth and sixth are extremely small.

The telson is small and laminar, and is armed with a few short, stiff hairs.

The antennule is fully as long as the head and first four thoracic

segments. More than three-fourths of its length are formed by the peduncle ; the first joint of which, though very stout, is shorter than either of its two other joints, while the second is considerably the longest. There is a minute secondary appendage, consisting of four short joints. The flagelluin is only as long as the first joint of the peduncle ; it too consists of four joints, the first of which forms quite half its length. The entire inferior sui'face of the appendage is armed with closely placed long hairs.

The antenna is as long as the head, thorax, and first two abdominal segments ; it is very stoutly built and adapted for climbing. The first three joints of its peduncle are short and together as long as the fiagellum, while the two distal joints are subequal, and form two-thirds of the entire length of the organ. The fiagellum consists of two stout long joints, which are armed with strong hooked spines. The entire lower surface of the peduncle being furnished with long stiff hairs, like those on the superior antenna. Its last joint is armed with two paira of stout, hooked spines, and by a hooked terminal nail.

The gnathites could not be closely examined, but it could be seen that the mandibular appendage is large and clawed, and that the maxilliped is exceptionally large and pediform.



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The first of the gnathopods is small, being no longer than the first two joints of the peduncle of the superior antenna ; nearly half its length is made up by the basipodite. The articulation between the ischiopodite and meropodite is very oblique, and the appendage appeal's to consist of but five pieces, owing probably to the dactylopodite being fused with the propodite, the subchela being formed between these and the dilated carpopodite. The second is very much larger thau the first, being nearly as long as the head and entire thorax ; it, however, resembles it closely in general form, and like it is composed of but five pieces.

The fourth and fifth thoracic appendages are subequal and exactly similar, and have the distal extremities of their articuli dilated so as to admit of very free flexion, but are otherwise of the usual ambulatory type. In length they nearly equal the first six thoracic segments. The sixth, seventh, and eighth much resemble the fourth and fifth but are stouter built, and, while the sixth is only subequal to them, the seventh is as long as the antennule, and the eighth as long as the antemiule except the last joint of the flagellum.

The first three abdominal appendages, though of the usual type, are exceptionally small. The fourth is as long as the last joint of the peduncle of the antennule, its propodite forming half its length. Its rami are unequal, the outer being hardly more than half the length of the inner, both rami and peduncle being armed with stout - spines. The fifth is only two-thirds the length of the fourth, but is stouter ; like the fifth, its rami are unequal and spinose. The sixth is reduced to a rudimentary tubercle, armed with one or two spines.

EXPLANATION OF PLATE II.

Fig. 1. Melita cotesi, x 20 ; la, 2nd and 3rd right thoracic appendages, x 10.

Fig. 2. Phoxus uncirostratus, x 15 ; 2a, mandible and appendage, x 30 ; 26, the maxilla?, x ] 20 ; 2c, the Gth abdominal appendage, x 30.

Fig. 3. Ampelisca daleyi, x 7.

Fig. 4. Lysianassa tvood-masoni, x 10.

Fig. 5. Anonyx indicus, x 12'5 ; 5a, distal joints of 3rd thoracic appendage, x 50.

Fig. G. Parapleustes pictus, x 15.

Fig. 7. Cyrtophium andamanense, x 25 ; 7 a, flagellum of inferior antenna?, x 30 ; 7b, last three abdominal segments with appendages, x 30.

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