VII.—*Natural History Notes from H. M.'s Indian Marine Survey Steamer* 'Investigator,' *Commander* Alfred Carpenter, R. N., D. S. O., *Commanding. No.* 9. *Further Notes on the* Amphipoda *of Indian Waters.*—*By* G. M. Giles, M. B., F. R. C. S., *Surgeon-Naturalist to the Marine Survey.*

[Received May 5th, 1887 ;—Read February 1st, 1888.]

(With Plates VI.—XII.)

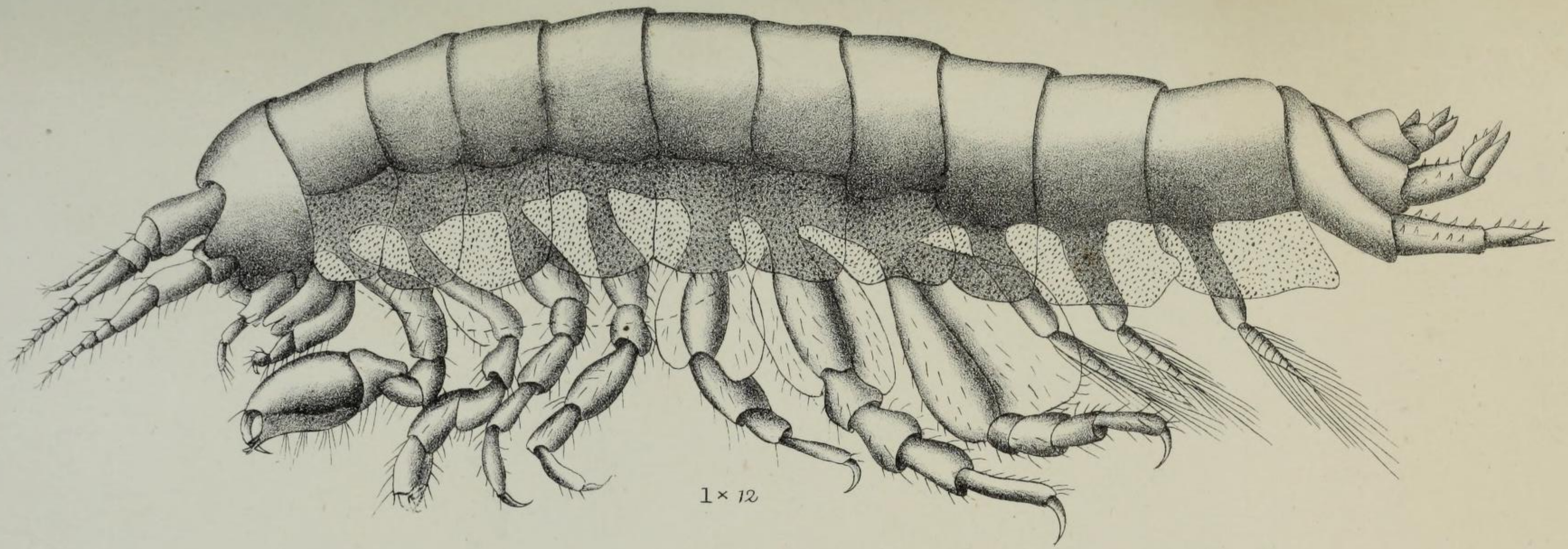
How little the Amphipoda of the Bay of Bengal have been hitherto worked may be judged from the fact that every species I have as yet examined appears to be new to science. Indeed, with the single exception of a fresh-water species, *Gammarus fluviatilis*, which I met with in a mountain lake (the Pandar) at an elevation of 11,000 feet in the Hindu-Kush range, and of the doubtful case of *Amphithoe indica*, M.-Edw., described in the present paper, I have yet to find a described Indian form.

The group having been thus hitherto neglected in India, it appears a good plan to set about the description of the species as they come to hand, more especially as, on account of their minuteness and fragility, they are best examined in the living state, a work which can only be carried out on boardship.

On this account the species are described provisionally in the order in which they come to hand, the work of arranging them systematically being left to some future time when sufficient material shall have been collected. I will now proceed to describe the species met with since my last contribution to this Journal.

1. Anonyx amaurus, n. sp., Pl. VI., Fig. 1.

This form is interesting on account of its having, as far as I can make out, no traces whatever of eyes. It was trawled at a depth of 1300 fathoms off the Coast of Burmah in Lat. 16° 44′ 45″ N., Long. 95° 34′ 30″ E.; bottom temperature 36°. Although this station is over 40 miles from the nearest shore, the bottom appears to consist largely of water-logged drift wood, and other shore material, amongst which was a number of the fruits of a plant which, Dr. King of the Royal Botanical Garden, Calcutta, informs me, are probably those of *Baringtonia racemosa.* The abundant albuminous material of the seed is still comparatively fresh and sound. On breaking open one of these, I found two specimens of our species; and another seed yielded a third specimen. All three are females and the egg-pouches of two contained ova. The animal is, for an amphipod, remarkably broad in proportion to its depth, the pleura being narrow, while the coxal plates are of considerable depth.



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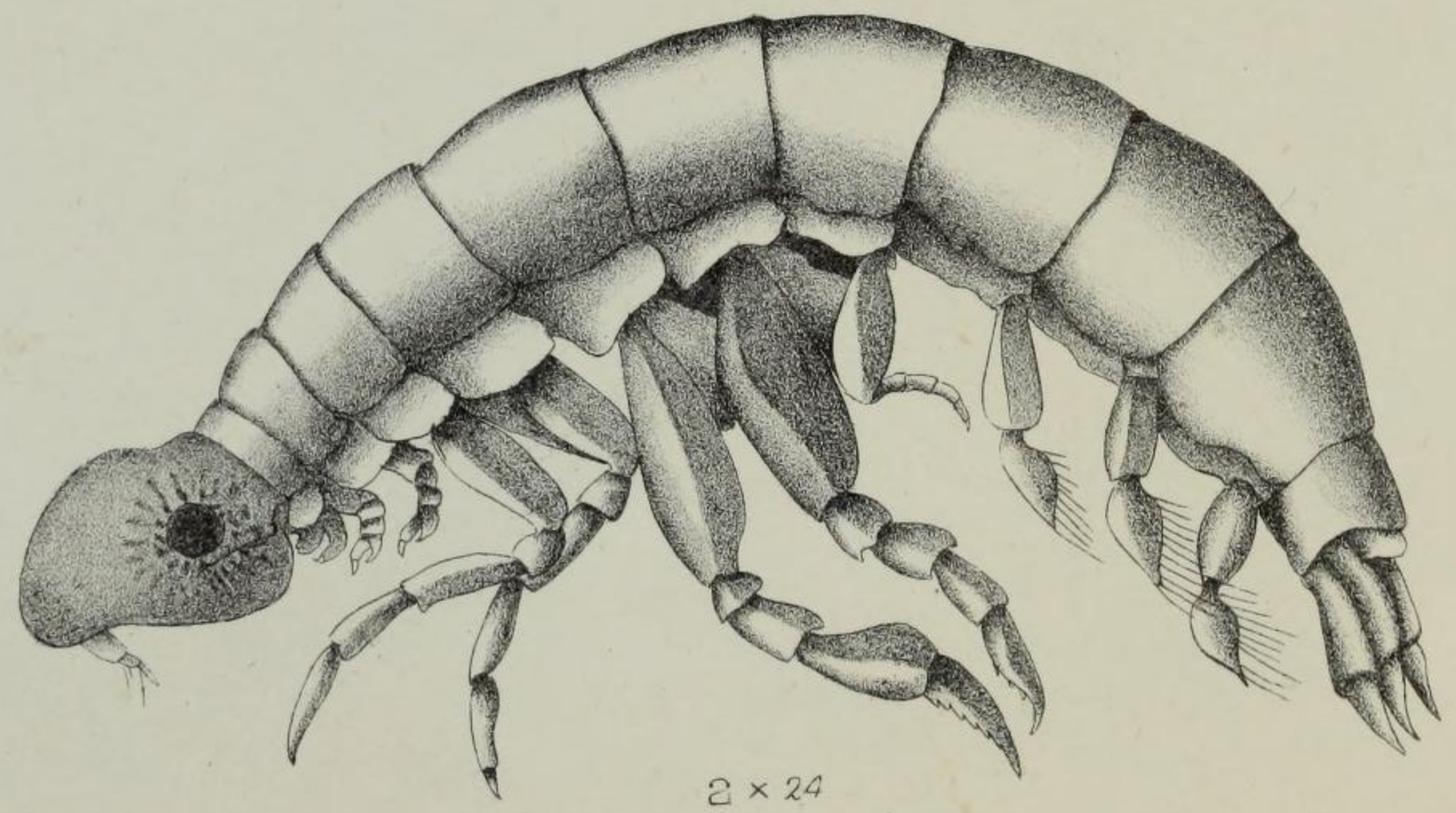

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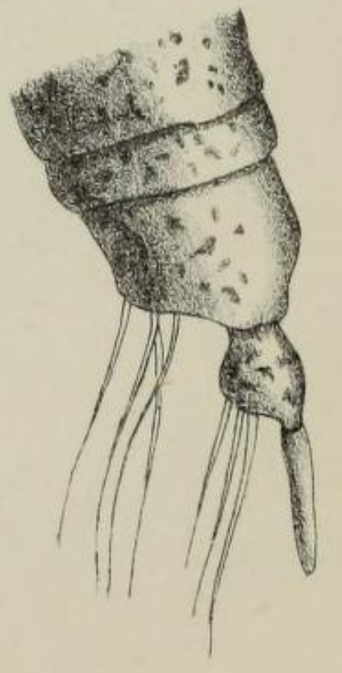

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G.M.Giles, del.
Parker & Coward, lith.

West, Newman & Co imp.

1. ANONYX AMAURUS.
3, 4. ELSIA INDICA.

5x19.

6x50.

12x12.

9x50.

7x10.

1x11

4x40.

8x10.

11x40.

10x50.

3x40.

2x11.

G.M.GILES, del.

1 × 20

2 × 40

7 × 40

8 × 100

4 × 200

5 × 200

6 × 40

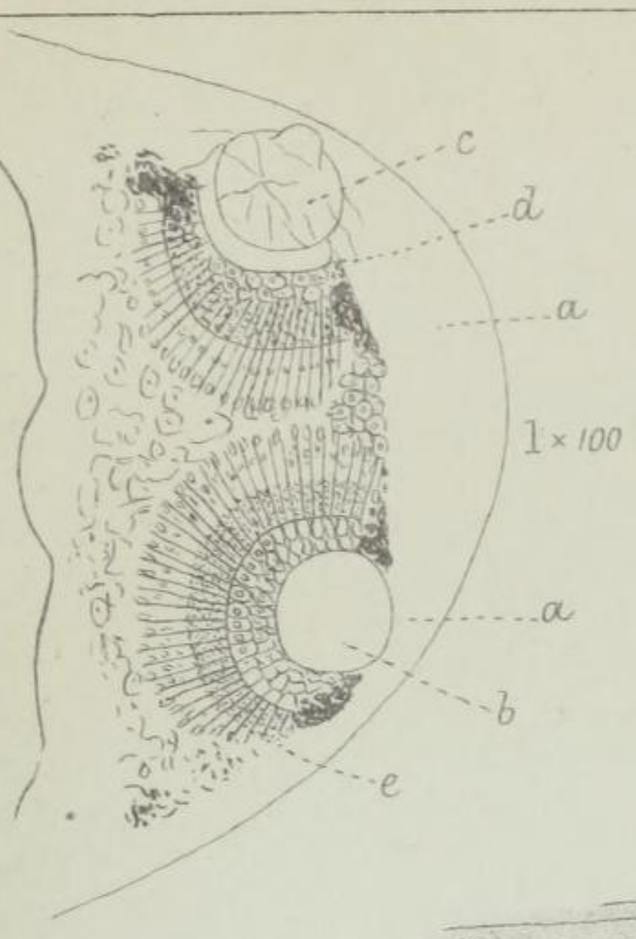
3 × 40

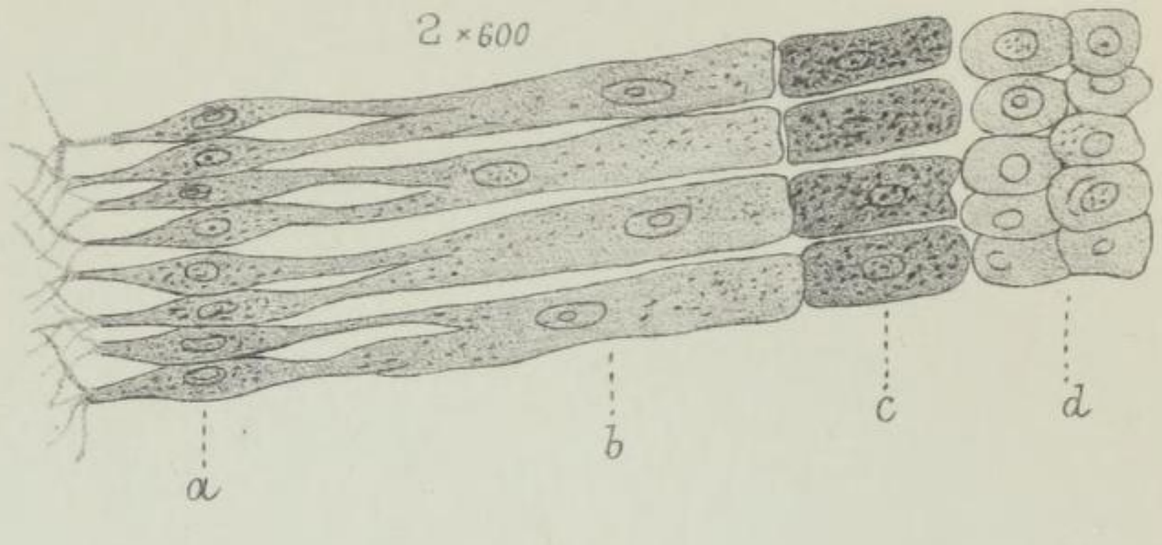
10 × 100

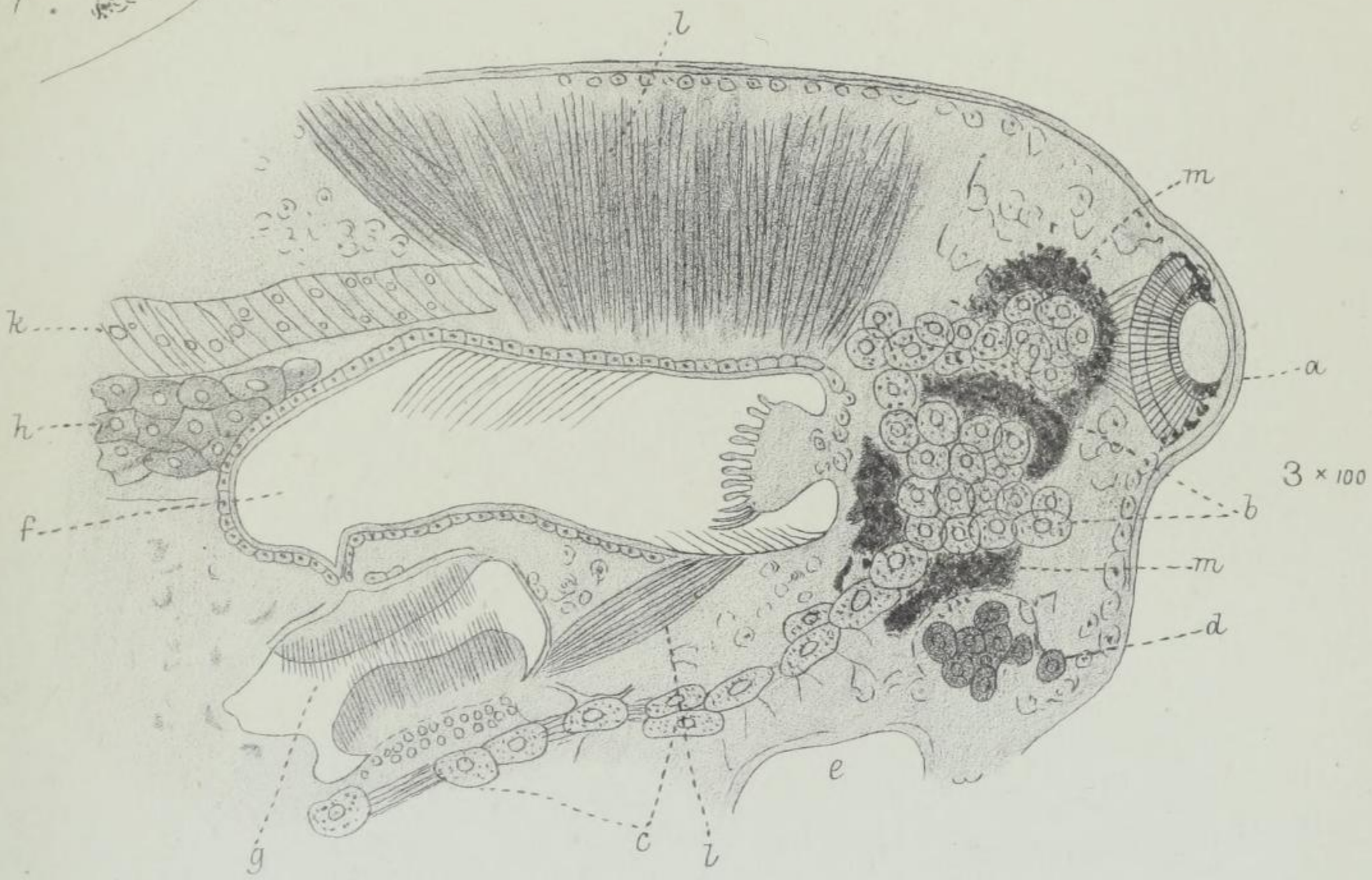
9 × 100

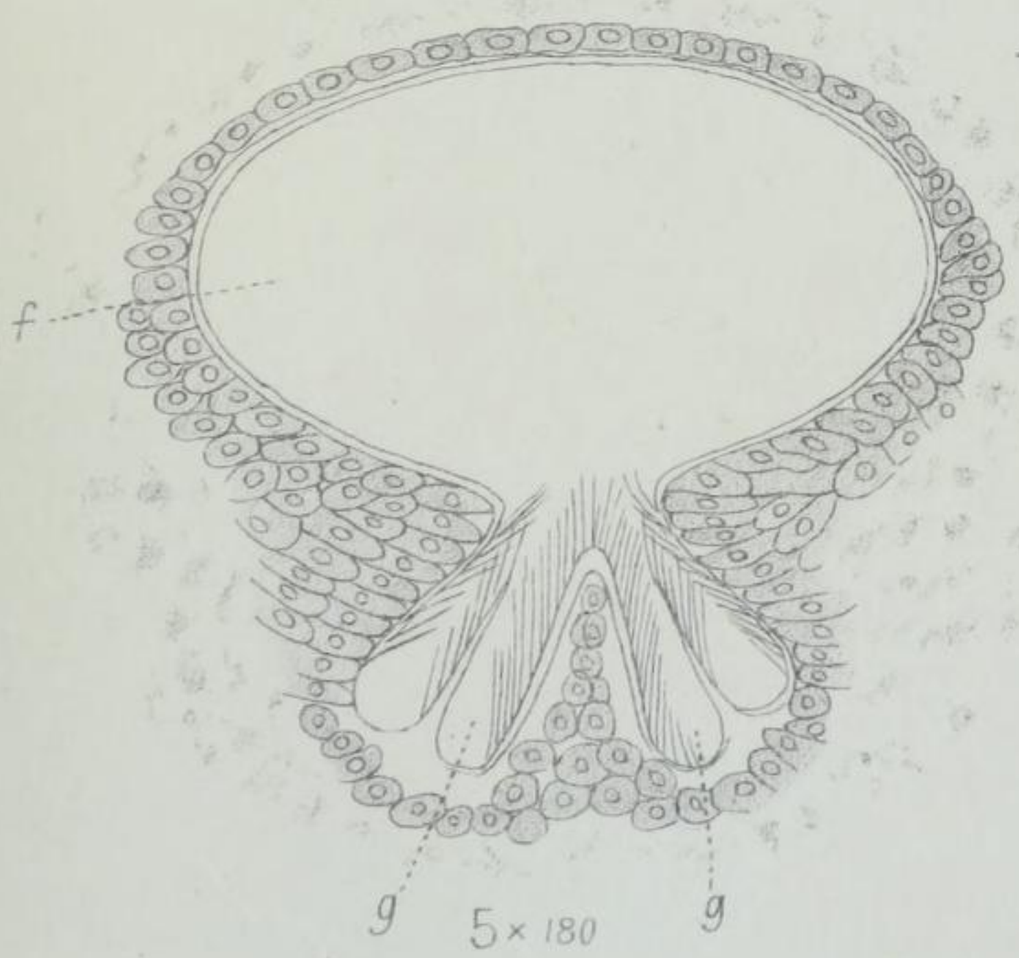
G.M. Giles, del.
Parker & Coward, lith.

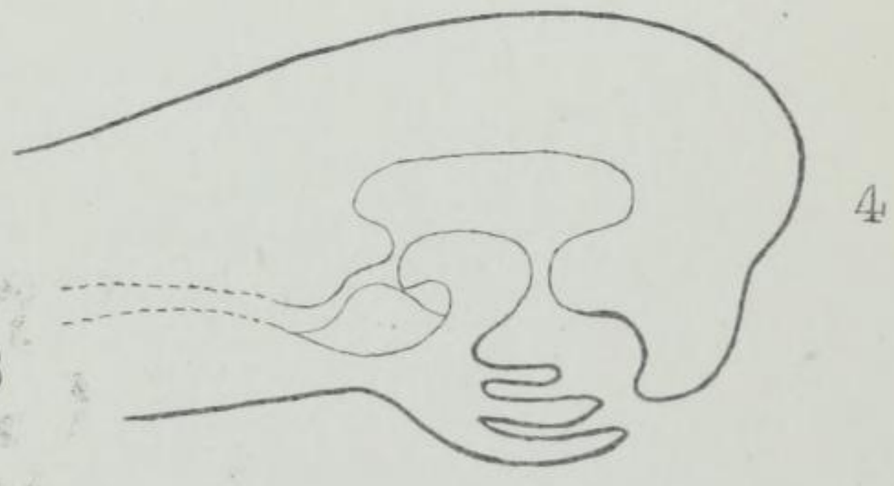
West, Newman & C° imp.

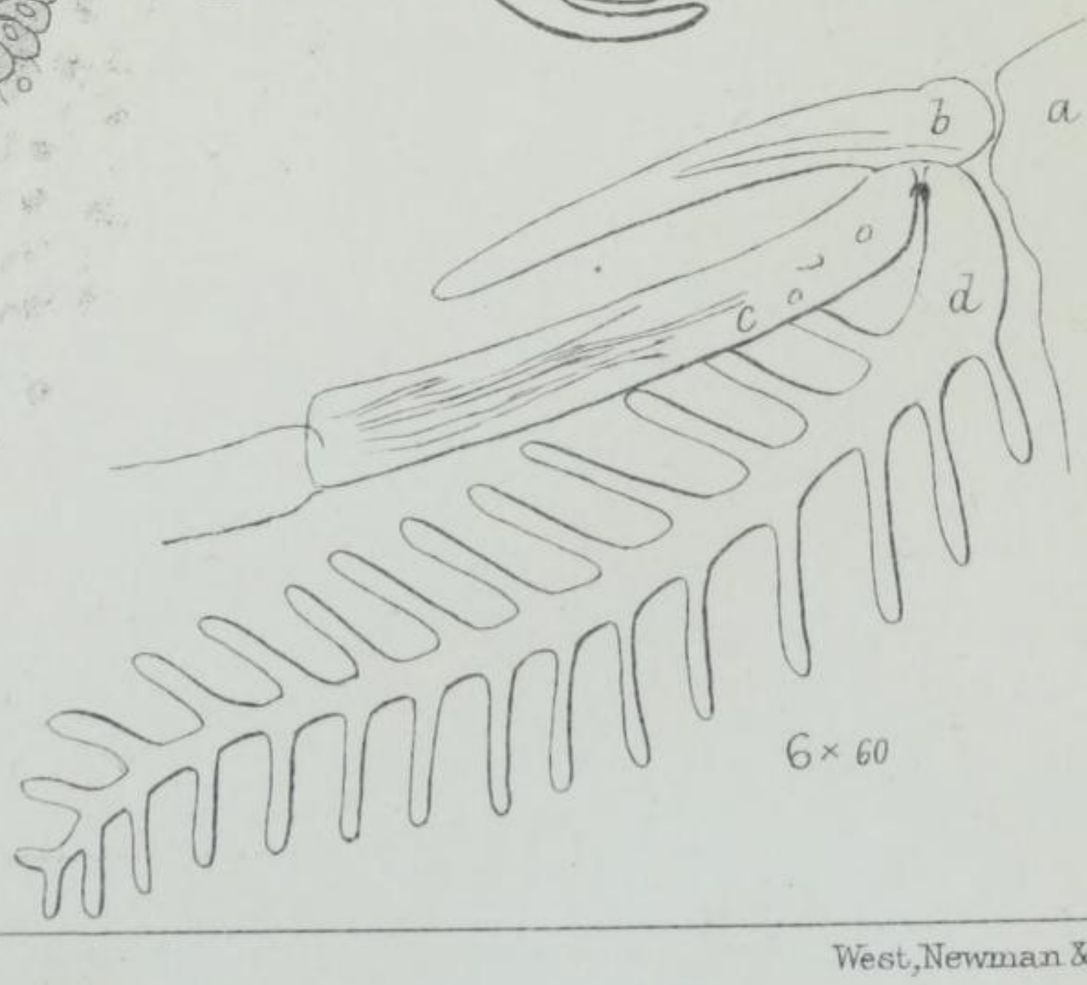






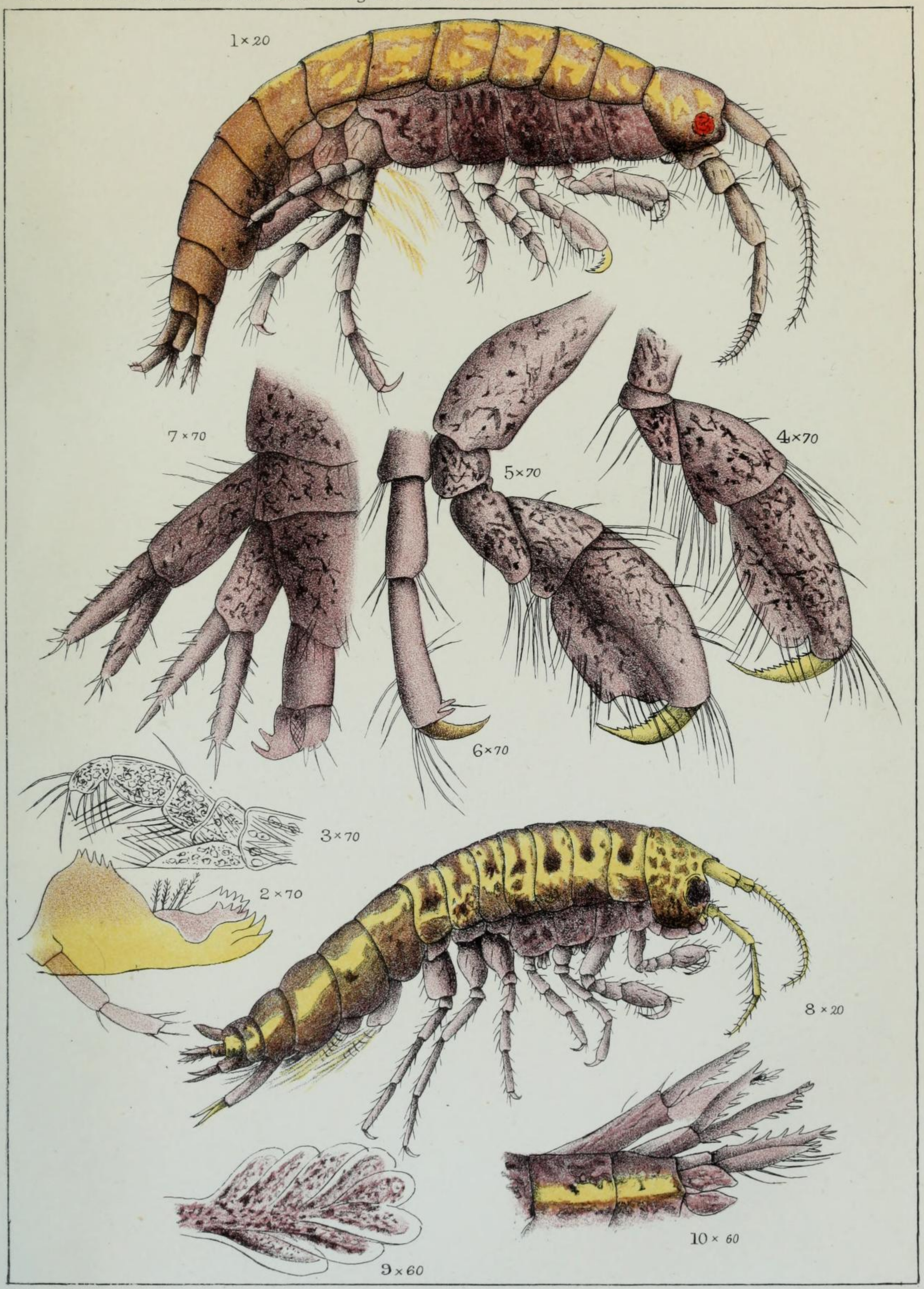






Parker & Coward lith. West, Newman & Co. imp

AMPELISCA LEPTA.



G.M.Giles, del.
Parker & Coward, lith.

West, Newman & C°imp.

1–7. AMPHITHOË INDICA. M. EDW.

8–10. ATYLUS COMES. *n. sp.*

Parker & Coward lith. West, Newman & Co. imp.

UROTHOË RUBER.

1×36

2×36

3×36

G.M.Giles, del.
Parker & Coward, lith.
West, Newman & Co imp.

1, 2, CARELLA MADRASANA, n. sp. ♀.

The legs are short and stout and the mouth-parts exceptionally strong, so as to be eminently suited for digging its way into the hard albumen of the seeds on which it feeds. It might at first sight appear strange that an inhabitant of so great a depth should feed on such exclusively shore products. From the quantity of these seeds and other driftage brought up in the trawl, it is, however, evident that, as long as the tides and currents remain as they now are, the animal can never be at a loss for food. That it is really a bottom organism there can be no doubt, as, apart from its eyeless condition, its limbs are ill-suited for swimming, and the driftage brought up in the trawl was too abundant and of too varied a character to admit of any suspicion of its having been picked up by the trawl on its upward or downward route.

The species can, however, have but a very limited distribution, as situations in which abundant and well-preserved food drifted from the shore is to be found at such a considerable depth must be quite exceptional, and widely separated from each other, as they can only be found in the neighbourhood of great tidal rivers, and where such enter the sea in the neighbourhood of considerable depths.

The animal is of an uniform ivory-white throughout; and the largest specimen is about 12 mm. in length.

The *head* is small and short, rounded in front and broad behind at its junction with the thorax, where the animal very nearly attains its maximum breadth.

The segments of the *thorax* are long and subequal, the middle members of the series, however, slightly exceeding the others in all dimensions.

The first three *abdominal segments* are longer than any of the thoracic and of remarkable depth, the third being the largest. The remaining three segments diminish rapidly in size, and the *telson* is small, conical, and upturned.

The *antennule* is short and stout, its total length being but one-fifth that of the body. It consists of a peduncle of three joints, of which the first is long and cylindrical, and the remaining two, remarkably short, form considerably less than half of the peduncle. The flagellum consists of a long conical basal joint, forming quite half its length, and of five or six short tapering joints of the usual form. The secondary appendage consists of two joints, the first of which, though much thinner and cylindrical, exactly equals the first joint of the primary flagellum in length, while the second joint is small and short.

The *antenna* is subequal to the antennule, but of slighter build. Its peduncle is longer, consisting of three joints of nearly equal length,

which together nearly equal the peduncle of the antennule with the long first joint of its flagellum in length. Its remaining joints if present cannot be distinguished. The flagellum consists of six or seven short joints.

The *gnathites* are remarkably short, the mandibles being especially powerful and provided with a long jointed appendage. The maxillipedes are large and pediform, and are terminated by a globular joint provided with a strong claw.

The second of the *thoracic appendages* is very stoutly built, and is terminated by a powerful subchela, the dactylopodite forming a powerful curved claw, and the propodite having its posterior border prolonged into a stout plate, which is curved downwards to oppose the dactylopodite; this plate is armed with a number of tooth-like spines not shewn in the drawing. The third thoracic appendage, in general form, closely resembles the second, but it is slightly longer, and very much slighter, and differs also in the basipodite being strengthened on its anterior border by a strong flat plate. The fourth and fifth thoracic appendages are somewhat shorter than the two preceding, stoutly made, and of the ordinary ambulatory type. The sixth, seventh, and eighth have their basipodites provided with large strengthening buttress-like plates; all three are stoutly built, but, while the sixth is the shortest, the seventh is the longest of all the appendages. The eighth is intermediate in length, but has its distal five joints shorter even than those of the sixth, its excess of length over the latter being due entirely to the great size of the basipodite, which is nearly twice as long as that of any other appendage; it has no strengthening plates on its anterior border, but this is more than compensated for by the immense size of the posterior buttress.

The first three *abdominal appendages* are of the usual swimming type, but are somewhat small in proportion to the bulk of the animal. The last three appendages are short and stout, and are each provided with a pair of short, subequal, styloid rami; they diminish progressively in length and to a less extent in thickness, the last being rather shorter than its breadth; all three are armed with a series of short stout spines.

The animal differs from any of its congeners enumerated in Spence Bate's Catalogue in the first joint of the flagellum and of the appendage of the antennule being markedly longer than their successors; in being eyeless; and in the exceptional development of the gnathopoda, which are much better formed even than in the closely allied *Opis*, a genus to which, if this character alone were taken into account, the species might be referred. The distinction, however, between *Anonyx* and *Opis*, resting as it does on this character alone, is of very doubtful generic value, and

I have preferred to class the present form under *Anonyx* on account of its more closely resembling in most other points the known species of that genus than it does the hitherto described species of *Opis*.

Since the date of the issue of Spence Bate's Catalogue of the Amphipods of the British Museum (1862), a considerable number of species have been added to *Anonyx* and a few to *Opis*, the descriptions of all of which are not accessible in India. From considerations of locality and depth, it is, however, highly improbable that any of these corresponds to the species now described.

Sars (Archiv Math. Naturv. (Christiania) 1881, p. 437) has described an eyeless species of the genus (*A. typhlops*) from 1710 fathoms in the Arctic seas, but I have not been able to obtain access to the paper. The temperature of the water at such depths as 1300 and 1710 fathoms is pretty constant all over the world, and deep-sea species have, as a rule, a wide distribution, so that it is possible that our forms may be the same. Still it appears extremely unlikely that the present species would be able to obtain suitable food in such regions, so that, provisionally at any rate, I describe it as new in the absence of any evidence to the contrary.

2. Ampelisca lepta, n. sp., Pls. VIII. & IX.

This species was dredged in 107 fathoms on the edge of the Swatch-of-no-Ground, at the head of the Bay of Bengal. A very large number of specimens were obtained in the mass of soft mud brought up in the dredge, which, with the exception of a few annelids, contained no other living organisms. The mud contained a quantity of broken lamellibranchs and pteropod shells, but none of these appeared to have been recently inhabited.

The subfamily *Ampeliscades* contains the single genus *Ampelisca*; *Haploops* wanting the character of having two pairs of simple eyes, and so being very doubtfully a member of this subfamily. With the characteristics of *Ampelisca*, as given by Spence Bate (Cat. Amphip. Crustacea, p. 90), the present species entirely agrees, but it differs from the five of the known species figured in that work in the slenderness of the body, and in the great length of the fifth thoracic appendage, and wants also the vinous colouration which appears more or less to characterize many of the species. These points, however, are hardly sufficient to be of generic value.

The animal measures about 6 mm. in length and is of a fine ivory white throughout, with the exception of the rings of dark brown pigment surrounding the eyes.

The *head* is of moderate size, irregularly quadrate; the portion carry-

ing the eyes and antennules projecting forwards much beyond that giving support to the antennæ. In length, it barely equals the first two thoracic segments together.

The two pairs of *eyes* are of fair size and are placed close to each other on the produced upper part of the cephalon, the outer pair being situated a little behind as well as below the inner.

The *thorax* consists of seven distinct segments increasing gradually in length from before backwards, the last being the longest. It forms exactly half of the total length of the animal. The first four coxal plates are deep and vertical, while the last three are narrow and much everted, giving a fictitious appearance of breadth to this portion of the body when seen from above.

The first of the *abdominal segments* is as long as the last thoracic, but the second and third are considerably shorter, while the remaining three are very short, the fifth being not half the width of either the fourth or sixth, and with difficulty distinguishable from the former. The *telson* forms a deeply cleft, semilunar plate, which appears to be movably articulated to the sixth segment.

The *antennæ* and *antennules* are long and slender, but unequal. The *antennules*, much the shorter, equal the first six thoracic segments in length. The peduncle consists of a short spindle-shaped basal joint and two slender distal articulations, of which the first is nearly four times as long as the second, which is with difficulty distinguishable from the flagellum. This latter consists of ten very slender articulations. The *antennæ* are as long as the body less the last four abdominal segments. The peduncle consists of five joints, of which the first two are very short, completely hidden behind the projecting anterior border of the cephalon. The third joint is long and thick and the fourth and fifth very long and slender, so that the flagellum forms much the shorter portion of the organ. This latter is but little longer than that of the antennule and consists of 14 or 15 slender somewhat shorter articulations.

The *gnathites* are rather small and are more adapted for sifting and retaining finely divided material than for biting and cutting. The mouth is guarded in front by a blunt triangular plate, which appears to be immovably connected with the anterior surface of the head. The mandibles are provided with a four-jointed hirsute appendage and with two plates, of which one has a simple cutting edge of no great power, perfectly smooth for its posterior half, but worn in front into a series of irregular dentations. The second plate has a more complex structure. In front it is provided with two stout conical teeth, the more anterior being quite plain and smooth, while the posterior, which is more slender and pointed, has its posterior border minute-

ly dentated. Behind these two teeth comes a plate immovably connected with that bearing them, but placed more to the dorsal aspect of the organ, and bearing six processes or stout hairs of peculiar form. Arising from stout bases they at first become constricted and then expand into a lanceolate terminal plate the borders of which are minutely dentated. It is difficult to determine what may be the function of these peculiar organs, unless it be to finely comminute the mud from which the animal separates the nutritive particles on which it subsists. The first maxillæ present no points of particular interest, consisting of the usual pair of hirsutely edged plates. The second maxillæ are somewhat peculiar, their inner border being armed with a series of peculiarly formed flattened hairs shaped like small lanceolate leaflets. The maxillipeds are four-jointed, pediform, and clawed, and are provided with a pair of elongated flattened inner plates, both these and the main portion of the organ being extremely hirsute.

The second and third *thoracic appendages* are but little modified from the plain ambulatory type, presenting only a tendency to the subchelate plan of construction, the dactylus being long and smooth, and the propodite being but little dilated; the only specialization for grasping being the provision of a series of stout dentate hairs on its posterior border, not unlike those on the mandibles. Both these pairs of appendages are essentially alike, but the third is considerably the longer and is even less specialized than the second, the propodite being barely dilated, and the dactylus, of very moderate strength. The fourth and fifth appendages are quite of the usual ambulatory type, and alike in general plan, but, while the first is the slightest and shortest of all the appendages except the second, the fourth is the longest and stoutest, slightly exceeding the thorax in length. The sixth and seventh are of moderate length, the sixth having its distal articulations exceptionally stout, while those of the seventh are exceptionally slight, both have their basipodites strengthened by anterior and posterior buttress-like plates; the eighth has the basipodite very stout and is strengthened behind only by an extremely broad plate, its breadth being one and a half times its length. The eighth appendage is short and its remaining articulations are in general form like those of the seventh.

The first three *abdominal appendages* are of the usual swimming type, but are more freely furnished with hairs than is usually the case. They diminish regularly in size from before backwards. The last three are biramous and styloid, armed only with a few short spines on their protopodites. The rami are somewhat flattened and have a bold hollow curve on their inner borders beset with minute dentations (Fig. 10.).

The animal differs from *A. gaimardii*, *A. ingens*, *A. belliana*, *A. limicola*, and *A. japonica*, the species figured by Spence Bate (*loc. cit.*), in the great length of the fifth thoracic appendage; from *A. pelagica* in the antennæ being shorter, in its colour being white instead of pale yellow, and in presenting no blotches of red pigment on the cephalon; from *A. macrocephala* in the eyes being larger, and the upper and lower pairs equally distinct, in none of the segments being carinate, in colour, and in size; from *A. tenuicornis*, *A. lævigata*, and *A. carinata* in wanting the posterior dorsal carina.

Anatomy.—The visual organs of *Ampelisca* are arranged in a manner somewhat exceptional amongst the *Amphipoda*. Being anxious to examine the minute structure of these and to make out whether both pairs of eyes were alike or of different structure, I made several sets of serial sections in the various axes of the animal. From an examination of these, the following points were made out, which, without pretending to be a complete account of the minute anatomy of the animal, it may be well to record.

Organs of Vision.—The two pairs of eyes are identical in structure, but quite distinct from each other, and belong to a high type of the simple invertebrate eye. The portion of the chitinous coat of the head which forms the "cornea" is but slightly more convex than the general curve of the part. Imbedded in this is a refractile body of a slightly flattened spherical form, consisting of a delicate sac containing a structureless gelatinous material.

The sac is quite distinct from the cavity in which it is contained, and is capable of dislocation from its hollow bed. In sections where this has happened the contained material may be seen oozing from the shrunken sac, and forming a drop very similar in appearance to the myelin drops that form in the course of a medullated vertebrate nerve. The lens, thus formed, rests on a concave surface formed of the epidermic layer of the head, which here consists of soft rounded cells, granular and easily stained in spirit specimens, but doubtless quite transparent in life. Surrounding the lens, and forming a sort of iris, is a ring of these epithelial cells, deeply impregnated with a deep brown pigment.

Behind this epithelial layer comes the retina. This consists of three distinct layers. Immediately beneath the epithelial layer is a layer of cylindrical bodies, nucleated and deeply pigmented, and continuous with the bases of these (so that each appears to have its continuation in the next layer) is a layer of tapering rods, which divide at their deeper extremity into two or more slender fibres. Between these two layers there is doubtless an organic connection, each cylinder fitting accurately on to its corresponding rod, but that the continuity is

not absolute is evidenced by the existence of a distinct line free from granules at their point of junction, and by the circumstance that rough handling has a tendency to separate the layers at this point. The rods, like the cylinders, are nucleated, the nuclei lying not all in the same plane, but exhibiting a tendency to alternation. These rods contain but few granules and, as already mentioned, divide below into a number of fibres, each of which is continuous with a cell of the third and last layer. This last layer consists of spindle-shaped cells strongly granular and distinctly nucleated. They are prolonged at their superficial extremities into fibres, which are continuous with the branches of the rods of the second layer, and their deep extremities split up into a number of fine fibres, which can, in favourable cases, be made out to inosculate with fibres issuing from the ganglionic mass supplying the eye.

With such refractile arrangements, the outer surface being but little curved, the entire work of refraction must be performed by the lenticular bag of highly refringent fluid, and the rays, passing through the transparent epidermic layer, must be brought to a focus on the deeply pigmented anterior extremities of the front layer of rods of the retina. The lens is probably a modified cuticular structure. It must be acknowledged that so specialized a structure as this is of a higher type than the very ill-developed compound eyes which are commonly met with amongst the *Gammaridæ*.

Nervous System.—The ventral nerve cord is large and well developed. In the thoracic region, the paired ganglia are placed so close to each other as to nearly blend, the transverse commissures presenting scarce any constriction. In the abdominal region these commissures are somewhat longer. The longitudinal commissures between the second thoracic and the maxillipedal ganglia are longer than usual and diverge outwards, the latter pair being placed fully the width of the œsophagus apart. From these spring the long commissures of the œsophageal collar, which in front join with two long, cord-like chains of cells which lie on each side below the anterior prolongation of the peculiar gizzard to be described below. This ganglionic cord, curving upwards, blends with the main mass of the supra-œsophageal ganglion, which fills up nearly the entire space of the head between the gizzard and its anterior wall. From the periphery of this mass project eight rounded processes, the centres of the two pairs of eyes and of the two pairs ef antennæ respectively. Those of the eyes lie almost in contact with the bases of the retinal spindle cells and distinct fibrous connections can be made out between them and the retina. From the long cord-like horns that run back from the main brain mass to the œsophageal commissure, branches may be traced to the gnathites and to the green-gland. Each of the great

ganglion masses, the ventral ganglia included, is surrounded more or less completely by a layer of small round cells that have all the histological characteristics of leucocytes. From an examination of certain figures illustrative of current researches in the group, I am inclined to think that these have been, in some cases, mistaken for nervous elements and described as portions of the ganglion system. They are, however, simple granular rounded cells with small indistinct nuclei, both cell substance and nuclei greedily absorbing all dye stuffs. These cells are quite without tails or other protoplasmic connections, and appear to be packed in the intercellular lymph tissues surrounding the ganglia rather than embedded in any intercellular material. They are certainly mesoblastic and probably are plasmic cells whose function it is to subserve the rapid nutritive changes going on within the ganglionic system.

Muscular System.—This, in one species, is but feebly developed, the sections contrasting strongly with those of species of more active habits, such as inhabit the surface. In the head a number of radially placed bands suspend the gizzard, those in the middle line above being the most strongly marked. A strong band runs between the anterior part of the under surface of the gizzard obliquely downwards and backwards to the antero-inferior corner of the "sifting" stomach. The body muscles are especially feeble, the best developed being the great extensors of the segments, which attain a development somewhat superior to the other body muscles. The great obliquely vertical bands which take up so large a share of the segmental space in most crustaceans are scarcely developed at all in the thoracic segments and but feebly so for even the first three abdominal segments, which usually have these muscles of immense size for keeping up the constant vibrations of the three anterior abdominal appendages. Living, however, as this species does, imbedded in tolerably thick mud, it can have but few opportunities for putting this movement in action, the want of a free current through its branchial plates being met in another way. The muscles of the thoracic appendages and of the last three abdominal appendages are correspondingly weak, the greater part of the space within the articulations being taken up with aggregations of plasmic cells like those already described as surrounding the ganglionic centres.

Digestive System.—The gnathites, already described, work beneath a vaulted space formed by the sterna of the cephalic and maxillipedal segments. From the middle of this vault a funnel-shaped pharynx leads into a very narrow œsophagus of some length, which opens into a large cavity which appears to function as a gizzard. This cavity is nearly rounded in transverse section, but slightly flattened from above downwards, especially behind, the width of the lumen being about one quarter

the depth of the head and more than a third of its breadth. In length, it considerably exceeds half the length of the head, the œsophagus opening into it rather in front of the middle of its length. It is lined throughout with chitine, and presents sundry toothed plates and hairs which subserve the trituration of food. Of these plates and hairs, the following are the most remarkable: from the anterior wall of the cavity, on either side of the middle line, projects a strong flattened plate somewhat narrowed at its origin from the wall of the cavity and expanded at its border, which latter is armed with a double row of strong teeth, very like those on the triturating plate of the mandible; the upper ranks of these teeth are short, strong, and somewhat lanceolate in form, while the lower ranks are longer, thinner, and of more uniform thickness, and interdigitate with a series of similar long weak teeth placed on a second pair of plates situated on the anterior portion of the ventral wall of the organ (Plate II, fig. 3.). Lastly, the middle part of the dorsal wall of the organ is densely clothed with long thin flexible hairs. From the vicinity of the posterior end of the ventral wall, rather nearer the posterior end of the organ than to the point of entry of the œsophagus, a funnel-shaped depression leads to a very short channel, which admits the food to a second chitin-lined cavity, which I have already alluded to as the "sifting stomach." Seen in transverse section this latter cavity has a cordate outline; a strong chitinous ridge, with a very broad base, projecting upwards into its lumen from its ventral wall, and reaching upwards nearly to the level of the dorsal wall of the organ, thus dividing the greater part of the length of the cavity into two nearly distinct spaces. In front and behind, this ridge sinks down rapidly to the level of the ventral wall of the cavity. Each of the two main spaces into which the viscus is thus cut off is further subdivided by a very delicate chitinous plate which projects upwards and inwards nearly as high as the main median ridge. These plates, the median ridge, and the walls of the viscus are alike clothed with closely set, short, and stiff, but very fine, hairs, so that the entire organ must form a most efficient sieve by which all particles that have not been sufficiently comminuted in the gizzard are kept from entering the mid-gut. The "sifting stomach" opens behind by a constricted channel into the mid-gut. The mid-gut is of considerable dimensions, and is perfectly straight and of nearly uniform diameter throughout, it opens by a narrow anus on the under surface of the sixth abdominal segment close to the telson. In its anterior portion the endothelial coat is two cells in thickness and the mesoblastic layer of perceptible thickness. In the hinder part of the canal, however, the endothelium is reduced to a single row of cells and the meso-

blastic layer is so thin as to be scarcely perceptible. It is a simple rounded channel without foldings or complications of any sort. The large size of the canal is no doubt connected with the bulky nature of the food in proportion to its contained nutriment. In all but one of the specimens cut the intestinal canal was full and its contents simply mud, exactly similar to that clinging to the outside of the animal, which appears to live by swallowing the mud without any particular selection, trusting to the elaborate arrangements of its digestive apparatus to separate and utilize any particles that may possess a nutritive value.

Glandular System.—This in our species possesses but a feeble development. Situated below the main mass of the supra-œsophageal ganglion is the green gland, consisting of a mass of somewhat elongated cells enclosed in a distinct capsule. The situation of its duct could not be made out. The liver lies behind the gizzard and immediately underneath the anterior end of the dorsal vessel. It is of small size, and does not completely sheath the mid-gut, being placed almost entirely above and at the sides. Certain glandular cells can also be made out within the basipodites of certain of the thoracic appendages, notably of the fifth, but the position of their ducts could not be discovered with certainty, although I am inclined to think that the opening is in the propodite, near its articulation with the dactylopodite.

Vascular System.—The dorsal vessel is a tube of considerable size occupying the greater part of the space between the great extensor muscles of the segments above and the intestinal canal below; and is slightly constricted at the points of junction of segments. Of large size in the thoracic region, it tapers off, in front and behind, and is lost. Beyond the constrictions, already mentioned, no signs of valves could be made out. It appears to open by minute, oblique slits into the general lymph spaces surrounding it. In histological structure it consists of an inner layer of flat, polygonal epithelioid cells, covered by a layer of flattened nucleated fibres disposed in a regular spiral round the tube, the ostioles communicating with the lymph space consisting of interstices between the thus obliquely placed fibres (Pl. II, Fig. 3). The general body cavity is divided into lateral halves by a delicate vertical septum connecting the dorsal vessel with the body wall above and with the intestinal canal below, and each half is further subdivided by a horizontal septum running from pleuron to pleuron above the generative gland tubes to the side of the intestine.

Organs of Respiration.—The branchiæ of our species attain an exceptional degree of complexity. There are five pairs, which are attached to the coxopodite of each of the thoracic appendages except the

first and last. Each gill plate consists of a flattened lamina of considerable length,the longest being nearly as long as twice the depth of the body. From each face of this primary lamina, spring secondary laminæ arranged in regular alternation on either side to the number of 20 or 30 on each face. These secondary laminæ are of considerable area, the depth of the largest being quite half the length of an average thoracic segment. Gills of so complicated a structure as this are rare amongst the Amphipoda, and their presence in our species is no doubt connected with its mode of life. Burrowing as it does in thick mud, its anterior abdominal appendages cannot be kept in the usual rapid vibration which in most species maintains a free current of water through the subthoracic hollow. Such a current being unobtainable, the difficulty is met by the great increase of available gill surface secured by the complex branchial structure already described.

Organs of Reproduction.—Although a very large number of specimens was obtained, all appear to belong to the female sex, all presenting the same external characteristics, and all the specimens that were dissected having the same form of generative gland. Apparently the animals were not breeding at the time of the haul, as, although the ovaries of most of those sectionized contained young ova, none carried eggs beneath the thorax. The ovaries consist of a simple tube bent on itself and occupying nearly the entire length of the thorax, so that a typical section exhibits four tubes cut across and disposed in a semicircle below the alimentary canal; of these the outer pair appear to be the glandular and the inner, the duct portions of the organs. Such ova as were met with in this latter portion of the tube were enveloped in a voluminous ovoid coating of albuminous material. The flexure of the ovarian tube takes place at the anterior end of the thorax, so that its blind commencement is in the most posterior portion of the region. In one series of sections, the organ presents a suspicious resemblance to a sperm-producing gland, in other respects differing in no way from the usual type, while no ova could be made out in any portion of the series of sections. It may be that this is a male specimen, but, if this be the case, the organs of both sexes closely resemble each other, even to the detail of the double tube bent on itself.

3. Microdeutopus megnæ, n. sp., Pl. VII., Figs. 1—4.

The species described below was taken in the surface net in the turbid water (about 6 fathoms) of the Megna Shoals.

The animal, which is $4\frac{1}{2}$ mm. long, is of a dirty white colour, and the intestinal canal often shews through the body as a greenish streak.

The *head* is small and somewhat excavated below, the antennæ originating a good deal behind the antennules. There is no rostrum, and the single small black rounded eye is placed on a prominent angle situated between the antennules and antennæ.

The *thorax* forms a little more than half of the entire body length, and is long and slender, the segments (saving the first, which is shorter) being subequal. The coxal plates are small and narrow, the anterior ones being so short as not to overlap in all positions of the animal; that of the third is the deepest, while the last three are extremely narrow.

The *abdomen* is small and, like the thorax, narrow, its first three segments being about the same size and depth as the immediately preceding thoracic segments with their coxæ. The last three segments are small and nearly cylindrical, and the short *telson* is armed above with a pair of peculiar conical protuberances bearing a single strong bristle. The last three segments also have their posterior borders furnished, in the middle line, with a few short stiff hairs.

The *antennules* and *antennæ* are stout, approaching the pediform, especially in the case of the latter. They are subequal in length, the antennules being a little the longer, equalling the length of the thorax less its last segment. The peduncle of the *antennules* forms nearly two-thirds of the entire length of the organs and is very stout. It consists of three joints, of which the first is the stoutest, but is intermediate in length between the two remaining joints, the second joiut being much the longest and forming nearly half the peduncle, while the last joint is the shortest and slenderest. All three joints are moderately hirsute, especially along their inferior borders. The appendage of the antennule is uni-articulate, and so small as to be very easily overlooked, indeed, it is of so delicate a character that it will be found to be wanting in a large proportion of specimens. The flagellum proper is very slender and consists of 10 to 14 short articuli armed with extremely short hairs.

The peduncle of the *antennæ* is both absolutely and relatively much longer and stouter than that of the antennules. It is five-jointed, the first two joints being short, but very stout, the last two very long and subequal to each other and to the long middle joint of the peduncle of the antennule, and the third joint about half the length of the two distal pieces. All its joints are moderately hirsute especially on the inferior borders, and the last joint is additionally armed on the sides with a number of stout tooth-like spines. The flagellum is very short, forming not a quarter of the entire length of the organs, and consists of 10 or 12 very short, feebly armed articuli.

The *gnathites* and the digestive apparatus generally present a strong general resemblance to those of *Ampelisca lepta*, already described. The

mandibles are of even more complex structure, their cutting and triturating plates being alike doubled. Each pair of plates is immovably connected together, the two cutters having simple toothless chisel edges and closely resembling each other in general form, while the triturating plates are very peculiar, the more superficial plate being smaller than the deeper and armed with short, stout, conical teeth, the most anterior being blunt and considerably longer than the rest, and the deeper triturating plates even more complex. Most anteriorly comes a vertically arranged row of three stout, bluntly conical teeth placed, it will be observed, at right angles to the main row of triturating processes. Behind this row comes a peculiar stout tooth with a trenchant bifid apex, and, behind this again, a number of long stout spines of no great strength. The mandibular appendage is of exceptionally great proportional size, being absolutely considerably longer than the pediform ramus of the maxilliped, and may often be made out projecting forwards between the roots of the antennules and antennæ. The palp has four joints, of which the first is very short, while the remaining three are subequal and long. The last joint ends in a dense brush of long thin hairs, but the remainder of the organ is nearly smooth.

The *digestive organs*, as far as they were examined, closely resemble those of *Ampelisca lepta*, the chitinous stomach being subdivided into two cavities, and closely resembling that of *Ampelisca* in the arrangement of its armature. There is the same pair of strongly armed plates at the anterior extremity of the organ, and it is further notable that, as in *Ampelisca*, the spines of these plates resemble in form those on the posterior portion of the triturating mandibular plate; being simple pointed rods, in both cases, in the present species; and lancet-headed spines in both situations in *Ampelisca*. The "sifting" stomach appears to be of identical constructiou in both species.

The second and third *thoracic appendages*, or *gnathopoda*, present considerable sexual differences. In the male, the 1st gnathopod, though of but medium length, is immensely stout, being nearly as thick as the body of the animal. It is furnished with a well-developed and very powerful double subchela, the dactylus, which is strong and a little varicose, but otherwise unarmed, being opposible to the nearly quadrangular, very short, and hirsute propodite and the latter again to the prolonged postero-inferior angle of the immensely dilated carpopodite. The articulation between this latter and the meropodite is very oblique, being placed much more on the anterior than on the inferior aspect of the articulus. The remaining joints, though very short, present nothing remarkable. The second gnathopod in the male is short, slender, and imperfectly subchelate, the dactylus being barely opposible to the dilated,

but not prolonged, propodite. As in its predecessor, the articulation between the carpus and merus is extremely oblique.

In the female, the *gnathopods* are both much smaller, the first, though larger, being not disproportionately so to the second. The subchelæ of both pairs are single and very rudimentary, that of the first being barely opposible and the grip secured only by a few weak spines on the propodite, while the second pair differ but little from an ordinary ambulatory appendage. The carpo-meropodital articulation of the first is oblique, but in the second gnathopod it is of the ordinary type.

In the young male, the 1st gnathopoda are comparatively small, but can still be distinguished from those of the female by the presence of the distally prolonged spine of the propodite.

The 4th and 5th *thoracic appendages* have rather long and falciform dactylopodites, but are otherwise of the usual ambulatory type ; the fifth is the longer of the two, being as long as the last four thoracic segments and subequal to the sixth appendage, while the fourth, which is subequal to the third, is at least one-fifth shorter. The sixth, seventh, and eighth thoracic appendages resemble each other in general form, but increase in dimensions, especially in length, from before backwards, the increase being mainly in the great proportionate length of their distal articuli, the length of their basi- and ischiopodites differing in much smaller proportion, so that, while the sixth does not exceed the fifth in length, the seventh appendage is as long as the entire thorax, and the eighth longer than the seventh by the length of the animal's head. Their basipodites are much compressed, but not distinctly buttressed.

The first three *abdominal appendages* are large and powerful and well armed with hairs, and the last three, short and cylindrical with styloid rami, both protopodites and rami being armed with a number of short stout spines. When extended, they all three reach about the same level and their rami are subequal, the protopodite of the last pair being extremely short.

The animal was found in considerable numbers to all appearance swimming freely in the water; there was, however, abundant drift wood which may have served as its hiding place, aud the little creatures when under observation showed a very strong tendency to take advantage of such opportunities of concealment.

It is possible that those taken had been washed from their hold by the strength of the current, which often reaches a speed of $4\frac{1}{2}$ knots on the Megna Flats. Still, I cannot say that I actually detected a specimen burrowing a shelter for itself in any case that came under my observation.

The posterior appendages are, however, admirably adapted for clinging to any chance protection that might be met with.

The male is provided with five pairs of simple *branchial laminæ* attached to each thoracic appendage between the third and seventh inclusive. In the female, the gravid egg pouch renders it difficult to make out the exact number of these laminæ, but I am inclined to think that it is the same as in the male.

Our species differs from *M. gryllotalpa* in the much greater proportionate size of the 8th thoracic appendage; from *M. websterii* in the larger size of the seventh appendage and in the body of the latter being much stouter; from *M. anomalus* and *M. tenuis* in the appendage of the superior antenna being uni- instead of multi-articulate; from *M. versiculatus* in the posterior thoracic appendages being longer in that species, and in the peculiar form of the anterior thoracic appendages of *versiculatus;* from *M. longipes* in the antennules and antennæ being subequal in our species, while in the former the antennule is much longer than the antenna; from *M. macronyx* in the three posterior segments of the pleon being armed with spines; from *M. grandimanus* in the antennules and antennæ being nearly of equal length and in the form of the last pair of abdominal appendages, which in our species have the peduncle much shorter than, instead of subequal to, the rami; from *M. australis*, *M. tenuipes*, and *M. chelifer*, in the flagellum of the antennules being shorter instead of longer than the peduncle; and from *M. mortoni* in this same point (which appears to characterize all the Australian members of the genus), and in the form of the first gnathopod of the male; *M. maculatus* (Thompson, Am. N. 4, (5), IV, p. 33, from Dunedin, New Zealand), agrees with the other Australasian forms in possessing a very long antennule, the appendage of which is multi-articulate, and differs further from our species in the comparative shortness of the 7th thoracic appendage.

4. Monoculodes megapleon, n. sp., Pl. VII., Fig. 12.

This species was taken at the surface in the drift net in rather turbid water on the banks off Chittagong.

Only a single (probably male) specimen was obtained, so that I am unable to furnish any details as to its more minute anatomy. The animal is 3·2 mm. long, of a dirty white colour, and the intestinal canal shews through the carapace as a greenish streak.

The *head* is very small, and is produced in front into a peculiar, down-turned hooked rostrum, very minutely serrated along its posterior border. The anterior half of the upper surface, and a portion of the

sides, are occupied by the eyes, which blend in the middle line so as to appear to be a single organ.

The *thoraæ* is small, forming only a third of the whole body length. The segments increase gradually in length from before backwards, the last being nearly double the length of the first, and are of very moderate depth. The coxal plates, however, are very deep, nearly equalling, as a general rule, the depth of their corresponding segments. The last coxal plate is the only marked exception to this rule, being only half the depth of the corresponding segment and little more than half the depth of that immediately preceding it.

The *abdomen* is very large, forming more than half of the total body length, the first three segments alone exceeding the thorax in length, while the remaining three are as long as the first four thoracic segments. The first three segments are of great depth, while the last three are rather narrow. The *telson* is simple and laminar.

The *antennule* is slightly longer than the thorax. It is moderately hirsute, the distinction between peduncle and flagellum is very ill-marked, the first joint alone of the former markedly exceeding the succeeding articulations in size. The flagellum consists of 10 or 12 short joints.

The *antennæ* are slightly longer, exceeding the antennules by the length of an average thoracic segment. The peduncle forms a good deal less than half its length, is moderately hirsute, and consists of five joints, of which the first three are very short and the last two long and stouter than any part of the peduncle of the antennule. The flagellum is very smooth, its hairs being extremely fine and short, and consists of about forty very short joints, the lines between the component articuli being very indistinct.

With the exception of the maxilliped, which is small, hirsute, and clawed, nothing could be made out of the *gnathites*, which are very small and almost completely hidden by the sides of the head.

The second and third *thoracic appendages* are long and slender, the third being a little the longer and stouter, nearly equalling the combined head and thorax in length. They closely resemble each other and shew well the peculiar form characteristic of the genus in having the postero-inferior angle of the carpopodite prolonged into a spine opposible to the propodite and long enough to meet the dactylopodite. This spine in the second thoracic appendage projects a little behind the propodite, while in the third the propodite slightly exceeds the spine. The fourth and fifth are the shortest of the thoracic appendages; they are subequal and moderately stout, and closely resemble each other, both being very hirsute and termi-

nated by a brush of hairs so dense as to hide their dactylopodites, which, if present, must be very small. The sixth and seventh are stout, and alike in general form, having their meropodites considerably expanded. They are articulated quite to the edge of the coxæ and their basipodites, though strong, are without buttress plates. The seventh is considerably the longer, the sixth being only as long as the head and the first four thoracic segments, while the seventh is as long as the head and thorax save its last segment. The eighth is unfortunately partially wanting on both sides in my one specimen, but is evidently much the largest and longest of the appendages, the basi-, ischio-, and meropodites, which remain, being very considerably larger than those of any other appendage; the basipodite is strengthened by buttress-like plates both in front and behind.

The first three *abdominal appendages* are of the usual type, but are exceptionally powerful. The last three are rather long and thin, the fourth being longest, and the sixth the shortest, the fifth, however, projecting rather beyond the other two, when all three are extended. They are almost without hairs or spines, such as are present being very fine and short, and have their protopodites cylindrical and their rami, of which each has a pair, of styloid form.

Our species differs from *M. carinatus* in wanting the dorsal keels and in both gnathopoda being of typical form; from *M. stimpsonii* in the much larger proportional size of the abdomen; and from *M. demissus* in the last two coxæ being of fair size, certainly not very small, in the eyes being black and not vermillion-coloured, and in the greater size of the abdomen.

Concholestes, gen. nov.

The following species is a most singular one in its habits. It belongs certainly to the subfamily *Corophiides* of the family *Corophiidæ*, but I can find no genus, either in Spence Bate's Catalogue of the British Museum Amphipoda, or amongst the numerous new genera that have been established in the family since the date of that publication, that, by any moderate extension, can be made to include so peculiar a species, although it certainly approaches most nearly to *Corophium*.

It was obtained by dredging in 7 fathoms, on a sandy bottom, off the "Seven Pagodas," on the Madras Coast. Amongst the catch were a number of specimens of *Dentalium lacteum*, some living, a few empty, and more containing a small pagurus. On examining the latter, I was surprised to find that two specimens were inhabited by a tubicolous amphipod which had made its home in the shell, lining it with a mix-

ture of silken secretion with fine sandy particles; this inner tube being quite distinct and coherent when separated from the shell by dissolving the latter in dilute hydrochloric acid.

Though quite lively, it was evident that the animal must be quite confined to the bottom, as it was evidently incapable of lifting its heavy house, but crawled about the bottom of the jar by means of its powerful antennæ. Of the two specimens, one was a female, and it is noticeable that the eggs she carried were enclosed in no proper egg-pouch, but were retained under the thorax only by narrow plates fringed with long hairs, which, though of equal morphological value, differ markedly from the usual broad plates.

So far as I am aware, the circumstance of an amphipod making use ef a deserted shell as a tube has not been previously observed, and I have based the proposed generic name on this circumstance.

Animal long and slender, with the abdomen composed of six distinct but very small segments; antennule moderately large, flagellate, but without appendage; antennæ very large and pediform inserted barely behind the antennules; 3rd thoracic appendage with a well-developed subchela considerably larger than the weakly subchelæ of 2nd thoracic appendage; 7th and 8th thoracic appendages short, with the carpopodital articulation peculiarly modified, the joint being placed obliquely on the anterior and outer face of the articulus, and the distal end of the carpopodite rounded, and covered with short closely set recurved hooklets; 8th thoracic appendage ambulatory; 4th abdominal appendage biramous, 6th blunt, rounded, without rami, nearly hidden beneath the squamous telson.

5. Concholestes dentalii, n. sp., Pl. VII, Figs. 7—11.

The *head*, seen laterally, forms a truncated pyramid with the base forwards, the small eye being situated on a small angular process between the antennule and antenna, but no marked recess is formed for the reception of the latter appendage. The carapace projects forwards a little in the middle line between the antennæ in the form of two processes, forming a sort of bifid rostrum.

The *thorax* is very large, being a little more than twice as long as the combined head and abdomen. The length of the segments is somewhat irregular, the first being the shortest, the 2nd, 5th, and 6th subequal and longest, and the remaining segments of intermediate length. The first segment has the additional peculiarity of being prolonged into a sort of rostrum, armed with a tuft of hairs, which overlaps the back of the head. The coxal plates are small,

and quite distinct from each other, the first four forming conical processes directed obliquely forwards and downwards from their corresponding pleura, and the hinder three being longer, but very narrow, plates.

The first three *abdominal segments* are subequal, nearly cylindrical, and are a little shorter than the first thoracic segment; the last three are very diminutive, and the *telson* short, squamous, and semilunar.

The *antennule* is stout, less than half as long as the body. Its peduncle forms three-fourths of the length of the organ, and consists of three joints, subequal in length, but diminishing progressively in stoutness, and the flagellum consists of five stout longish articuli. Both peduncle and flagellum are armed with a large number of long stiff hairs, and the flagellum is, in addition, provided below with a series of flexible flattened hairs quite different from the others. The antenna is pediform and much the largest of all the appendages, being very stout and nearly as long as the entire thorax. Almost the entire length of the organ is formed by the peduncle, the flagellum being represented by a single short, stout joint terminated by a pair of strong claws. The first and last pedunculary articuli are subequal and rather short, the second a little longer than these, and the third and fourth subequal and very long, forming together two-thirds of the length of the organ, which is profusely armed with long, stiff hairs.

The *gnathites*, as far as they could be examined, present no points of peculiar interest, the mandibles being of simple form and palpate, and the maxillipeds small and unguiculate.

The first of the *gnathopods* is but feebly subchelate, no palm being developed to the propodite; such grasping power as it may have being furnished by a number of fine serrations on the dactylopodite and some stiffish hairs on the protopodite. The appendage is as long as the peduncle of the superior antennæ; the second gnathopod, though but little longer, is much stouter and has the protopodite much dilated, the palm, though rather oblique, being strongly armed with three formidable teeth, and the dactylopodite being strongly serrated. The dactylopodite also presents the following additional peculiarities: first, it is armed in its anterior border with one or two hairs, a most exceptional circumstance, and, secondly, it is really trifid when seen from above, as, from a point about half way along its length, a powerful secondary tooth projects obliquely on either side; these latter being but little exceeded by the main central tooth either in length or stoutness. As in the 1st gnathopod, the carpo-propodital articulation is rather oblique.

The next two *thoracic appendages* (4th and 5th) are short, being only as long as the two first joints of the peduncles of the anten-

nules. They are mainly remarkable for the stoutness of their articuli and the length and straightness of their dactylopodites. The 6th and 7th thoracic appendages are of very peculiar structure, and have already been shortly described in the generic diagnosis. They are similar in general form, but the 6th is somewhat the larger, its excess of length being gained mainly in the basipodite. Each carpopodite forms a stout cylinder, armed at its point with a short, stout spine, and densely clothed at its apex and outer aspect with short stout recurved hooks. The propodite is articulated a little below the middle of the outer and anterior aspect of the carpopodite, and the dactylopodite forms a small, but much curved hook. The 8th thoracic appendage differs considerably from any of the other appendages, and is more of the normal type. Subequal to the second gnathopod in length, it is the slenderest of all the appendages, the basipodite alone being of any size, and even this considerably tapered distally. All the thoracic appendages are somewhat hirsute.

The first three *abdominal appendages*, though of the usual type, are very small and much broader than long. The fourth is the largest of them all, its peduncle being stout and armed with a few stout spines, and its rami, which are equally stout, about half the length of the peduncle and armed with a number of stiff slightly curved spines. The articulations of the rami of this appendage with its peduncle are strong and of hinge type; and watching the animal while alive, I was impressed with the idea that the organ could be, and probably is, employed by the animal as a forceps for holding on to its house. Of the fifth abdominal appendage I have been unable to obtain a satisfactory view. It is small and its peduncle is very short, though of considerable breadth. The ramus appears to be single and rounded, and has its end beset with recurved hooks, similar to those on the carpopodites of the 6th and 7th thoracic appendages. The last abdominal appendage is short and blunt and has no ramus, its end being armed with a few spines, some of which show a tendency to hooking.

6. Amphithoe indica, M.-Edw., Pl. X., Figs. 1—7.

This very beautifully ornamented species was obtained in the drift net, in the middle of the Bay of Bengal, on a voyage from Chittagong to Madras. Although so far from land, there was a certain amount of flotsom and jetsom to be met with on the surface, and it was in the interstices of such pieces that the little animal had its home. It builds no regular tube, but constructs an irregular sort of shelter for itself by glueing together tiny morsels of driftage, ekeing out its materials; from the appearance of some of the irregular masses resulting from its

architectural efforts, I am inclined to believe, with pellets of its own excreta, as observed in certain kindred species by F. S. Smith (*Nature*, 1880, p. 595). To this queer home it clings most tenaciously, and I should certainly have overlooked it altogether had not my assistant, in lifting some of the morsels of débris, with the view of cleaning the catch, accidentally demolished a homestead and evicted one of the tenantry; when a closer examination resulted in the discovery of a considerable number of specimens.

The animal is about 5 mm. long, and is very beautifully coloured. The ground colour is a rich deep purple, fading to nearly a burnt-sienna tint towards the dorsal line, the coxal plates being darkest and free from paler markings. The whole of the head and thorax is mottled with patches of the brightest golden yellow, which forms a broad, but somewhat irregular, band along the middle of the back, and is further disposed in irregular patches over the pleura of the somites. The basipodites of the thoracic appendages are of the deepest purple, but on their distal articuli the colour fades to a paler shade of the same tint.

The *head* has an irregularly pentagonal outline, its anterior border being peculiarly vertical and straight, and without any rostrum. It nearly equals in length the first two thoracic segments; its depth is but little less. The eye, which is coloured the brightest scarlet, is of medium size and placed at the antero-inferior angle of the head.

The *thorax* is large, forming five-ninths of the entire body length. Its segments are stout, and as deep as they are long, and do not differ markedly from each other in length, but the 3rd, 4th, 5th, and 6th are subequal, and about $\frac{1}{3}$ longer than the two first and the last segments. The five anterior coxal plates are deeper than the corresponding segments, and the 5th has the additional peculiarity of being composed of two lobes, of which the anterior is as deep as, or deeper than, the coxæ in front of it, while the posterior lobe is very narrow and corresponds in form and depth to the very small coxæ of the 6th and 7th segments behind it.

The *abdomen* is small, forming but little more than $\frac{1}{3}$rd of the entire body length. Its first, second, and fourth segments are subequal in length to the first two thoracic segments, while the third is subequal to a median thoracic, and the last two are very short, the penultimate segment being the shortest of all. In depth, the 1st abdominal segment only equals the last thoracic segment and its coxæ, the 2nd and 3rd are somewhat deeper, and the last three segments very narrow. The *telson* is small, laminar, somewhat upturned, and of a roundedly conical outline. The last three segments are armed with a few hairs along the middle line.

The *antennule* is a little more than a third of the body length, reaching back to nearly the end of the 4th thoracic segment. Its peduncle is moderately stout and forms more than half the length of the organ. Of its three articuli, the first is the longest and stoutest, the second, nearly as large, and the third, very small, is dotted along its inferior border with a number of long fine hairs, but, with the exception of a few short fine hairs, is naked above. The flagellum tapers gradually, and is formed of 13—14 short joints, each of which is distally armed with a few short stiffish hairs.

The *antenna* exactly equals the antennule in length, but is much stouter and subpediform. The peduncle forms $\frac{3}{4}$ths of the entire length of the appendage; its first three joints are very stout, but in length together only equal the 4th, which is subequal to the 5th. The proximal segments are pretty liberally clothed with long hairs, and the last with hairs shorter and almost spinous. The flagellum consists of 9—11 very short joints, each of which is armed distally with a circlet of short stiff hairs.

The *gnathites* are rather small and inconspicuous, but the mandible, which is provided with a small appendage, is of remarkable complexity, its triturating portion being subdivided into three distinct, but immovably connected, plates, each armed with dentations of progressively increasing severity. The deepest of these three plates is armed, in addition, with a number of compound sifting hairs.

The maxillæ and maxillipeds are small, but quite of the usual type. The second and third *thoracic appendages* (*gnathopoda*) are small and rather weakly subchelate. The palm of the propodite of the 1st gnathopod is fairly marked, but has its angle round and not produced into an opposible ramus, while that of the 2nd gnathopod has the palm even less pronounced, being retracted and excavated; both have a pair of stout spines near the angle between which the dactylopodite closes. In both, the dactylopodites are feebly serrate, and the carpo-meropodital articulations, oblique. The fourth and fifth thoracic appendages are subequal in length to the gnathopoda; both are somewhat slighter and quite of the usual ambulatory type. The sixth, seventh, and eighth thoracic appendages resemble each other closely in general plan, but differ greatly in length, the sixth being subequal to the appendages in front of it and a little more than $\frac{1}{4}$th the body length, while the seventh is fully a third, and the eighth, a sixth, longer than the seventh. All three have the basipodites strengthened by buttress plates, those of the sixth being placed in front as well as behind the cylindrical portion of the articulus, while, in the 7th and 8th, the buttress is placed entirely behind. The basipodites certainly do

"taper" distally (as described by Milne-Edwards, Nat. Hist. des Crustacés, vol. iii, p. 31), but not so markedly as to make it a prominent characteristic. All three appendages shew also a peculiarity of the propodites, which are armed at the distal end of their anterior borders with a pair of stout blunt spines including between them a rounded depression, and giving one the impression of their being especially suited to subserve the guiding of a thread. All the thoracic appendages, except the first and last, appear to carry gill plates in both sexes.

The three anterior *abdominal appendages* are large and well developed, but are quite of the usual type. The 4th and 5th abdominal appendages are stout, the peduncle of the 5th being considerably the shorter. Their rami are subequal and styloid and are armed with stout short spines, some of which, near the ends of the rami, shew a tendency to become recurved. The peduncles also are armed with a few similar spines. The last appendage is peculiar. Its peduncle is very short and broad and armed only with a single spine at the end of its inner border. Its rami differ greatly, the inner ramus being very stout and nearly spherical and armed only with a single short spine and a few hairs, while the outer is laminar and quite smooth, and has its inner border developed into a peculiar double hook.

I think it is more than probable that this specics is identical with *A. indica*, Milne-Edwards (loc. cit.), more especially as my specimens agree in the most prominent peculiarity which the species possesses, namely, the shortness and equality of the antennæ. Milne-Edwards' species was taken on the other side of the peninsula, but, as it is thoroughly pelagic, it is probably found on both sides. His description is, however, so utterly inadequate that it would be impossible to pronounce on the point without seeing the actual specimens. He does not appear to have figured the species, and S. Bates' figure (Cat. Amph. Crust. British Museum, pl. xlii, fig. II), which is stated to have been drawn from the type in the Museum of the Jardin des Plantes, is so small and indistinct that it is impossible to draw any certain conclusions from it. As far as they go, figure and description incline me to believe that this is the same species, but in any case a more complete figure and description were a desideratum.

7. Atylus comes, n. sp., Pl. X., Figs. 8—10.

The main point of interest connected with the present species is its close superficial resemblance to, and its companionship with, *Amphithoë indica*. Several specimens were taken with the latter species, already described; but it was not until after repeated examinations that I was able to assure myself that the differences were not of a sexual value

only. This was at last negatived by the discovery of egg-bearing females belonging to both species.

The colouration of the two species is closely similar (although the *Atylus* has, if anything, a larger share of the bright yellow maculi on a brown purple ground that characterize both species) that I think that there can be little doubt that we have to do with a case of mimicry, in which case there can be little doubt that it is the *Atylus* who gains the advantage, as the *Amphithoë* is much the stouter and stronger species, and possesses the added advantage of being able to construct itself a home which makes pursuit almost futile. Whether or not the *Atylus* avails itself of deserted *Amphithoë* nests, I am unable to say, as the resemblance is so close that, until I had the whole catch under the microscope, I did not suspect that I had to do with more than a single species. I am inclined to think, however, that such must be the case, as all my brightly coloured specimens were certainly turned out of hiding places of sorts, and so think that the probable advantage that is gained by the mimicry is the facility of appropriating empty nests without being discovered as a feeble interloper by the much better armed *Amphithoë*. It seems possible too that such a habit may be more or less a generic characteristic of *Atylus*, as Liljeborg (Oefvers. Vetensk. Akad. Förhandl. p. 8, 1852) had already noticed a curious resemblance between *Amphithoë tenuicornis* and *Atylus compressus*, though there is no note as to their habits.

The species, although a slenderer animal, is about the same length (5 mm.) as *Amphithoë indica*, and has the yellow maculi somewhat larger and more regularly distributed than in that species.

The *head* is proportionally larger and deeper, being nearly cylindrical and much deeper than long. At its antero-inferior angle is carried a black-pigmented compound eye much longer than the scarlet eye of the *Amphithoe*. The cephalic shield is angulated in the middle line in front, but can hardly be said to be rostrate.

The *thorax* is small, forming considerably less than half the body length and not much exceeding the abdomen in that respect. It is much compressed, its segments being a good deal deeper than long, and its posterior segments are, if anything, shorter than those in front. The coxal plates are narrow, the anterior four being not more than half the depth of their corresponding segments and the three posterior not much more than a third the depth of the anterior coxæ.

The *abdomen* is large and deep, its three anterior segments being as long as $1\frac{1}{2}$ thoracic segments; the fourth segment is also of considerable size, equalling in length an average thoracic segment, and the last two segments are very small. The *telson* is composed of two, quite

distinct, oval leaflets, regularly articulated to the posterior border of the last segment, and capable of free motion like an appendage. It is possible that this power of thus erecting the telson may serve as a substitute for the uropodal hooks of the associated *Amphithoë*, enabling the animal to hang on to the nest it has appropriated in much the same way that species does by the latter means.

The *antennules* and *antennæ* are subequal and short, being hardly more than a third of the body length, reaching back as far as the back of the third thoracic segment.

The *antennules* have the peduncle considerably shorter than the flagellum, the first joint being long and stout, the second rather more than half the length of the first, and the third joint so small as to be almost indistinguishable from the flagellar articuli, which latter are 14—16 in number, short, and, like the peduncle, but feebly armed with a few fine hairs.

The first joint of the peduncle of the *antennæ* is hidden behind the projecting anterior border of the head and the next two are very short and stout, while the remaining two pieces are long and slender and subequal to each other and to the flagellum, which latter consists of 8—10 short articuli. Both peduncle and flagellum are somewhat more strongly armed than the corresponding parts of the antennules.

The *gnathites* are large and strong. The mandibles are simple in construction, the biting plates having a straight, unserrated cutting edge, while the triturating plate consists of a single row of simple blunt teeth arranged in a vertical series with a tuft of compound, sifting bristles behind them. They are provided with a long four-jointed appendage. The first maxilla has the inner lamella strongly toothed and almost mandibuliform, and the second maxilla has the outer ramus but little flattened, and almost palp-shaped.

The *gnathopoda* (2nd and 3rd *thoracic appendages*) are of similar form, with weak subchelæ, the protopodite being simply dilated and not produced into a distinct palm, but the anterior of the two is considerably the smaller, its length only equalling that of the head and first two thoracic segments, while the posterior is longer by the length of an additional thoracic segment. The fourth and fifth thoracic appendages are of the usual ambulatory type, but differ in length, the fourth being subequal to the second gnathopod, while the fifth, the shortest of all the thoracic appendages, is not quite as long as the first gnathopod. The remaining three thoracic appendages closely resemble each other in form, all having, as in the *Amphithoë*, dilated basipodites tapering below, and their remaining articuli long and slender. They differ, however, somewhat in length, the seventh, the longest of all the thoracic

appendages, being as long as the head and first five thoracic segments, while the eighth is a trifle shorter, and the sixth is only subequal to the second gnathopod.

The three anterior *abdominal appendages* are of the usual type and are strong and well developed. The last three appendages are strong, with the inner ramus slightly shorter than the outer, both rami being armed with stoutish spinous hairs. The three pairs of rami are subequal, but the peduncles differ a good deal in size, that of the fifth being only half, and that of the sixth only a quarter, the length of the peduncle of the fourth.

Our species differs from the hitherto described members of the genus as below : from *A. gibbosus*, *A. bispinosus*, *A. swammerdamii*, *A. villosus*, *A. carinatus*, *A. corallinus*, *A. huxleyanus*, *A. spinulicauda*, and *A. compressus*, in having no dorsal carinæ or spines ; from *A. crenulatus* and *A. austrinus* in having the antennæ subequal, and not differing considerably in length as in those species ; from *A. vulgaris* and *A. capensis* in the antennæ being considerably shorter ; and from *A. inermis*, *A. simplex*, and *A. fissicauda* in the last three thoracic appendages not being subequal, but differing a good deal in length.

8. Urothoe ruber, n. sp., Pl. XI.

This form was extremely common in the surface net takings on the banks of Chittagong, and was easily distinguished from the other organisms comprised in the catch by its bright brick red colour. Its length is about 3 mm.

Its *head* is small and somewhat olive-shaped ; the large eyes being placed rather high up on its lateral aspect.

The *thorax* is of moderate size, forming rather less than half of the body length, excluding the head. It is depressed rather than compressed and its segments increase in size regularly from before backwards. The coxal plates are deep, especially the first four ; owing to their extreme transparency it was difficult to make out the posterior ones clearly, but they appeared to be as in the figure, the 5th not being markedly small, as indicated in the generic diagnosis ; this, however, is also the case in *U. elegans* (Sp. Bate).

The *abdomen* is large, forming nearly half of the entire body length, its 3rd segment being the largest and alone as long as the head, while the 5th is the shortest of all.

The *antennule* is small, its peduncle is three-jointed and as long as the head, and its basal joint is armed dorsally with a number of plumose compound hairs. The flagellum is very small, 4-jointed, and its appendage even smaller and made up of two very slender articuli.

The *antenna* is much larger than the antennule, its peduncle alone equalling in length the entire organ, while, with its long flagellum, it slightly exceeds the animal in length. The peduncle appears to be 3-jointed from the blending of its first three pieces into one, on which the orifice of the green-gland forms a small tubercle about half along its length. The flagellum is very long, slender, and smooth.

The *gnathites* are small and feebly armed, the mandible, which is provided with a long 3-jointed appendage, armed with a number of long stiff setæ, being provided with a small cutting, and two very small triturating, lamellæ, and the maxillæ and maxillipeds exceptionally small and feeble.

The second and third *thoracic appendages* are small and slender, imperfectly subchelate and extremely hirsute. The 4th and 5th, also very hirsute, are otherwise of the usual ambulatory type, but are even shorter than the gnathopoda. The 6th has a very peculiar form. Its basipodite, short and stout, is expanded below to articulate with the much expanded ischiopodite, half way down which is a row of formidable spines; both it and the meropodite are provided with peculiar lamelliform processes on their posterior borders, from the posterior border of which, and from the inferior border of the process of the latter, spring a number of very long bipennate compound hairs. The inferior border of the propodite is similarly provided, but to a less extent. The lower borders of all the articuli are armed with a row of short stout spines. The 7th is the largest of all the appendages, and, though, in general form, it resembles the ordinary ambulatory appendage, it too is decorated, along the posterior border of the basipodite and meropodite, with long compound hairs of the same character as those on the sixth thoracic appendage. The 8th, somewhat smaller than the 7th, resembles this latter in general form, but is more feebly armed.

The three anterior *abdominal appendages* are large and powerful, and their paddles are armed with compound, plumose hairs, like those of the posterior thoracic appendages, in place of the usual simple cirrhi. The fourth is large and smooth with its rami unequal, the inner being somewhat the smaller. The fifth resembles the fourth, but is considerably smaller. The sixth is the largest of all, and, like the anterior appendages, is armed with long plumose compound hairs. Its protopodite, though short, is very stout, and its large rami are nearly equal, the outer only slightly exceeding the inner in length. The *telson* is squamiform and completely double.

In the female there is a large egg-pouch, which appears to be supplemented by the long fringe of feathery hairs from the posterior thoracic appendages, for in several cases I noticed very advanced ova entangled.

A series of transverse sections shewed the stomach to be very simple and scarcely at all armed. It was also evident that the diet of the animal consists mainly of minute marine algæ and diatoms. The peculiar fin-like form assumed by the sixth abdominal appendage no doubt subserves the almost purely surface existence which the creature appears to lead.

9. Œdicerus puliciformis, n. sp., Pl. VII, Figs. 5 & 6, ♀.

Although not in all points agreeing with the definition of *Œdicerus* as restricted in Spence Bate's Catalogue, the present species corresponds sufficently well to the genus as extended by Kossmann (Zool. Reis. ii, p. 130, 1880), who combines under *Oedicerus* the genera *Kroyera*, *Monoculodes*, and *Westwoodilla*, as well as Dana's original *Œdicerus*.

Our species resembles most nearly *Œ. æquimanus*, Kossmann, from the Red Sea (*loc. cit.*). From this, however, it differs in the proportions of the body, the thorax in Kossmann's species being relatively much larger, exceeding considerably in length the first three segments of the abdomen, while the reverse is the case in the species to be presently described.

Female specimen, carrying ova, dredged in Megna shoals, 5 fathoms. Length, about 2 mm. Colour, dirty white.

Head quadrate produced into a somewhat acute rostrum, which is fringed below with fine hairs; excluding the rostrum, it is as long as the first three thoracic segments. *Eyes* placed laterally, very small, so that they might well be overlooked.

Thorax small, forming less than a third of entire body length, the segments of about uniform depth, but increasing regularly in length from before backwards. Coxal plates small, of almost uniform depth.

Abdomen large; the first three segments alone considerably exceeding the thorax in length; fourth segment narrowed in front so as to move freely beneath the much excavated posterior part of the third: fifth and sixth segments very small. *Telson* squamiform, entire.

All the appendages are remarkable for their extreme hirsuteness, their distal parts especially being so thickly clothed with long fine hairs that their outline is very difficult to trace.

Antennules short, equalling the first five thoracic segments in length; the peduncle forms rather more than a third of their entire length.

Antennæ long, peduncle consisting of three short basal, and two longer distal, joints; flagellum slender, multiarticulate, not very hirsute; the entire organ nearly as long as the thorax and abdomen together.

Maxillipedes large and pediform. The second of the *thoracic appendages*, as long as the thorax, slender, weakly subchelate, the palm

being ill-developed and the dactylopodite smooth and unarmed. The carpopodite, however, is prolonged into a styliform process opposible to the propodite. Third thoracic appendage closely resembles the second, but has the propodite rather shorter and broader. In both these appendages the inferior border of the propodite is armed with a number of peculiar uncinate hairs. The fourth, fifth, sixth, and seventh thoracic appendages are about the same length as the gnathopoda, the fifth and sixth being slightly the longer, the seventh shorter than the rest, all closely resemble each other and are so thickly covered with hairs that their dactylopodites can only with difficulty be made out among the dense brush springing from the end of the propodite. The eighth differs much from all the preceding thoracic appendages, being very nearly as long as the entire body of the animal. Its three proximal joints are stout and armed with short, sharp spines, while the remaining articulations are filiform and clothed with long thin hairs.

The first three *abdominal appendages* are of the usual type, but are very large, the protopodites being exceptionally long and the rami broad and well armed. The last three pairs are all biramous and styliform.

Elsia, gen. nov.

For the following species I can find no genus into which it will at all well fit. The family *Platyscelidæ*, to which it undoubtedly belongs, has been divided by Professor Claus (Arb. Zool. Inst. Wien. 2, 1879) into two groups, into the second of which—characterized by the body being more or less compressed and extended, by the abdomen being long and not easily flexible on to the ventral aspect of the thorax, and by long and narrow coxal plates,—our species falls without any difficulty. Claus divides this group into three subfamilies, the *Pronoidæ*, *Lycœidæ*, and *Oxycephalidæ*. Of these three, the second corresponds best to the present species, and is thus characterized by Claus, "Body generally shaped as in *Hyperia*: abdomen can be half flexed on thorax: coxal plates of 6 and 7 thoracic appendages triangular; 8th thoracic appendage feeble. In the female the body is more compressed than in the male and the hinder antennæ usually aborted." Claus enumerates the following genera as belonging to this subfamily, *Thamyris*, *Lycœa*, *Simorhynchus*, *Pseudolycœa*, *Paralycœa*, and *Lycœopsis*. The present species corresponds to none of these, although it approaches most nearly to *Pseudolycœa*. From this, however, it differs in the following points.

α. The parts near the mouth are *not* "produced into a sort of snout."

β. Eyes large, but do not cover the whole extent of head.

γ. Gnathopoda *not* simple and claw-shaped, but complexly subchelate.

These differences are so considerable that I feel constrained to propose for it a new genus, characterized as below.

Antennules short, hidden by the cephalon. *Antennæ* obsolete (in the female). Second and third *thoracic appendages* small, subequal, subchelate, the palm of their forceps formed by the prolonged posterior inferior angle of the carpopodite; sixth and seventh pairs larger than the rest: hindermost pair very small, the basopodite alone well developed, while the distal joints are very small and ill-defined. Fourth and fifth *segments of pleon* fused together.

10. Elsia indica, n. sp., Pl. VI., Figs. 2—4, ♀.

A single specimen (female) was taken in the surface net in Bombay Harbour.

Total length about 4 mm.

Colour deep sepia-brown throughout, without spots or blotches.

Head ovate, prolonged in front into a sort of proboscis, the lower surface of which is hollowed out; at the back of its lateral faces are the large compound eyes.

Thorax much compressed forming nearly half of the entire body length. Coxal plates not markedly differing in depth, the fourth and fifth being somewhat the deepest, while those in front of and behind these gradually diminish. The last three segments are subequal and larger than the rest, the first especially being very narrow.

Abdomen broader and less compressed than the thorax and as long as the last four segments of the latter. The first three segments subequal and larger than any of those preceding them. The fourth and fifth blended together, not half as long as the third, and the sixth very small.

The *antennules* are very short, consisting of a peduncle formed of three short, but stout, joints and a rudimentary flagellum consisting of two pieces, of which the first is tumid and pear-shaped, and the second slender and digitiform. The last joint of the peduncle and the first flagellar articulation are furnished with a few short soft hairs.

Antennæ obsolete.

The *gnathites* generally, including the maxillipedes, appear small and ill-developed.

The second and third *thoracic appendages* are small and subequal, the hinder being but a trifle the larger, neither approaching the head in length. They closely resemble each other, having a complex unarmed subchela formed by the prolongation of the antero-inferior angle of the carpopodite opposed to the somewhat dilated propodite, and the dactylopodite being small and claw-shaped. The fourth and fifth pair are

subequal, simple, and slender, and as long as the first five thoracic segments ; the posterior border of their propodites are weakly denticulated. The sixth and seventh pair closely resemble each other, but the sixth is somewhat the larger, being as long as the entire abdomen. Their basipodites are short and broad and the anterior border of their propodites is markedly denticulated. The eighth is much smaller, and more than half its length is formed by the broad and fairly stout basipodite, the remaining articulations being very small and scarcely definable from each other. In all the thoracic appendages the dactylopodite is extremely minute. Simple *branchial sacs* are attached to the 5th, 6th, and 7th thoracic appendages.

The first three *abdominal appendages* are stout, their protopodites being especially long, while their rami are short and but ill-provided with marginal hairs. The last three pairs are stout with styliform rami ; all three reach to an equal length beyond the posterior extremity of the abdomen.

11. Caprella madrasana, n. sp., Pl. XII, Figs. 1 & 2, ♂ ♀.

Three specimens of this form, two males and one female, were taken in the drift net lowered nearly to the bottom in 6—9 fathoms off the "Seven Pagodas" Madras, and afterwards in a similar depth in Palk's Straits.

The animal (with the exception of the eye, which is of a deep purple tint) is of a dirty white colour throughout, and is very small, the males measuring only 3 and the females only 4 mm. in length ; and in general outline resembles *C. linearis*, although its nearest ally is probably *C. geometrica*. The body is quite smooth without tubercles or spines, the *head* is rounded and unprovided with any rostrum, and presents a somewhat pear-shaped outline when viewed laterally, being deeper than long.

The first segments of the *thorax* are very long and slender in both sexes, the first being as long as the head and united to it by a visible, but apparently immovable, suture. The second is as long as the head and the first segment together, and the third, fourth, and fifth progressively longer, the last forming $\frac{2}{9}$ths of the entire length of the animal. The sixth segment is nearly as long as the second, and the seventh very short.

The rudimentary *abdomen* is represented only by two or three very indistinct rings, and no rudiments of its appendages can be made out with the exception of a short projection armed with a small articulus (or hair ?) from the penultimate ringlet.

The *antennule* is more than $\frac{1}{3}$rd as long as the body, reaching back as far as the origin of the first pair of branchial sacs. Rather more than half its length is formed by the three-jointed peduncle, whose middle articulus is much the longest, the third joint being very short. It is nearly naked, being armed only with a very few fine, short hairs. The flagellum consists of five joints, of which the first is much the longest, exceeding a good deal, in this respect, the last joint of the peduncle; each joint is armed with a small hair on its distal extremity above, and with a pair of soft flattened hairs below, the first articulus having two additional pairs of such hairs at equal distances along its lower border indicating probably that the flagellum grows from its base by the intercalation of additional articuli, as my second male specimen has this joint longer than in that figured presenting an additional pair of hairs, the last being opposite a very indistinct line of division.

The *antenna* is somewhat shorter than the antennule, being but $\frac{2}{7}$ths the total length of the creature; the peduncle is five-jointed, the first two joints being stout, but very short, while the third is but little longer and as slender as the last two articuli, which are very long and subequal and together make up $\frac{2}{3}$rds of the entire length of the organ. The flagellum consists of two stout articuli, and, like the peduncle, is armed, more especially along its inferior border, with strong simple hairs.

The *gnathites* appear to be of normal form, the mandibles being provided with a large palp, and the maxillipeds, small, but of pediform outline and clawed.

The second *thoracic appendage* is small and takes its origin from the anterior border of the segment, close to the maxillipeds. It is only as long as the third thoracic segment and is but feebly subchelate, the propodite being but little dilated. It has, however, some amount of grasping power, as the posterior border of the propodite is armed with a ridge divided into peculiar square-topped teeth, and the dactylopodite is provided with a number of stout tubercular spines. The third thoracic appendage is the longest and largest of the appendages, and, though no true palm is developed, is more strongly subchelate than its predecessor; the propodite being much dilated and armed with a peculiar downwardly directed tooth about its middle, and further provided, at the proximal end of the same margin, beyond the reach of the opposition of the dactylopodite, with a strong tubercle armed with a stout spine exactly like those on the propodites of the posterior thoracic appendages by which the animal fixes itself. The third and fourth thoracic segments have no appendages except a pair of simple laminar gill-sacs. The sixth pair of appendages is very weak, but little

longer than the segment from which it springs, and quite of the usual ambulatory type. The seventh and eighth pairs are large and powerful and are used by the animal to anchor itself to any suitable object; they resemble each other closely in general form, but the eighth is much the larger, the seventh being only as long as the 1st and 3rd thoracic segments, while the eighth is as long as the 2nd, 3rd, and 4th thoracic segments together. Each has the basipodite rather stout and the meropodite and carpopodite of very moderate size, the main part of the length of these appendages being formed by the propodite and dactylopodite, which are of great size and strength; the dactylopodite being stout and falciform, and the propodite being provided at its proximal extremity with a tubercle and spine like that already described as similiarly situated on the 3rd thoracic appendage. By means of the grasp obtained between this and the point of the dactylopodite, the animal is able to attach itself to such comparatively smooth surfaces as the interior of a leaden ring which formed the walls of the cell in which it was confined.

The female differs from the male in the following points :—

1st. She is larger and proportionately stouter.

2nd. She is provided with an egg-pouch attached to the 3rd and 4th thoracic segments. This is large and deep; the laminæ of the 3rd segment being directed downwards and backwards, and their posterior border overlapped by those springing from the 4th segment. During life these laminæ are kept in constant motion so as to produce a continuous current of water round the contained ova.

3rd. No trace of the abdomen or its appendages can be made out.

Observing the living animal, I was much struck with the activity of its circulation, which is much more active than in any other amphipod that has come under my notice, the lymph current flowing as rapidly as in the highest crabs.

12. Caprella palkii, n. sp., Pl. XII, Fig. 3.

This species closely resembles the preceding, so much so that, a single immature female only having been obtained, I am in some doubt as to whether or not it is a distinct species or merely a stage of *C. madrasana*. On the whole, however, I am inclined to think that it is specifically distinct.

The specimen was dredged in 7 fathoms in the mouth of Palk's Straits, and was clinging to some Sargassum weed. The differences between the two species are as follows :—

1st. The 1st thoracic segment is proportionally shorter.

2nd. The 3rd and 4th thoracic segments are each armed with two

stout, forwardly directed, dorsal spines, one situated about the middle of the segment, and the other at its hinder edge.

3rd. There is more difference between the antennæ, the superior pair being proportionally larger.

4th. The 2nd thoracic appendage has its propodite better developed.

5th. The 3rd thoracic appendage is somewhat smaller.

EXPLANATION OF THE PLATES.

Plate VI.

Fig. 1. *Anonyx amaurus*, × 12. The dotted line beneath the body shews the outline of the brood-pouch. The coxal plates are represented as semitransparent, in order to shew the form of the parts beneath; they are in point of fact, however, quite opaque. Fig. 2. *Elsia indica*, ♀, × 24. Fig. 3. Antennule, × 100. Fig. 4. One of the gnathopods, × 100.

Plate VII.

Fig. 1. *Microdeutopus megnæ*, ♂, × 11. Fig. 2. Gnathopoda of female, × 11. Fig. 3. Mandible and its appendage, × 40. Fig. 4. Pediform ramus of the maxilliped, to shew its relative proportions to the mandibular palp, × 40. Fig. 5. *Œdicerus puliciformis*, × 19. Fig. 6. Terminal joints of gnathopoda, × 50. Fig. 7. *Concholestes dentalii*, × 10. Fig. 8. Head, seen from above, × 10. Fig. 9. Subchela of 2nd gnathopod, × 50. Fig. 10. Distal joints of 6th thoracic appendage, × 50. Fig. 11. Last three abdominal segments, × 40. Fig. 12. *Monoculodes megapleon*, × 12.

Plate VIII.

Fig. 1. *Ampelisca lepta*, × 20. Fig. 2. Last three abdominal segments and appendages, × 40. Fig. 3. The mandible and its appendages, × 40. Fig. 4. Sifting plate of mandible, × 200. Fig. 5. Cutting plate of mandible, × 200. Fig. 6. 1st maxilla, × 40. Fig. 7. 2nd maxilla and maxilliped, × 40. Fig. 8. One of the rami of 2nd maxilla, × 100. Fig. 9. Imperfect subchela of 2nd thoracic appendage, × 100. Fig. 10. Ramus of one of posterior abdominal appendages, × 100.

Plate IX.

Fig. 1. Transverse section of head (× 100) of *A. lepta* at the level of the upper pair of eyes; (*a*) chitinous coat of animal, (*b*) lens, (*c*) lens of the other side dislocated and shrunken with contained fluid oozing out, (*d*) epithelial layer of dermis deeply pigmented to form a sort of iris, (*e*) retina. Fig. 2. A portion of retina of preceding, × 600; (*a*) deepest layer of spindle-shaped bodies, (*b*) middle layer of nucleated rods divided below into fibres inosculating with ends of the preceding layer, (*c*) deeply pigmented rods external to middle layer, (*d*) epithelial layer of dermis. Fig. 3. Vertical longitudinal section of head of *A lepta* × 100, cut a little to one side of the middle line in the plane of the inner pair of eyes; (*a*) inner eye, (*b*) cerebral nervous mass (the upper

of the two dotted lines from (*b*) points to the centre of the inner eye, the lower to that of the inferior antenna; between them is seen a smaller projection, that of the external eye), (*c*) anterior portion of œsophageal nervous collar, (*d*) the green-gland, (*e*) the cavity of the mouth, (*f*) cavity of the gizzard, (*g*) sifting stomach, (*h*) the liver, (*k*) anterior part of dorsal vessel, (*m. m.*) masses of plasmic cells surrounding the nervous centres, (*z. z.*) muscles of the gizzard. Fig. 4. Diagrammatic median section of *A. lepta* to shew arrangement of the parts of the intestinal canal. The thick line shews the external integument, the thin, the fore-gut, the dotted line the mid-gut. Fig. 5. Transverse section head of *A. lepta*, at the level of the passage between the gizzard and the "sifting stomach;" (*f*) gizzard, (*g*) sifting stomach, × 180. Fig. 6. Semi-diagrammatic transverse section of the basal portions of a thoracic appendage, × 60; (*a*) pleuron of segment, (*b*) coxa, (*c*) basipodite, (*d*) gill-plate.

Plate X.

Fig. 1. *Amphithoë indica*, M.-Edw., × 20. Fig. 2. Mandible, × 70. Fig. 3. Maxilliped, × 70. Fig. 4. 1st Gnathopod × 70. Fig. 5. 2nd ditto, × 70. Fig. 6. Distal joints, 5th and 6th thoracic appendages, × 70. Fig. 7. Last three abdominal segments and appendages, × 70. Fig. 8. *Atylus comes*, × 20. The specimen figured was somewhat smaller than that of *Amphithoë indica*, but the difference is an individual not a specific character. Fig. 9. Last three abdominal appendages, × 60. Fig. 10. One of the compound branchial plates, × 60.

Plate XI.

Fig. 1. *Urothoë rubra*, × 30. Fig. 2. Flagellum and appendages of antennule, × 200. Fig. 3. Mandible, × 100. Fig. 4. 6th thoracic appendage, × 100. Fig. 5. Last three abdominal segments, × 100. Fig. 6. Transverse section through animal in hinder thoracic region; (*a*) coxa, (*b*) gill-laminæ, (*c*) nerve-ganglion, (*dd*) ovarian tubes, (*e*) intestine, (*f*) heart, (*g*) digestive glands - "liver."

Plate XII.

Fig. 1. *Caprella madrasana*, ♂, × 36. Fig. 2. *Caprella madrasana*, ♀, × 36. Fig. 3. *Caprella palkii*, × 36.