

XX NOTES ON CRUSTACEA DECAPODA
IN THE INDIAN MUSEUM.

VI, INDIAN CRANGONIDAE.

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(Plate VIII.)

The number of Crangonidae known from Indian seas has been considerably increased by recent work in shallow water on various parts of the coast. In dealing with the additional material that has come to hand I have thought it useful to include references to all the known Indian forms and to construct keys to facilitate the identification of the species of *Pontophilus* and *Aegeon*.

Six species hitherto unknown are described, all belonging to the genus *Pontophilus*, while, thanks to the assistance of Dr. W. T. Calman, I have been able to rectify certain errors in the nomenclature of two species of *Aegeon*.

In a previous paper in this series¹ I expressed the view that *Philocheras*, Stebbing (= *Cheraphilus*, Kinahan, *partim*) could not be sustained as a distinct genus, but must be merged in *Pontophilus*. In examining the new forms of this genus a point hitherto overlooked has come to light, namely, that in certain species there are considerable differences between the sexes in the form of the pleopods. The modifications of these appendages are not only of interest as evidence of the affinities of the different species, they also, as it appears to me, afford a valuable clue to the origin of the various genera of the family and point to lines of descent very different from those suggested by Ortmann in 1890. I have thought it best to discuss the structure of these appendages and the phylogenetic conclusions which may be derived from them under a separate heading at the end of the paper.

In all eighteen species of Crangonidae are now known from Indian waters, ten belonging to the genus *Pontophilus*, six to *Aegeon* and one each to *Prionocrangon* and *Crangon*.

Genus *Pontophilus*, Leach.

The six undescribed Indian species of this genus were obtained, two from Kilakarai at the northern end of the Gulf of Mannar

¹ *Rec. Ind. Mus.*, VI, p. 5 (1911).

and four from Port Blair in the Andamans. One of the new forms, *P. incisus*, is a very close ally of the Atlantic and Mediterranean *P. sculptus*, the remainder are sharply distinguished from all species previously described by well-marked characters found in the sculpture of the carapace and abdomen and in the form of the rostrum, lateral process of the antennule, antennal scale and first two pairs of legs.

In some of the species there are considerable differences between the sexes in the form of the last four pairs of pleopods, a feature discussed in detail on p 381, and other sexual distinctions of an unusual nature are met with in *P. lowisi* and *P. candidus*. In the former the antennal scale, which is remarkable for the possession in both male and female of a series of spinules on its outer margin, shows wide differences in form in the two sexes. In the latter a conspicuous spine in the mid-dorsal line of the carapace is present in the male and absent in the female, a remarkable distinction when the great constancy of the armature of the carapace in other species is remembered.

The ten Indian species of *Pontophilus* may be distinguished thus :—

- I.—First peraeopods with rudimentary exopod ; second peraeopods very short, not reaching distal end of merus of first pair, their chela well formed with curved fingers ; lateral process of antennular peduncle styliform, much longer than broad.
 - A. Median carina of carapace with two spines ... *gracilis*, Smith.
 - B. Median carina of carapace with three spines ... *abyssi*, Smith.
- II.—First peraeopods without exopod ; second peraeopods longer, reaching beyond carpus of first pair, their chela ill-formed with parallel fingers ; lateral process of antennular peduncle not styliform, usually subquadrate and broader than long.
 - A. A median longitudinal carina on carapace and on 3rd, 4th and 5th abdominal somites [rostrum broad distally, anterior margin squarely truncate or concave].
 1. Outer margin of antennal scale armed with a spine or a series of spinules in addition to a terminal spine.
 - a. Carapace with five carinae bearing spines ; a single additional spine on outer margin of antennal scale, placed near base ; merus of first peraeopods with a single spine at distal end of outer margin ; first four abdominal somites with strong lateral sculpture ... *incisus*, sp. nov.
 - b. Carapace without spines and without lateral carinae ; a series of spinules on outer margin of antennal scale ; merus of first peraeopods with three spines at distal end of outer margin ; lateral sculpture of first four abdominal somites feeble ... *lowisi*, sp. nov.
 2. Antennal scale without additional spines on outer margin ; [carapace with spines and lateral carinae ; first four abdominal somites with strong lateral sculpture.] ... *sabsechota*, Kemp.
 - B. No median longitudinal carinae on carapace or abdomen.

1. Lateral margins of rostrum anteriorly divergent; apex broad, squarely truncate [carapace with one mid-dorsal spine in male only; two pairs of lateral spines in both sexes] *candidus*, sp. nov.
2. Lateral margins of rostrum anteriorly convergent, apex narrow, rounded or pointed.
 - a. Rostrum of good size, separating the eyes; carapace with one or more teeth in median line; dactylus of second peraeopods not narrower than fixed finger.
 - i. Carapace pubescent with three teeth in mid-dorsal line [four pairs of lateral teeth on carapace; lateral process of antennular peduncle anteriorly spinose] *pilosus*, sp. nov.
 - ii. Carapace not pubescent with only a single tooth in mid-dorsal line.
 - α. Three pairs of lateral teeth on carapace; lateral process of antennular peduncle anteriorly pointed; "thumb" of subchela formed of a single articulated tooth *plebs*, sp. nov.
 - β. No lateral teeth on carapace; lateral process of antennular peduncle anteriorly truncate; "thumb" of subchela formed of two teeth, closely juxtaposed and not articulated *hendersoni*, Kemp.
 - b. Rostrum exceedingly small, eyes contiguous; carapace without teeth in median line; dactylus of second peraeopods very slender, less than half the breadth of fixed finger *parvirostris*, sp. nov.

***Pontophilus gracilis*, Smith.**

1901. *Pontophilus gracilis*, Alcock, *Cat. Indian deep-sea Crust. Macrura and Anomala*, p. 115.
1905. *Pontophilus gracilis*, Stebbing, *Marine Invest. S. Africa*, IV, p. 49, pl. xxv.

***Pontophilus abyssi*, Smith.**

1901. *Pontophilus abyssi*, Alcock, *Cat. Indian deep-sea Crust. Macrura and Anomala*, p. 116.

***Pontophilus incisus*, sp. nov.**

(Plate viii, fig. 1.)

The rostrum is longitudinally channelled; its sides are almost parallel and its distal border, in dorsal view, is strongly concave. The actual apex is rounded, but is abruptly deflexed at a right angle and can therefore be seen only from in front. The sides of the rostrum and the orbital margins are clothed with long hairs which partially conceal the eyes.

On the carapace a shallow groove extends transversely across the base of the rostrum. In the mid-dorsal line there is a rather obscure interrupted carina composed of four short ridges. The first of these ridges ends anteriorly in a conspicuous tooth just behind the transverse groove mentioned above; the second, which is very feebly developed, usually terminates in a minute denticle; the third is

well elevated and its margin in lateral view is a little uneven; the fourth is distinct and ends abruptly. The first lateral carinae are not parallel; but converge anteriorly. Each is composed of a number of short ridges ending anteriorly in denticles. The foremost ridge is short and terminates in a comparatively large tooth placed a little behind the first of those in the median line. The small teeth or denticles on the two ridges posterior to it are also well formed, while the remainder are minute and can only be seen with difficulty. At the posterior end of the carapace there are a few additional short ridges, some bearing denticles, between the median and the first lateral carinae. The second lateral carina is also

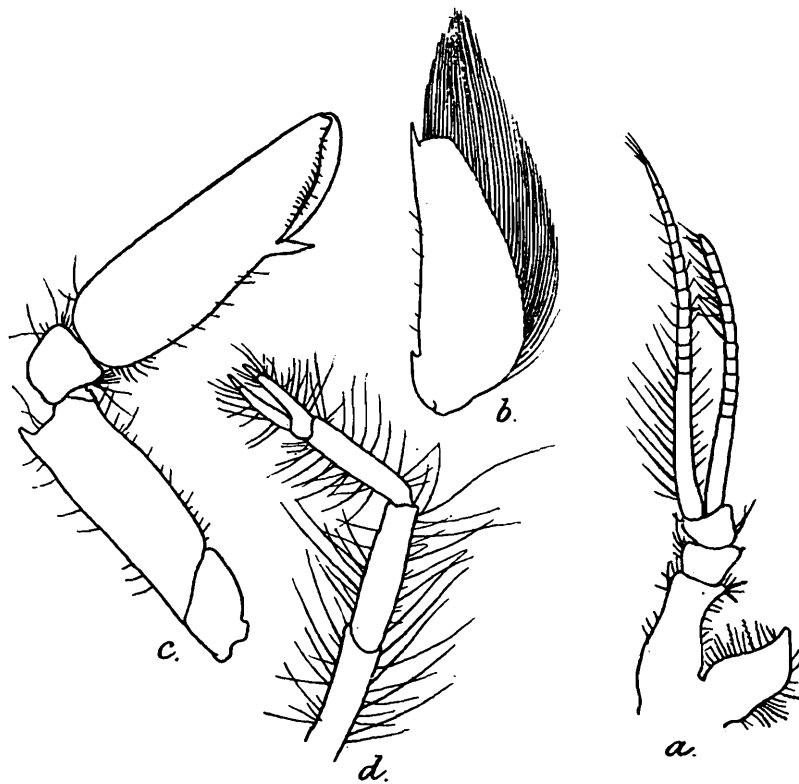


FIG. 1.—*Pontophilus incisus*, sp. nov.

a. Antennule.

b. Antennal scale.

c. First peraeopod.

d. Second peraeopod.

composed of interrupted ridges, the foremost ending in a stout hepatic tooth situated in advance of the primary median tooth. The ridge flanking the hepatic tooth is comparatively long and is succeeded by another, also of considerable length, which ends in a conspicuous tooth; the remaining ridges, three or four in number, are short and each may or may not bear a small denticle. There are sharp orbital and branchiostegal spines, the latter being the longer and extending beyond the level of the rostral apex. Except for the ridges, the entire carapace is covered with a fine pubescence and also, in many cases, bears several upstanding tufts of long setae.

The corneal portion of the eye is reniform in outline. The basal segment of the antennular peduncle (text-fig. 1a) is longitudinally keeled below and usually bears a small tooth near its proximal end. Its lateral process is transversely oblong with the outer distal angle somewhat drawn out and projecting forwards. The second and third segments of the peduncle are extremely short, the two combined being scarcely half the length of the first.

The antennal scale (text-fig. 1b) is broadest near the base and is narrowed strongly towards the apex. It is about three times as long as broad and the short spine which terminates its outer margin extends by almost its whole length beyond the apex of the lamella. On the outer margin, at the end of the proximal quarter is a single stout tooth, recalling that found in *P. sculptus*, but placed much nearer the base. The margin behind this tooth is strongly convex and that in front of it slightly concave.

The outer maxillipedes reach beyond the tip of the antennal scale by almost the entire length of the ultimate segment.

The first peraeopods (text-fig. 1c) are a little shorter than the outer maxillipedes and do not possess exopods. The spine on the outer margin of the merus is strong and, as in *P. sculptus*, is terminal in position. On the distal margin of the carpus there are two external spines. The propodus is nearly three and a half times as long as wide and the "thumb" of the subchela is exceptionally large and strong. At their base the first peraeopods are separated, in both sexes, by a sharp forwardly directed sternal tooth.

The second peraeopods (text fig. 1d) are clothed with long hairs and reach beyond the end of the carpus of the first pair by almost the entire length of the chela. The carpus is about one fifth shorter than the merus and nearly one fifth longer than the chela. The chela, as in allied species, is weakly constructed, without incurved claws at the apex. The fingers are of equal breadth and length and the palm is exceptionally short, occupying only about one fifth the length of the chela.

The slender third peraeopods reach beyond the tip of the antennal scale by the two terminal segments and by one third the length of the carpus. The latter segment is nearly one and a half times the length of the merus, twice the length of the ischium and one and a half times the length of the propodus and dactylus combined. The propodus is equal in length with the ischium and is two and a half times as long as the dactylus.

In the last two peraeopods, which are similar, the four distal segments are practically glabrous; those of the fourth pair reach beyond the antennal scale by the length of the dactylus. The merus in this pair is a trifle longer than the dactylus, four fifths the length of the propodus and nearly twice as long as the carpus. The dactylus is almost three quarters the length of the propodus.

The abdominal segments are deeply grooved and incised, much as in *P. sculptus*, the depressed portions being pubescent and the raised portions glabrous. On the first five somites the sculpture is

transverse for the most part; but there is a sharp longitudinal mid-dorsal carina in the posterior three quarters of the third somite, a pair of juxtaposed carinae, fused posteriorly, in the same position on the fourth somite and a similar pair of carinae, slightly divergent posteriorly, on the fifth. On the sixth somite the only sculpture consists of a pair of longitudinal carinae separated by a broad flat interspace. The pleura of the first four somites are pointed below, bluntly in the female, rather more sharply in the male.

The pleopods show marked sexual differences. In the male the endopod of the last four pairs is comparatively well developed and possesses an appendix interna. In the female the endopod is reduced in size and is extremely small in the case of the last pleopod: the appendix interna is present in the second pair, but is much smaller than in the male; in the third and fourth pairs it is quite rudimentary and from the fifth it is entirely absent.

The outer uropod is shorter than the inner and is very slender, nearly four times as long as broad. The telson is scarcely longer than the inner uropod and is also very slender. It is sulcate above and bears two pairs of small dorso-lateral spinules. The lower edges are fringed with long setae and distally it terminates in a sharp point, flanked by a pair of short spinules and bearing two pairs of long finely plumose setae.

Large females reach a length of 18 mm.; the males are smaller, not exceeding 15 mm., and are apparently much less abundant. The eggs are about 0.4 × 0.3 mm. in longer and shorter diameter.

Pontophilus incisus is a remarkably close ally of *P. sculptus*, Bell, a species known from the Mediterranean and from the French and British coasts.¹ In all conspicuous characters there is a very close similarity between the two forms, but differences in detail are sufficiently numerous to justify their specific separation. In *P. incisus* there is only one strong tooth in the mid-dorsal line of the carapace, whereas in *P. sculptus* there are almost invariably two. In *P. incisus*, also, the antennal scale is narrower and the tooth on its outer margin is placed near the base instead of in the middle. In both species the spine on the outer margin of the merus of the first peraeopods is terminal and not sub-terminal as in some other species of the genus; in *P. incisus*, however, the anterior edge of the merus between this spine and the articulation of the carpus is entire, bearing only a few hairs, whereas in *P. sculptus* two or three additional spines are found in this position. In *P. incisus*, moreover, the lateral process of the antennular peduncle is more pointed distally, the subchela is more slender, the palm of the second peraeopods shorter and the dactyli of the last two peraeopods comparatively longer.

In a previous paper² I have remarked on the presence of the appendix interna in *P. sculptus*; but I failed to notice that in the

¹ I have compared the Indian species with specimens of *P. sculptus* from the Irish Sea.

² Kemp, *Rec. Ind. Mus.*, VI, p. 10 (1911).

development of this appendage there were marked sexual differences. The condition in *P. sculptus* is, in fact, precisely the same as has been described above in the case of the related Indian form.

As regards the characteristic tooth on the outer edge of the antennal scale, I noted, in the paper cited above, that it was apparently absent in a single Mediterranean example of *P. sculptus* preserved in the Indian Museum. Further examination of this individual shows that the tooth is indeed present, but situated at the proximal end of the scale. The specimen is, in fact, in all points identical with the types of *P. incisus* and differs from *P. sculptus* in the characters noted above. It is labeled "Mediterranean" without more precise locality and is said to have been received from E. Cornalia, from whom Wood-Mason obtained a large number of Mediterranean Decapoda. From Heller's description,¹ however, it seems clear that the true *P. sculptus* occurs in the Mediterranean, for in his description of the antennal scale he says "am Seitenrande ausser dem endständigen stachel mit einem zweiten beiläufig in der Mitte." It is probable therefore that some mistake has arisen and that the specimen, said to have been found in the Mediterranean, was in reality obtained in Indian waters.

In life *Pontophilus incisus* is closely mottled with dark grey and brown, the colouration being apparently protective.

All the specimens in the collection are from the Andaman Is.—

$\frac{9027}{6}$	Andamans, 20 fms.	Investigator.	1, 10 mm.
$\frac{9070}{10}$	Port Blair, Andamans, 2-12 fms.	S. Kemp.	41, 7-18 mm.

The specimens from Port Blair, among which the types of the species (9070/10) are included, were obtained in the channel off Ross I. on a rough bottom composed of sand, stones, shells and coral.

Pontophilus lowisi, sp. nov.

(Plate viii, fig. 2.)

The rostrum is longitudinally channelled above; its lateral margins are curved and strongly divergent distally. The anterior margin is very broad and, in dorsal view, a little concave. The true apex is sharply deflexed; it has a rounded margin and is visible only from in front.

On the carapace there is no trace of the transverse groove behind the rostrum which occurs in most species. In the mid-dorsal line there is a longitudinal carina which extends close up to the base of the rostrum. Throughout the greater part of its length this carina is obscure; but for a short distance just behind the middle of the carapace it is sharp and well defined and owing to its greater elevation is distinct in lateral view. A feeble groove runs obliquely forwards and downwards on either side of the cara-

¹ Heller, *Crust. südlich. Europa*, p. 228 (1863).

pace terminating just above the sharp branchiostegal spine. This spine reaches to the level of the rostral apex and extends far in advance of that which defines the outer orbital angle. Except for those on its frontal margin the carapace is entirely devoid of spines and, except for that in the mid-dorsal line, it is without carinae. The carapace does not appear to be pubescent.

The basal segment of the antennular peduncle is about one and a half times the length of the second and third combined; its lateral process is oval (text-fig. 2a).

The antennal scale differs notably in the two sexes. In the female (text-fig. 2b') it is scarcely more than twice as long as broad

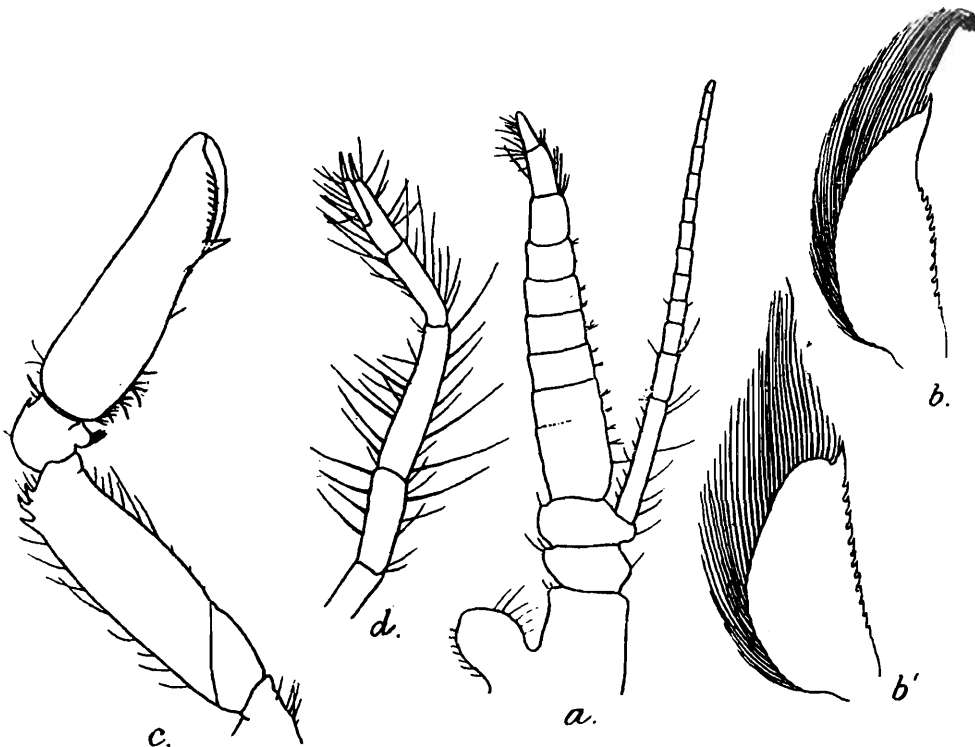


FIG. 2.—*Pontophilus lowisi*, sp. nov.

- | | |
|----------------------------|-------------------------------|
| a. Antennule. | b'. Antennal scale of female. |
| b. Antennal scale of male. | c. First peraeopod. |
| d. Second peraeopod. | |

and the lamella, though narrowed, is of considerable breadth at its distal end. In the male (text-fig. 2b), it is almost three times as long as broad and the lamella slopes sharply away from the base of the distal tooth. The outer margin in both sexes bears numerous spines, in this respect differing from all known species of the genus. In the female the margin is straight or very slightly concave and bears some 12 or 13 spines which increase in size from behind forwards. In the male the margin is strongly sinuous, convex in the middle and concave towards the distal end. It bears from 9 to 11 spines, similar to those of the female, but they are restricted to the basal convex portion of the margin and do not extend on to the concave part nearer the apex.

The third maxillipedes reach almost or quite to the end of the antennal scale. The combined length of the two subequal distal segments is not greater than that of the antepenultimate. The latter segment bears a few small spinules at the distal end of its lower margin and the exopod, when naturally flexed, reaches but little beyond the middle of its length.

The first peraeopods (text-fig. 2c) reach a little further than the third maxillipedes. The merus at its outer distal angle bears three stout curved spines and there is a single external spine near the distal end of the carpus. The subchela is a little more than three times as long as broad; the "thumb" is large and sharp as in *P. incisus*. The first legs are separated at their base by a large forwardly directed sternal tooth.

The second peraeopods (text-fig. 2d) are clothed with long hairs and reach beyond the carpus of the first pair; the merus is as long as the carpus and chela combined, the carpus is one and a third times the length of the chela and the fingers are a little less than one and a half times as long as the palm. Each finger bears a slender spine at its apex, but the spines are not curved and the claw is apparently without cutting edges. The fixed finger is a little broader than the dactylus.

The third peraeopods reach beyond the antennal scale by the length of the two ultimate segments. The proportions are much the same as in *P. incisus*, but the propodus and dactylus are comparatively a trifle longer, their combined lengths being almost three quarters that of the carpus.

The fourth and fifth pairs bear scattered setae on the propodus. The fifth reach beyond the scale by about half the length of the dactylus. The propodus in this limb is two and a half times the length of the carpus and is a quarter longer than the subequal merus and dactylus. Seen under a high power of the microscope the anterior margins of the merus and carpus have a roughened appearance, as though they were studded with small tubercles.

The abdomen in a dried specimen shows faint indications of sculpture, very shallow transverse grooves and elevations being visible on the first four segments. In the posterior half of the second somite and over the greater part of the third and fourth there are sharp longitudinal mid-dorsal carinae. Those on the second and third somites are simple, but that on the fourth is longitudinally grooved in the middle and thus has the appearance of a double carina fused at either end. There are two short dorsal carinae on the fifth somite and a pair of similar widely-separated carinae, which are exceedingly obscure, on the sixth. The pleura are not pointed inferiorly.

The pleopods of the male resemble those of *P. incisus*, the endopod of the last four pairs is well developed and carries an appendix interna. In the female, as in *P. incisus* and *P. sculptus*, the endopod is greatly reduced and the appendix interna, found in those species in a rudimentary condition on the second, third and fourth pairs, is entirely suppressed.

The outer uropod is a little shorter than the inner and bears long setae on its outer, as well as on its inner margin; it is a little more than three times as long as broad. The telson reaches about to the apex of the inner uropod; it is deeply sulcate above with two pairs of dorso-lateral spinules and in the form of its apex resembles *P. incisus*.

This species is, I believe, the smallest known Macruran. It is smaller even than *P. sabsechota*, Kemp, the largest individual in the collection, an ovigerous female, being slightly less than 7.5 mm. in total length. The eggs are comparatively large for such a small species; when not eyed and to all appearances freshly extruded they are about 0.34×0.27 mm. in longer and shorter diameter; when fully eyed and ready to hatch they measure about 0.48×0.36 mm.

Pontophilus lowisi is perhaps distantly related to *P. bidentatus*, de Haan¹, and *P. japonicus*, Doflein², but from both these species it differs conspicuously in the form of the carapace and in the presence of a series of spines on the outer edge of the antennal scale.

The colouring of the species differed considerably in specimens from different localities. Individuals found on a muddy bottom were for the most part densely pigmented with grey and brown, the last abdominal somite and tail-fan being colourless except for a dark transverse band on the latter. Specimens from sandy ground were much lighter in colour, often quite pale and sometimes with one or two transverse brown bands. In one example from this type of bottom the pigmentation is very peculiar, the carapace being deep amber brown, the abdomen white with transverse bars of brown on the fifth somite and tail-fan and the antennules bright red.

$\frac{9074}{10}$ Port Blair, Andamans, 3-12 fms. S. Kemp. 69, 4.5-7.5 mm.

Specimens were found off Ross I. and in various other parts of the harbour, but were most abundant at the inner end on a muddy bottom. The types of the species are numbered 9074/10 in the Indian Museum register.

With this species I have associated the name of Mr. R. F. Lewis, Deputy Superintendent of Port Blair, to whom I am much indebted for assistance during my visit to the Andamans.

Pontophilus sabsechota, Kemp.

1911. *Pontophilus sabsechota*, Kemp, *Rec. Ind. Mus.*, VI, p. 6, pl. ii, figs. 11-14.

A male from Port Blair, only 8 mm. in length, agrees in most particulars with the type, a female. The distal margin of the

¹ De Haan, in Siebold's *Fauna Japonica*, p. 183, pl. xlv, fig. 14 (1849) and Balss, *Abhandl. math.-phys. Klasse K. Bayer. Akad. Wiss. München*, Suppl. Bd. II, p. 68, text-fig. 41 (1914).

² Doflein, *Abhandl. math.-phys. Klasse K. Bayer. Akad. Wiss. München*, XXI, p. 621, pl. iii, fig. 6, and text-fig. p. 622 (1902).

rostrum is, however, more definitely concave in dorsal view and the anterior tooth of the second lateral carina of the carapace is less acute. The outer margin of the merus of the first legs terminates in a small spine and two similar spines exist between it and the articulation of the carpus: these spines do not exist in the type. The dactylus of the second legs is proportionately shorter than in the female, less than twice the length of the palm. The dorsal carina of the fourth abdominal somite is feebly channelled longitudinally; that of the fifth is similar in its anterior half, but posteriorly it is split into two divergent branches. On either side of the median line in the third, fourth and fifth somites are short but well defined carinae, which are transverse on the third but take a more oblique direction on the two succeeding somites. In the type specimen these lateral carinae are obsolete and the median keel of the fourth somite does not appear to be bifurcated posteriorly. In the pleopods there is a wide difference between the sexes. The endopod of the last four pairs is well developed in the female; but in the male is exceedingly small in the second, third and fourth pairs and is entirely absent from the fifth.

In life the male was almost pure white in colour with a black spot in front of the median tooth of the carapace, a pair of similar spots on either side between the first and second lateral carinae and a pair near the posterior margin. There were transverse bars of black pigment on the fourth abdominal somite and on the tail-fan, a black band near the distal end of the subchela and three similar bands on the fourth leg, situated on the ischium merus and propodus.

⁹⁰⁸⁵/₁₀ Port Blair, Andamans, 6 fms.

S. Kemp.

1 ♂, 8 mm.

***Pontophilus candidus*, sp. nov.**

(Plate viii, fig. 3.)

The rostrum is flat and not channelled longitudinally; its lateral margins are curved, convergent from the base to the middle and divergent from the middle onwards. The distal end, seen in dorsal view, is abruptly and squarely truncate. The true apex of the rostrum is sharply deflexed; it is visible only from in front and has a broadly convex margin.

The carapace is entirely devoid of carinae; its surface, though smooth to the naked eye, is microscopically scabrous. The transverse depression usually found behind the rostrum is obsolete. The spinulation shows a remarkable difference in the two sexes. In the male there is a sharp spine in the median line a little behind the base of the rostrum, but of this in the female there is no trace. In both sexes there is a sharp hepatic spine, situated about on the same level as the dorsal spine of the male, and below and in advance of it is another conspicuous spine situated behind the branchiostegal angle. In the male there is a short longitudinal groove above the hepatic spine and another beneath it, shallower

and considerably longer, extending almost to the posterior margin of the carapace. The branchiostegal angle is sharp and reaches the level of the rostral apex. On the margin immediately beneath it is a small spinule.

The basal segment of the antennular peduncle (text-fig. 3*a*) is broad, its outer distal angle is bluntly produced. The lateral process is transversely oval with a straight posterior margin and a sharp point at its antero-external angle. The antennal scale (text-fig. 3*b*) is broad, not more than two and a third times as long as wide; the outer margin is a trifle sinuous and terminates in a sharp spine which does not reach nearly as far forwards as the distal end of the lamella.

The third maxillipedes reach a little beyond the end of the

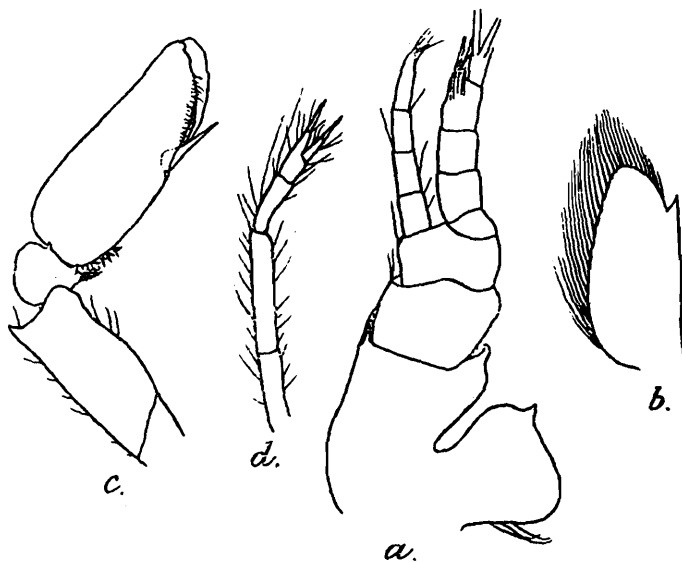


FIG. 3.—*Pontophilus candidus*, sp. nov.

a. Antennule.

b. Antennal scale.

c. First peraeopod.

d. Second peraeopod.

antennal scale; the ultimate segment is decidedly longer than the antepenultimate.

The first peraeopods (text-fig. 3*c*) reach a little beyond the third maxillipede and do not possess an exopod. The outer edge of the merus terminates in a single stout tooth and the margin between this tooth and the carpal articulation is entire. The carpus bears two spines on its outer distal margin. The subchela is little more than two and a half times as long as wide; the cutting margin is strongly oblique and the spine which forms the 'thumb' is extremely long and slender and is remarkable in that it is articulated and movable. The first legs are not separated at their base by the forwardly directed sternal tooth found in some other species of the genus.

The second peraeopods (text-fig. 3*d*) reach beyond the carpus of the first pair and are lightly clothed with hair. The merus is

long, more than twice the length of the carpus; the chela is a little shorter than the carpus. The fingers are a trifle shorter than the palm; they are of equal breadth, without definite cutting margins, and each bears at its apex a single stout seta serrated on the inner side.

The third peraeopods reach beyond the end of the first by the two ultimate segments. The carpus is one third the length of the merus and is a little shorter than the propodus and dactylus combined. In the fourth pair the propodus is the longest segment, nearly a quarter longer than the merus, a trifle longer than the carpus, and about 1.7 times the length of the dactylus.

The abdomen is quite smooth, without trace of sculpture; the lower margins of the pleura are rounded. The pleopods resemble those of *P. lowisi*. The endopod of the last four pairs in the female is greatly reduced and shows no trace of an appendix interna. In the male the endopod is better developed and in all four pairs is provided with a well formed appendix.

The outer uropod is shorter than the inner and is about three times as long as broad; its external margin is without setae, except for a few at the distal end. The telson reaches about as far as the outer uropod and is not sulcate above. It bears two pairs of dorso-lateral spinules and the apex is similar to that of *P. incisus*.

Living specimens were as a rule almost pure white with a narrow transverse brown band on the tail-fan.

^{9082-A}₁₀ Port Blair, Andamans. S. Kemp. 2 ♂, 4 ♀ 7-10 mm.

The type specimens bear the number 9082/10.

***Pontophilus pilosus*, sp. nov.**

(Plate viii, fig. 4.)

The rostrum is well developed and reaches almost to the end of the eyestalks. It is deeply hollowed longitudinally and tapers to a narrow rounded apex. On its ventral side there is a deep vertical keel, extending downwards between the eyestalks. The keel ends abruptly a little behind the apex where it bears a tuft of long setae.

The carapace is everywhere clothed with a fine pubescence, which, over the greater part of the surface, is comparatively short, but becomes more conspicuous laterally and on the antero-lateral portions takes the form of long silky hairs. There are three procurved teeth in the mid-dorsal line, but no carina. The first two of these teeth are placed rather close together in the anterior half of the carapace, while the third is in the middle of the posterior half. Behind the antennal spine, which reaches almost as far forward as the rostrum, there are two small teeth placed one behind the other in the latitude of the first tooth of the mid-dorsal series. Below these there is a stout hepatic tooth which overhangs a deep sulcus—the lateral continuation of the transverse post-rostral

groove, especially well marked in this portion of the carapace. The branchiostegal spine is strong and extends forwards beyond the level of the eyestalks. Behind it is another small tooth, placed further forward than any others of the dorsal series. Exclusive of the spines on its frontal margin, there are in all eleven teeth on the carapace: none of these teeth form the terminations of carinae.

In the male each of the last three thoracic sterna bears a median keel, which ends anteriorly in a small tooth: these keels are absent in the female. The first and second pairs of legs are adjacent at the base in the male and are not separated by the antorse spine found in *P. hendersoni*.

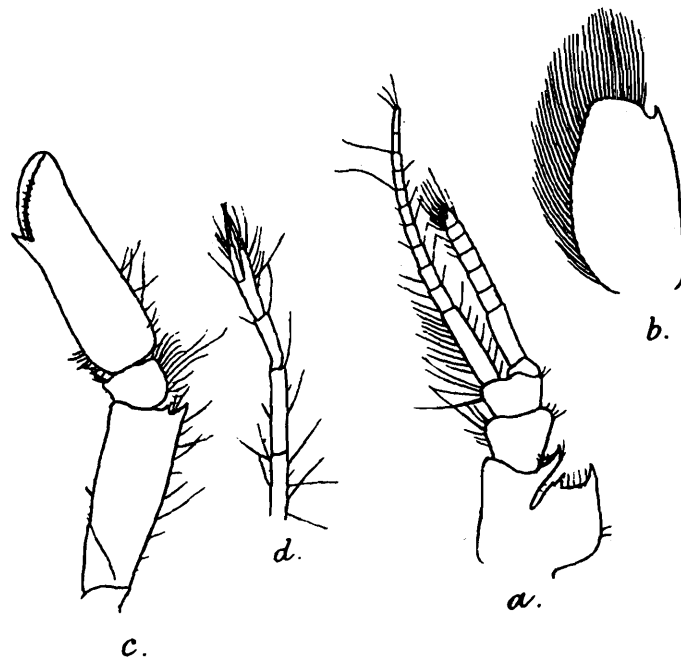


FIG. 4.—*Pontophilus pilosus*, sp. nov.

a. Antennule.
b. Antennal scale.

c. First peraeopod.
d. Second peraeopod.

The eyes are stout and short. In both sexes the distal margin of the stalk, on its upper and inner side, is produced beyond the cornea to a small but conspicuous papilla.

The basal segment of the antennular peduncle (text-fig. 4a) bears a stout ventral spine and another at the distal end of its outer margin. The lateral process is peculiar in form. It is fully as long as broad and is furnished anteriorly with two spines, the outermost the largest and the inner bearing a small internal spinule. The outer flagellum does not appear to be appreciably stouter in the male than in the female and is shorter than the peduncle.

The antennal scale (text-fig. 4b) is broad, its breadth in a large female being more than half its length. The outer margin is convex and terminates in a spine which does not reach as far forward as the lamella and is separated from it by a broad U-shaped gap.

The outer maxillipedes are clothed with long setae and reach beyond the end of the antennal scale by almost the entire length of the ultimate segment.

The first peraeopods (text-fig. 4c) are a little shorter than the outer maxillipedes and are not provided with exopods. The spine on the outer margin of the merus is terminal and on the anterior margin between it and the articulation of the carpus there is another smaller spine. The carpus is short; the inner margin is lobed and bears coarse setae, while on the outer margin are two spines. The breadth of the hand, measured near its base, is about one third its entire length.

The second peraeopods (text-fig. 4d) reach to the carpus of the first pair. The carpus is two thirds the length of the merus and is as long as the palm and half the length of the fingers. In the chela, which as in the preceding species is weakly constructed and without cutting margins or terminal claws, the palm is about one seventh longer than the dactylus. The fixed finger is noticeably shorter than the dactylus and both fingers bear long setae.

The slender third peraeopods reach beyond the antennal scale by about the length of the two ultimate segments. The merus is a little shorter than the ischium and a little longer than the propodus. The carpus is one and two thirds the length of the merus and is one fifth longer than the propodus and dactylus combined. The fourth and fifth legs are rather densely clothed with hairs. The merus, carpus and propodus are subequal and the dactylus is a little more than half their length.

The abdominal somites are quite smooth and are covered with a fine pubescence similar to that on the carapace; the margins of the pleura are rounded. The inner ramus of the last four pairs of pleopods is comparatively well developed in the male and carries an appendix interna; in the female it is reduced and no trace of this appendage is to be found. The outer uropod is shorter than the inner and is nearly three times as long as broad. The telson is one and a half times the length of the last abdominal somite; it is provided with two pairs of dorso lateral spinules and its lower margins are ciliated. The apex is similar to that of *P. parvirostris*.

Pontophilus pilosus is sometimes conspicuously banded in life with dark brown. In examples from very shallow water there is a narrow transverse band at the posterior end of the carapace and others, rather broader, on the second and fourth abdominal somites and across the middle of the telson and uropods. Individuals obtained at a depth of two fathoms were marbled with brown pigment mixed with a certain amount of pure white, the carapace being sometimes of a dull reddish-brown. In all the specimens there was a dark spot at the distal end of the subchela.

The specimens were obtained at the northern end of the Gulf of Mannar.—

$\frac{8979}{10}$ Kilakarai, Ramnad
dist., S. India.

S. Kemp.

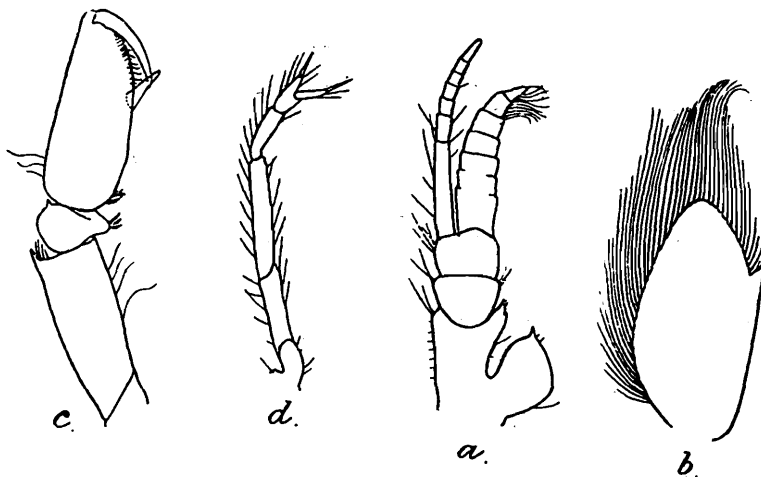
2 juv., 3 ♂, 4 ♀,
5.5-13 mm. TYPES.

Pontophilus plebs, sp. nov.

(Plate viii, fig. 5.)

The rostrum is longitudinally channelled; its lateral margins are convergent and meet in a narrowly rounded apex. The carapace is devoid of pubescence and is not carinated. It bears seven teeth, one situated mid-dorsally, close behind the rostrum and separated from it by a shallow transverse groove, and three pairs on either side. The latter comprise a stout hepatic tooth, on a level with that in the middle line, and two small teeth, both in advance of the hepatic, placed close together behind the sharp spinous branchiostegal angle. In the anterior half of the carapace there are obscure longitudinal furrows above and below the hepatic tooth.

The basal segment of the antennular peduncle (text-fig 5*a*) is longer than the two following combined, externally the distal

FIG. 5.—*Pontophilus plebs*, sp. nov.

a. Antennule.

b. Antennal scale.

c. First peraeopod.

d. Second peraeopod.

margin is produced to an acute tooth. The lateral process is more or less oval in shape, longer than broad, and is anteriorly pointed. The second and third segments are broader than long. The antennal scale (text-fig. 5*b*) is only twice as long as broad; the outer margin is straight and terminates in a tooth which is far exceeded by the distal end of the lamella.

The third maxillipedes reach beyond the scale by about half the length of the ultimate segment. The first peraeopods (text-fig. 5*c*) are scarcely shorter. The outer edge of the merus terminates in a large tooth and the margin between this tooth and the articulation of the carpus is unarmed. The carpus bears a stout external tooth. The hand is about two and a half times as long as wide and the single tooth which forms the 'thumb' of the sub-

chela is articulated, as in *P. candidus*, and not fixed as in most species of the genus.

The second peraeopods (text-fig. 5*d*) reach little beyond the end of the merus of the first pair. The merus is one third longer than the ischium and more than twice the length of the carpus. The dactylus is longer than the palm and conspicuously longer than the fixed finger, the fingers are of equal breadth and each bears a single stout seta at its apex. The whole limb is rather thickly clothed with hairs.

The slender third peraeopods reach beyond the end of the antennal scale. The carpus is a little longer than the merus and as long as the propodus and dactylus combined. The fourth and fifth peraeopods are shorter than the third. In the fifth pair the dactylus and propodus are subequal; the carpus is a little longer than the propodus and a little shorter than the merus.

In the male the last three segments of the thoracic sternum are carinate, the carina of each ending anteriorly in a small tooth. These carinae and teeth do not appear to exist in the female and in neither sex is there a sternal spine extending between the bases of the third legs.

The abdominal somites are smooth, without sculpture or pubescence; their pleura are rounded inferiorly. In the male the endopod of each of the last four pairs of pleopods is comparatively well developed and possesses an appendix interna. In the female there is no appendix interna and the endopod is very small in the second and third pairs, quite rudimentary on the fourth and absent from the fifth.

The telson, including the terminal spines, reaches a little beyond the end of the inner uropod. It is not sulcate above and bears two pairs of lateral spinules between which are two rows of exceedingly minute denticles. These denticles can only be seen if the telson is viewed obliquely from the side under a microscope; they extend from the base almost to the distal end and may be as many as sixteen in number. The apex is closely similar to that of *P. incisus*.

The outer uropod is shorter than the inner. It bears setae on its external margin and is fully three and a half times as long as broad.

The largest of the nine specimens obtained is only 6 mm. in length. No ovigerous females were found and it is possible, therefore, that all are immature. The characters are, however, quite distinctive and experience with other species leads me to believe that they would not change appreciably with further growth. The specimens were pale in life with sparse black dendritic chromatophores.

$\frac{9\frac{1}{10} \times 6}{10}$ Port Blair, Andamans, 2 fms. S. Kemp. 9, $4\frac{1}{2}$ -6 mm. TYPES.

The specimens were all found together in Phoenix Bay on a bottom of muddy sand.

Pontophilus hendersoni, Kemp.

1915. *Pontophilus hendersoni*, Kemp, *Mem. Ind. Mus.*, V, p. 261, pl. xiii, fig. 8.

The characters given in the key on pp. 356 and 357 will suffice to distinguish this species from all other Indian representatives of the genus.

P. hendersoni is very closely allied to *P. megalochair* (Stebbing)¹, obtained at depths of 25 and 37 fathoms on the coast of S. Africa. The African form agrees in nearly all respects with that from the Indian coast; in particular, there is (as shown in Stebbing's figures) an almost complete identity of form in the structure of the subchela, the 'thumb' being composed of two closely juxtaposed spines instead of the single one found in all other species of the genus.

There are, however, certain discrepancies between Stebbing's account and my own, which, if substantiated, are sufficient to justify the separation of the two forms. The apex of the lamella of the antennal scale is, for instance, much more acute in *P. megalochair* than in *P. hendersoni*, extending much further beyond the apex of the spine that terminates the outer margin (*cf.* Stebbing's pl. lxxix, fig. *a.i.* and my text-fig. 25*a*). Stebbing also has made no mention of the small tubercle found in *P. hendersoni* on the dorsum of the third abdominal somite and the armature of the telson is totally different. In *P. megalochair* the telson is furnished at its apex with a long and slender tooth, flanked by a pair of plumose setae (*v.* Stebbing, pl. lxxix, fig. T). In *P. hendersoni* the apex consists of a triangular plate with a minute spinule on either side and with two pairs of plumose setae arising from beneath it (*v.* Kemp, text-figs. 25 g, g').

Since the original account of *P. hendersoni* was published, additional specimens have been taken in the open sea on the Orissa Coast, a circumstance which tends to confirm the view that the occurrence of the species in the outer channel of the Chilka Lake was purely accidental and that it is not normally an inhabitant of brackish water.

$\frac{9.5.8.6}{10}$ Puri, Orissa coast, 4-4½ fms. S. Kemp. 3, 6½-9 mm.

Pontophilus parvirostris, sp nov.

(Plate viii, fig. 6.)

The rostrum is extremely small, far less conspicuous than in any other species of the genus. It recalls that found in many Pagurids and consists merely of a small flat triangular prolongation of the median part of the carapace. The apex is acute and does not reach further than to one third the length of the eyestalks.

The antennal spine is sharp and extends far beyond the level of the rostral apex; the branchiostegal spine is long and reaches

¹ *Philocheras megalochair*, Stebbing, *Ann. S. African Mus.*, XV, p. 71, pl. lxxix (1915). This work was not received in Calcutta in sufficient time to enable me to refer to it in my account of the Decapods of the Chilka Lake.

almost as far forwards as the ends of the eyestalks. The latter spine is flanked by a short carina which runs obliquely downwards and backwards and, above its posterior termination, in the anterior quarter of the carapace, there is another well marked spine. Except for this spine and for the carina mentioned above the entire surface of the carapace is smooth, save for a feeble transverse depression behind the frontal margin. On the sides of the carapace, most numerous below the branchiostegal carina, are some long silky hairs.

The thoracic sterna of the female are not carinate.

The eyes are elongate and their inner margins are contiguous; the cornea is well pigmented and its length in dorsal view is about equal to that of the stalk.

The basal segment of the antennular peduncle (text-fig. 6*a*) bears two stout teeth, one situated ventrally and one externally

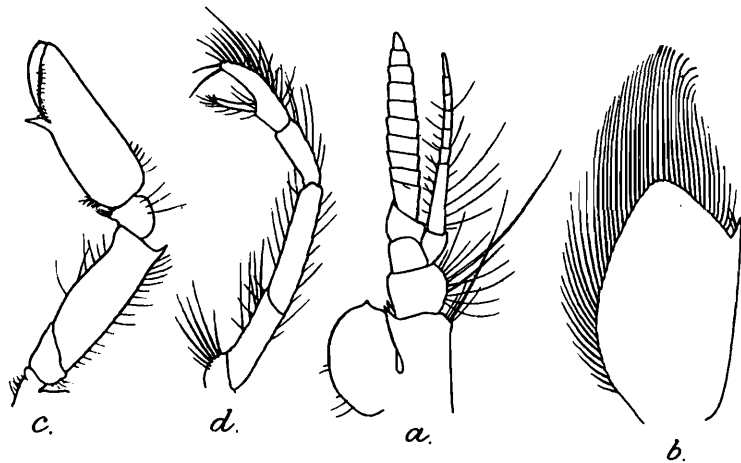


FIG. 6.—*Pontophilus parvirostris*, sp. nov.

a. Antennule.

b. Antennal scale.

c. First peraeopod.

d. Second peraeopod.

at its distal end. The lateral process is elongate oval and is furnished with a minute point anteriorly. The second and third segments are about equal in length and the outer flagellum in the female is about as long as the peduncle.

The antennal scale (text-fig. 6*b*) is about one and two thirds as long as broad; the outer margin is very slightly convex and terminates in a stout tooth which does not reach nearly as far forwards as the apex of the lamella.

The outer maxillipedes reach beyond the apex of the scale by more than half the length of the ultimate segment.

The first peraeopods (text-fig. 6*c*) reach as far forwards as the third maxillipedes and do not possess exopods. The merus bears a terminal (not sub-terminal) spine at the distal end of its outer margin. On the outer and inferior aspect of the carpus there is a sharp spine; the inner angle is produced and is provided with a

tuft of coarse setae. The basal breadth of the hand is little more than one third its entire length. The "thumb" of the subchela is stout and strongly deflected outwards. On the inner surface near the base of the propodus there is the usual tuft of coarse setae.

The second peraeopods (text-fig. 6*d*) reach about to the end of the merus of the first pair. The chela is a trifle longer than the carpus and is remarkable in that the dactylus is extremely slender, less than half the thickness of the fixed finger. As in allied forms the chela is very weakly constructed and is without terminal claws or definite cutting edges. The palm is about two thirds the length of the fingers and the propodus on its outer margin is densely fringed with long setae.

The slender third peraeopods reach beyond the scale by the whole length of the two ultimate segments. The merus is a little longer than the ischium and a little shorter than the propodus and dactylus combined. The carpus is twice the length of the ischium.

The fourth and fifth peraeopods are similar and stouter than the third. The merus is a little longer than the subequal carpus and propodus and about three times the length of the dactylus. The segments are rather densely clothed with hairs.

The abdominal somites are quite smooth, without carinae or grooves, and the margins of the pleura are rounded below. The sixth somite is about equal in length with the telson. The inner ramus of the last four pairs of pleopods is very short and does not possess an appendix interna. The uropods are half as long again as the telson and the exopod is nearly four times as long as broad.

The telson is rather broad at the base, but much narrowed at the apex. The margins are setose and there are two pairs of dorso-lateral spinules. The tip is triangular and sharply acute; beneath it three pairs of spinules arise, the innermost two thirds the length of the intermediate pair and two and a half times as long as the outer.

The colour in life of *Pontophilus parvirostris* was pale, mottled and spotted with dark umber, tending to maroon at the sides and on the appendages and forming distinct blotches on the pleura of the first, fourth and sixth abdominal somites.

The specimens are registered thus,—

$\frac{8989}{10}$ Kilakarai, Ramnad dist., S. India. S. Kemp. 4 ♀, 9-14 mm.
TYPES.

Genus *Aegeon*, Guérin Méneville.

1888. *Pontocaris*, Bate, *Rep. Challenger' Macrura*, p. 495.
1900. *Aegeon*, Stebbing, *Marine Invest. S. Africa*, I, p. 50.
1901. *Aegeon*, Alcock, *Cat. Indian deep-sea Crust. Macrura and Anomala*, p. 117 (including subgenus *Parapontocaris* p. 120).

All the described forms of this genus are represented in the collection of the Indian Museum. Three of them, *Aegeon orientalis*, Henderson, *A. habereri*, Doflein, and *A. lacazei*, Gourret, are intermediate in character between the more typical species of the genus and those which Alcock referred to the subgenus *Parapon-*

tocaris; the latter term should therefore lapse. *Aegeon orientalis* agrees with *Parapontocaris* in the complete absence of the hepatic groove and in the arrangement of the carinae on the first and second abdominal somites and resembles typical *Aegeon* in the very broad antennal scale and in the possession of strong median spines on the abdominal sterna. *Aegeon habereri* and *lacazei* are closely allied forms: in most respects they agree closely with typical species of the genus, but they resemble *Parapontocaris* in the sculpture of the first two abdominal somites and in the elongate form of the antennal scale.

In all six species of *Aegeon* are known from Indian waters; they may be distinguished by the following key:—

- I. Second lateral carina of carapace interrupted anteriorly by a well defined hepatic groove; lateral parts of 1st and 2nd abdominal somites irregularly lobed, without sharp longitudinal keels continuous with those on carapace.
 - A. Median carina of carapace with 4 teeth; two or three tubercles, forming an oblique transverse row, between median and 1st lateral carinae ... *cataphractus* (Olivi).
 - B. Median carina of carapace with 8 or 9 teeth or serrations; surface between carinae of carapace smooth, without tubercles.
 1. Marginal carina of carapace smooth; two lobules separated by a vertical furrow on either side of median carina of 2nd abdominal somite ... *pennata*, Bate.
 2. Marginal carina of carapace serrulate; a sinuous longitudinal ridge, entire and not divided by a furrow, on either side of median carina of 2nd abdominal somite ... *propensalata*, Bate.
- II. Second lateral carina of carapace not interrupted, hepatic groove absent; lateral parts of 1st and 2nd abdominal somites with sharp longitudinal keels continuous with those on carapace.
 - A. 1st and 2nd lateral carinae of carapace with 7 teeth, marginal with 7 to 9; antennal scale as broad as long ... *orientalis*, Henderson.
 - B. 1st lateral carina of carapace with 4 teeth, 2nd lateral with 3 to 6, marginal with 2 or 3; antennal scale much longer than broad.
 1. 2nd lateral carina of carapace with 5 or 6 teeth, marginal with 3; median carina of 2nd abdominal tergum bispinous ... *andamanense* (Wood-Mason).
 2. 2nd lateral carina of carapace with 3 teeth, marginal with 2; median carina of 2nd abdominal tergum unispinous ... *bengalense* (Wood-Mason).

***Aegeon cataphractus* (Olivi).**

1900. *Aegeon cataphractus*, Stebbing, *Marine Invest. S. Africa*, I, p. 50 (*ubi syn.*).
1905. *Aegeon cataphractus*, Pearson, *Ceylon Pearl Oyster Fish., Macrura*, p. 89.

Except that the teeth on the carapace are blunter and that the abdominal sculpture is a little less sharply defined, I can find no difference between the two Indian specimens and others of similar size from the Mediterranean.

Characteristic of *A. cataphractus* are the supernumerary tubercles between the longitudinal carinae of the carapace. Between the median and uppermost carinae are two or three tubercles arranged to form an oblique transverse row, which commences in the middle of the carapace and extends forwards and outwards on either side. Between the first and second lateral carinae there is a single tubercle placed on the posterior edge of the hepatic groove. Though both the Indian examples are small these tubercles are clearly visible.

The occurrence of this species in India is interesting, for very few sub-littoral Decapoda are common to the Mediterranean and to Indian waters. Miers, however, states that the species probably occurs at Senegambia, while Stebbing records it from the Cape of Good Hope, so that there is reason to believe that the distribution is continuous round the African coasts.

In Indian waters *A. cataphractus* appears to be very scarce. Pearson has recorded it from the Ceylon Pearl Banks and there are two specimens in the Indian Museum, both obtained on the west coast of the peninsula:—

- | | | | |
|----------------------|---|-----------------|-------------|
| $\frac{5.6.4.6}{9}$ | 26 mi. W.S.W. of Honawar, N.
Kanara dist., Bombay Pres., 28 fms. | Investigator. | 1 ♀ 15 mm. |
| $\frac{9.1.3.1}{10}$ | Karachi. | W. T. Blanford. | 1 ♂, 23 mm. |

Aegeon pennata (Bate).

1888. *Pontocaris pennata*, Bate, *Rep. Challenger Macrura*, p. 449, pl. xci.
1895. *Pontocaris pennata*, Ortmann, *Proc. Acad. Sci. Philadelphia*, p. 175.
1901. *Aegeon affine*, Alcock, *Cat. Indian deep-sea Crust. Macrura and Anomala*, p. 188, and *Illust. Zool. Investigator*, pl. li, figs. 3, 4.
1914. *Aegeon obsoletum*, Balss, *Abh. math.-phys. Klasse Bayer, Akad. Wiss. München*, Suppl. Bd. II, p. 70, pl. i, figs. 3.

Alcock, when describing *Aegeon affine*, suggested that the species might prove to be identical with Bate's *Pontocaris pennata*. The description and figures of the latter species being inadequate, the point could only be determined by actual comparison of specimens. In order to settle the question I sent co-types of *A. affine* to Dr. Calman, who, with his usual kindness, readily undertook to give me an opinion. He informs me that Alcock's suggestion is correct and that there is no doubt that the two forms are specifically identical.

An example of *Aegeon obsoletum*, determined by Balss, has been received in exchange from the Munich Museum; it was obtained in Sagami Bay, Japan, at a depth of 50-100 m. The individual agrees precisely with Indian specimens of *A. pennata*.

In addition to the characters noted by Alcock for the separation of this species from *A. medium* (= *A. propensalata*, Bate),

there is a marked difference between the two in the sculpture of the second abdominal somite. In *A. propensalata*, on either side of the middle line, there is a broad sinuous ridge which extends obliquely throughout the length of the somite. In *A. pennata* this ridge is broken in two by a deep vertical furrow.

Dr. Calman has kindly sent me the following notes regarding the types obtained by the 'Challenger'—"The three specimens of *P. pennata* differ among themselves in the form of the rostrum and other characters. In two specimens the rostrum is relatively short, bifid at tip, and with the lateral spines as large as in *A. medium*. In the third specimen the rostrum is longer, sharp-pointed, and with very small lateral spines. In this last specimen also there is a tendency towards a softening of the inequalities of the general surface, *i.e.* the keels and ridges are not so prominent. In particular the two lobules on either side of the median carina of the second abdominal somite are not sharply defined, although the vertical furrow separating them is distinct."

The following records of occurrence in Indian waters may be added to those given by Alcock :—

$\frac{19.11}{10}$	Persian Gulf, 26°20'30" N., 54°52'30" E., 35 fms. ...	Investigator'	Five.
$\frac{11.00}{10}$	Persian Gulf, 26°33' N., 52°23' E., 40 fms. ...	"	One.
$\frac{537.4.3}{10}$	Arabian Sea, 24°26'50" N., 66°35'50" E., 35 fms. ...	"	Seven.
$\frac{9127}{10}$	Coromandel coast, 14°25' N., 80°15'45" E., 12 fms. ...	"	Two.
$\frac{1707.8}{7}$, $\frac{2087.0}{7}$	} Ganjam coast, 26-93 fms.	"	Twenty-two.
$\frac{2395.401}{10}$, $\frac{2187.02}{10}$			
$\frac{160.2}{7}$	28 mi. S.W. of Puri, Orissa, 25 fms. ...	"	Three
$\frac{0286}{9}$	Off Gangetic delta, 20°18' N., 90°50' E., 65 fms. ...	"	One.
$\frac{9126}{10}$	Off Tennasserim coast, 13°27'30" N., 97°37' E., 50 fms. ...	"	Two.
$\frac{1100}{3}$	Off Cheduba, Arakan coast, 20 fms. ...	"	One.

According to the labels the individual from the neighbourhood of the Gangetic delta was "grey, touched with dark brown and green marks", while some of those from the Ganjam coast were irregularly banded with lichen green and mottled pink.

On the Indian coasts *A. pennata* is evidently common; it has been found at depths ranging from 12 to 93 fathoms. The type specimens were obtained by the 'Challenger' in the Arafura Sea, south of New Guinea, 8° 56' S., 136° 5' E., at a depth of 49 fathoms. Balss, under the name *A. obsoletum*, records numerous specimens from Japan from depths of 80 to 150 metres. The species is apparently one of wide Indo-pacific distribution.

Ageon propensalata (Bate).

1888. *Pontocaris propensalata*, Bate, *Rep. Challenger Macrura*, p. 409, pl. xc, figs. 2, 3; pl. lxxxv, fig. 5.
1895. *Pontocaris propensalata*, Ortmann, *Proc. Acad. Sci. Philadelphia*, p. 175.

1899. *Pontocaris media*, Alcock and Anderson, *Ann. Mag. Nat. Hist.* (7), III, p. 282.
 1900. *Pontocaris propensalata*, Whitelegge, *Mem. Australian Mus.*, IV, p. 198.
 1901. *Aegeon medium*, Alcock, *Cat. Indian deep-sea Crust. Macrura and Anomala*, p. 120, and *Illust. Zool. Investigator*, pl. xli, fig. 6.

In this case also I am indebted to Dr. Calman for the elucidation of the synonymy. Dr. Calman has kindly compared co-types of *A. medium* with the type of Bate's *P. propensalata* and has sent me the following note on the subject.—“ I cannot find any difference between the type of *P. propensalata* and *A. medium*. The sculpturing of the abdominal somites is less sharp in the former and the serration of the supramarginal carina of the carapace is very obscure—as it tends to be in the smaller of the two specimens of *A. medium* that I have examined.”

The only specimens in the Indian Museum are those described by Alcock from the Andaman Sea, 55-66 fathoms. Bate's type specimen was obtained off the Ki Is., south of New Guinea, 5°49' 15" S., 132° 14' 15" E., at a depth of 140 fathoms, and Whitelegge has recorded the species from 50 fathoms in Botany Bay.

Aegeon orientalis, Henderson.

1893. *Aegeon orientalis*, Henderson, *Trans. Linn. Soc., Zool.* (2), V p. 446, pl. xl, figs. 16, 17.

Three specimens in rather poor condition from the Persian Gulf and the Andamans evidently belong to this species, which does not appear to have been recognised since it was first described more than twenty years ago.

The spinulation of the carapace agrees exactly with Henderson's description except that the serrations on the marginal carina vary in number from 7 to 9. The abdominal sculpture also agrees with the original description; but there are two longitudinal carinae on either side of the second abdominal somite, and the five carinae on the first somite, as well as the median carina on the second, end anteriorly in sharp spines. These spines were perhaps worn away in the type, which is larger than any of the three specimens here recorded.

Although, as Henderson has remarked, the species bears a rather marked resemblance to *A. cataphractus*, it is not in reality a very close ally of that species. As has already been pointed out it is intermediate in character between the more typical species and those that Alcock referred to the subgenus *Parapontocaris*. Pearson's suggestion that *A. orientalis* is merely an extreme variation of *A. cataphractus*¹ is certainly incorrect. *A. orientalis* may readily be distinguished (i) by the complete absence of the hepatic groove, (ii) by the smaller number of serrations on the marginal carina of the carapace, (iii) by the sharp longitudinal lateral carinae of the first two abdominal somites and (iv) by the presence of only a

¹ Pearson, *Ceylon Pearl Oyster Fisheries, Macrura*, p. 89 (1905).

single retrorse spine behind the middle point of each of the submedian carinae of the last abdominal somite. The spines on the first two abdominal somites, if their presence proves to be constant, will also serve to distinguish the two forms.

I think it improbable that the specimens from deep water off the Hawaiian Is., recorded by Miss Rathbun as *Egeon orientalis*¹, are correctly referred to this species. In the examples in the Indian Museum the middle tooth of the median carina of the carapace is not smaller than the rest and the denticulation of the second lateral and marginal carinae is also different. Moreover, the third and fourth abdominal somites though strongly sculptured, only bear a single lateral longitudinal carina. These carinae, which are submedian in position and are clearly shown in Henderson's figure, are sinuous and towards the hinder end of the somite are directed obliquely outwards; that on the third is entire, while that on the fourth is interrupted in the middle. There are certainly not two lateral carinae on the third and three on the fourth as in Miss Rathbun's description.

The specimens examined are registered as follows:—

$\frac{27}{10}$	Persian Gulf, 26°22' N., 56°10' E.,	Investigator.'	1 ♂, 18 mm. 1 ♀, 15 mm.
	48-49 fms.		
$\frac{230}{10}$	Port Blair, Andamans.	J. Wood-Mason.	1 ♂, 14 mm.

The type and only other known example of the species is recorded by Henderson from the Gulf of Martaban.

***Aegeon andamanense* (Wood-Mason).**

1901. *Aegeon* (*Parapontocaris*) *andamanense*, Alcock, *Cat. Indian deep-sea Crust. Macrura and Anomala*, p. 121, and *Illust. Zool. Investigator*, *Crust.*, pl. ix, fig. 2.

***Aegeon bengalense* (Wood-Mason).**

1901. *Aegeon* (*Parapontocaris*) *bengalense*, Alcock, *Cat. Indian deep-sea Crust. Macrura and Anomala*, p. 122, and *Illust. Zool. Investigator*, *Crust.*, pl. ix, fig. 1.
1912. *Aegeon* (*Parapontocaris*) *bengalense*, Kemp and Sewell, *Rec. Ind. Mus.*, VII, p. 22.

Genus *Prionocrangon*, Wood-Mason.

***Prionocrangon ommatosteres*, Wood-Mason.**

1901. *Prionocrangon ommatosteres*, Alcock, *Cat. Indian deep-sea Crust. Macrura and Anomala*, p. 123, and *Illust. Zool. Investigator*, *Crust.*, pl. ix, fig. 4.

Genus *Crangon*, Fabricius.

***Crangon crangon* (Linnaeus).**

I have compared the Indian specimens with examples from Plymouth and the only appreciable distinctions that I can find are

¹ Rathbun, *Bull. U.S. Fish Comm. for 1903*, p. 911 (1906).

that in the Indian form the rostrum is narrower and distinctly longer, reaching almost to the end of the eyes (*cf.* text-figs. 7*a*, *b*) and that the sixth abdominal somite is less distinctly grooved inferiorly. There is the closest resemblance between the two groups of specimens in the form of the subchela and antennal scale.

The characters yielded by the rostrum and last abdominal somite may ultimately afford grounds for the recognition of the Indian form as a distinct subspecies, but in my opinion are insufficient for specific distinction.

A number of forms very closely allied to the common European species have been recorded from Japan; Miss Rathbun¹, indeed, has reported the presence of *C. crangon* itself at Rikuoku (Rikuchu) and Hokkaido. Balss², the most recent author to discuss the Japanese forms, notes that Brashnikow³ (writing in Russian) has established the fact that *C. crangon crangon* does not occur in

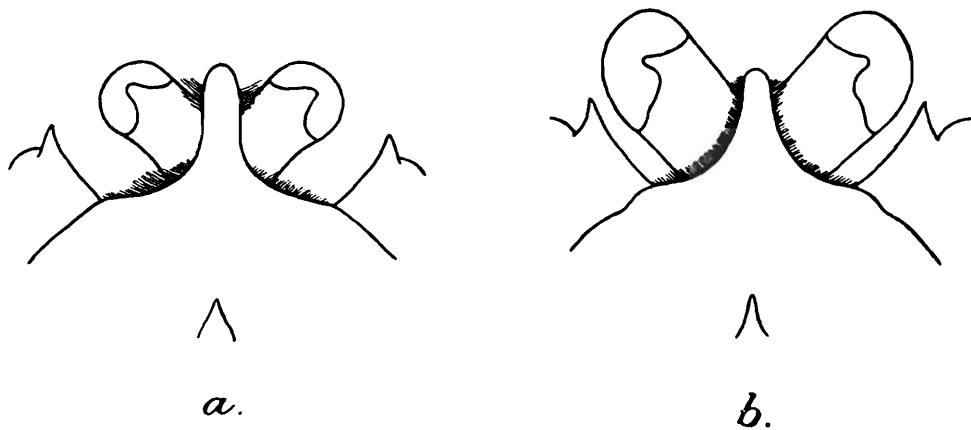


FIG. 7.—*Crangon crangon* (Linn.).

Anterior portion of carapace, rostrum and eyes: (*a*) of an Indian specimen: (*b*) of a specimen from Plymouth.

Japanese waters. He, however, gives a summary of the characters of *C. affinis*, de Haan, *C. propinquus*, Stimpson, *C. hakodatei*, Rathbun, *C. consobrinns*, de Man, and *C. cassiope*, de Man, and remarks that in the collections that he himself has examined these characters are inconstant, even in specimens from a single gathering. He regards the last four of the names just mentioned as synonyms of *C. affinis*, a form which he apparently considers to be merely a subspecies of *C. crangon*.

If Balss is correct, the retention of a distinct subspecific name for the Japanese form seems to have little to recommend it. The characters of *C. crangon*, if tabulated on Balss's plan, will evidently fall within the range of variation of the single Japanese

¹ Rathbun, *Proc. U.S. Nat. Mus.*, XXVI, p. 42 (1902).

² Balss, *Abhandl. math.-phys. Klasse K. Bayer. Akad. Wiss. München*, Suppl.-Bd. II, p. 62 (1914).

³ Brashnikow, *Mém. Acad. Imp. Sci. Nat. St. Pétersburg*, (8), XX, p. 84 (1907).

race that he recognises, the difference between the European and Japanese races consisting solely in the greater variability exhibited by the latter.

The Indian specimens do not show any marked variation, but the series is small. And even should their form prove constant, it is useless to speculate on the precise status of the different races until some general consensus of opinion on the Japanese forms has been reached.

Crangon crangon appears to be very rare on the Indian coasts ; the only specimens in the Museum are the following :—

$\frac{4.1}{3}^5$ Akyab, Arakan coast. F. Stoliczka. 5, 35-52 mm.

THE STRUCTURE OF THE PLEOPODS IN *PONTOPHILUS*.

The recognition of the fact that in certain species of *Pontophilus* there are often marked differences between the sexes in the form of the pleopods, and that the species themselves also differ to a great extent in the development of these appendages, has led me to re-examine the material available in the Museum collection. In the Indian Museum twenty-one species of the genus are represented, a very considerable proportion of those that are known ; but, unfortunately, in the case of thirteen only do we possess examples of both sexes.

Although in the development of the pleopods there is a certain amount of intergradation, it is possible roughly to classify the species according to the development of these appendages into five groups :—

Group I.

<p><i>P. norvegicus</i>, M. Sars <i>P. gracilis</i>, Smith <i>P. brevirostris</i>, Smith</p>	}	<p>Endopod of last four pairs of pleopods well developed in both sexes, with conspicuous appendix interna.</p>
--	---	--

P. spinosus, Leach, *P. abyssii*, Smith, and *P. occidentalis*, Faxon, represented in the collection by female specimens only, doubtless also belong to this group.

Group II.

<p><i>P. sculptus</i> (Bell) <i>P. incisus</i>, sp. nov. <i>P. australis</i>, Thomson</p>	}	<p>Endopod of last four pairs of pleopods comparatively well developed in male, reduced in female. Appendix interna present in male on all four pairs, but somewhat rudimentary on the last ; in female present on 2nd and 3rd pairs, rudimentary on 4th and absent from 5th.</p>
---	---	---

P. chiltoni, Kemp, known from female specimens only, also in all probability belongs to this group.

Group III.

- | | | |
|--|---|--|
| <i>P. lowisi</i> , sp. nov.
<i>P. pilosus</i> , sp. nov.
<i>P. candidus</i> , sp. nov.
<i>P. plebs</i> , sp. nov. | } | Endopod of last four pairs of pleopods comparatively well developed in male, reduced in female. Appendix interna present on all four pairs in male, but entirely absent in female. |
|--|---|--|

Group IV

- | | | |
|-----------------------------|---|--|
| <i>P. sabsechota</i> , Kemp | } | Endopod of last four pairs of pleopods large and well developed in female, quite rudimentary in male. Appendix interna absent in both sexes. |
|-----------------------------|---|--|

Group V

- | | | |
|---|---|---|
| <i>P. bispinosus</i> , Hailstone
and Westwood.
<i>P. trispinosus</i> , Hailstone. | } | Endopod of last four pairs of pleopods much reduced in both sexes. Appendix interna absent in both sexes. |
|---|---|---|

P. echinulatus (M. Sars), *P. victoriensis*, Fulton and Grant, *P. hendersoni*, Kemp, and *P. parvirostris*, sp. nov., represented in the Museum collection by examples of one sex only, also in all probability belong to this group.

In Group I the appendix interna is usually tipped with a series of small coupling hooks, which are ill-developed or absent in other groups that possess this appendage. In Group V the separation of a distinct segment at the base of the endopod is clearly marked, whereas in Group I the division is obscurely indicated.¹

P. sabsechota, the sole species comprised in Group IV, is apparently an abnormal form, the distinction between the sexes in the size of the endopod being the reverse of that found in any other species which in this respect exhibits sexual differences. The remaining groups clearly form a morphological series characterised by the progressive reduction of the endopod and by the reduction and suppression of the appendix interna. Group I in which the pleopods have retained their full development is clearly the most primitive, while Group V in which they are more reduced than in any other is the most specialised. It is noteworthy that Group I includes all the deep-water forms in the collection.

The facts are not only of interest in the light they throw on the development of the species within the genus; they also, as it appears to me, form a valuable clue to the evolution of the family as a whole, for the other genera can be divided into two sections agreeing, respectively, in the development of their pleopods with

¹ Cf. Wolleback, *Bergens Museums Aarbog*, 1908, no. 12, p. 44, text-fig. 2.

Groups I and V of *Pontophilus*. Ortmann¹ in 1890 published a genealogical tree of the five genera known to him; but the evidence afforded by the pleopods leads to results directly at variance with those which he obtained and it will be well therefore to discuss the matter briefly.

The two most primitive groups of species in the family are in all probability *Aegeon* and *Pontophilus*, Group I. They possess—most of them at any rate—a rudimentary exopod on the first legs, the number of branchiae is at least as great as that in any other genus and the endopod of the last four pairs of pleopods is well developed and possesses an appendix interna. In *Aegeon* the second leg is larger than in *Pontophilus*, Group I, agreeing more nearly with that of Group V, and the former genus also possesses a rather larger number of branchiae than the latter. In this last feature it appears to be the more primitive of the two, but in the curious C-shaped form of its gills it presents a character not known in any other genus of Caridea. *Aegeon*, in my opinion, must be regarded as an offshoot of the original stock from which the other genera are descended.

The evolution of the remaining genera of Crangonidae can, I think, be traced back to *Pontophilus*, from which there have been two main lines of descent, originating respectively in Group I and in Group V

In Group I of *Pontophilus*, as has already been noted, the second leg is shorter than in the other groups and it is not difficult to understand how *Sabinea*, Owen, and *Paracrangon*, Dana, have arisen from it by successive steps. In *Sabinea* the pleopods are as well developed as in any species of Group I and possess a conspicuous appendix interna; the second leg has, however, undergone further reduction; it is smaller than in any species of *Pontophilus* and terminates simply, the chela being altogether suppressed. *Paracrangon* is apparently a further development on the same line. The second legs are entirely absent and the endopod in the last four pairs of pleopods, though large and well-formed, is without appendix interna.

The other line of development has apparently arisen through forms similar to those of Group V and terminates in four branches, representing respectively the genera *Crangon*, L., *Sclerocrangon*, Sars, *Argis*, Kröyer (= *Nectocrangon*, Brandt) and *Prionocrangon*, Wood-Mason. In all these genera the endopod of the last four pleopods is greatly reduced, possesses a well marked basal segment, and is devoid of appendix interna.

The evidence afforded by the development of the second leg is, in this case, rather difficult to interpret. In all the four genera named above it has a proportionately greater length than in any species of *Pontophilus*; in *Prionocrangon*, evidently a very highly specialised form, it terminates simply, while in the other three it is chelate. But it must be presumed that all Crangonidae have

¹ Ortmann, *Zool. Jahrb., Syst.*, V, p. 530 (1890).

primarily arisen from a form in which this limb was well developed and *a priori* it was not to be expected that the four genera had passed through a stage in which it was to some extent reduced.

It is, however, difficult to see how it could have been otherwise. *Crangon* and its allied genera might, indeed, have arisen independently from an ancestor of *Pontophilus*, that is to say from a form differing from Group I of that genus only in the possession of long second legs. In this case the pleopods must have evolved separately in the two instances; with the result that their identity of structure, as we see it to-day in *Crangon* and the related genera on the one hand and in *Pontophilus*, Group V, on the other, is an example of convergence.

I am inclined to think that this conclusion is erroneous. The tendency that clearly exists towards the reduction or suppression of the second pair of legs shows that these appendages are unusually plastic in Crangonidae: the monodactylous condition of these limbs in *Sabinea* and *Prionocrangon* is evidently an instance of convergence and affords no evidence of real affinity. The structure of the pleopods is more likely to yield a trustworthy estimate of relationship.

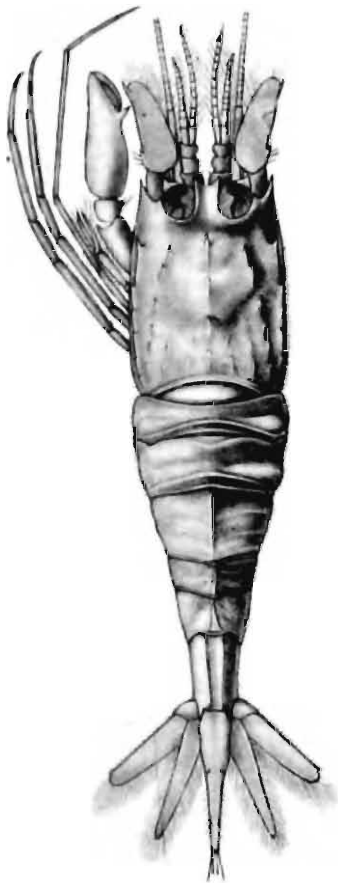
Of the genera *Vercoia*, Baker¹, and *Coralliocrangon*, Nobili², I have seen no examples. In the former, according to a sketch kindly sent me by Mr. Baker, the endopod of the last four pleopods is comparatively large, but without appendix interna. The genus has perhaps arisen separately from forms similar to those in Group III of *Pontophilus*; it differs from all species of the latter in the monodactylous character of the second legs. Owing to lack of information regarding the pleopods, it is impossible to make any suggestion regarding the relationships of *Coralliocrangon*. This is particularly unfortunate, for the persistence in the genus of the *linea thalassinica* points to its being a survival of some very primitive form.

¹ Baker, *Trans. Roy. Soc. S. Australia*, XXVIII, p. 158 (1904).

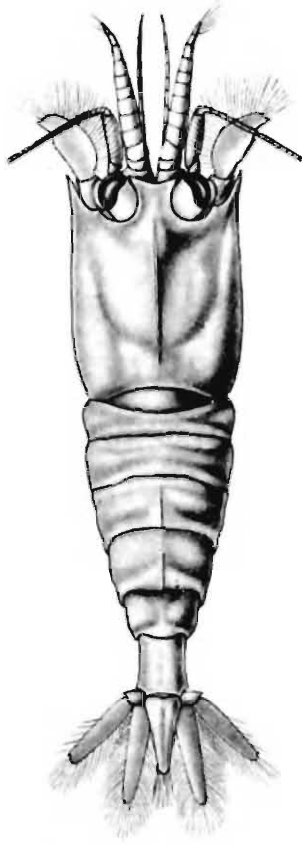
² Nobili, *Ann. Sci. Nat. Zool. Paris*, (9), IV, p. 82 (1906).

EXPLANATION OF PLATE VIII.

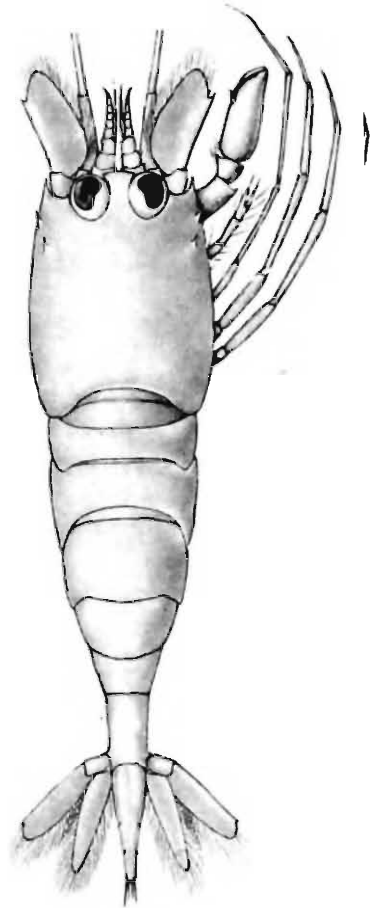
- FIG. 1.—*Pontophilus incisus*, sp. nov.
,, 2.—*Pontophilus lowisi*, sp. nov.
,, 3.—*Pontophilus candidus*, sp. nov.
,, 4.—*Pontophilus pilosus*, sp. nov.
,, 5.—*Pontophilus plebs*, sp. nov.
,, 6.—*Pontophilus parvirostris*, sp. nov.



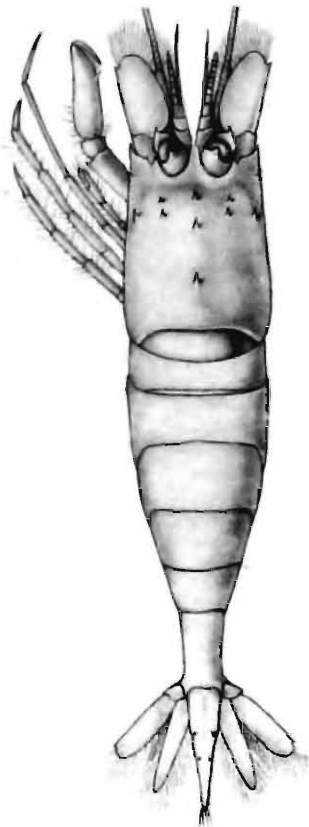
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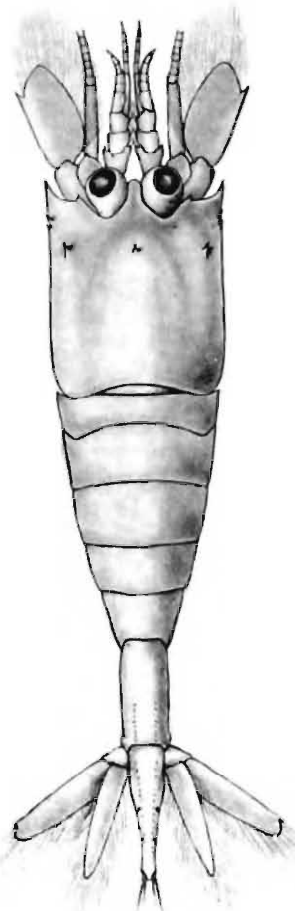
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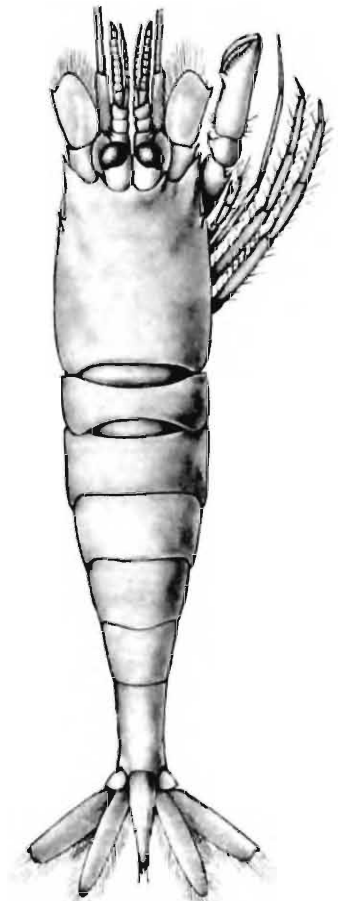
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6.

A.C. Chowdhary, del.

Bemrose, Collis, Derby

NEW INDIAN SPECIES OF PONTOPHILUS.

XXI NOTES ON CRUSTACEA DECAPODA
IN THE INDIAN MUSEUM.

VII. FURTHER NOTES ON HIPPOLYTIDAE.

By STANLEY KEMP, B.A., *Superintendent, Zoological Survey
of India.*

(Plate XXXVI).

Although only two years have elapsed since my previous paper on the Indian Hippolytidae was published, a number of interesting forms have come to light, obtained partly during the recent cruises of the 'Investigator' by Capt. R. B. Seymour Sewell, I.M.S., partly by Dr. Annandale in Japan, and partly by myself during a short visit to Port Blair in the Andamans.

The Hippolytid fauna of Port Blair is one of great richness. During three weeks' collecting, fully half the known Indian species of the family were met with, enabling me to obtain notes on the natural colouration of several forms hitherto unknown in this respect. In addition, three forms were found that had not previously been recognised, one representing a new generic type. Of these, *Thor discosomatis* is of particular interest owing to the fact that it lives commensally with a large anemone of the genus *Discosoma*, and is most peculiar in its colouration; the species of *Phycocaris*, gen. nov., is extremely grotesque in appearance and closely mimics the weed among which it lives.

Borradaile, in a recent paper,¹ has briefly described a genus and three new species of Hippolytidae from the Maldives, the Seychelles and other localities. If my identification is correct, two of these, *Thor maldivensis* and *Lysmatella prima* (the latter the type of the new genus), occur in the Andamans; but I am inclined to think that *Lysmatella* should at most be distinguished only subgenerically from the closely allied *Hippolysmata*. *Exhippolysmata*, recently proposed by Stebbing² to include *Hippolysmata ensirostris* and a nearly related form from S. Africa, does not appear to differ sufficiently to warrant either generic or subgeneric separation.

Genus **Saron**, Thallwitz.

Saron marmoratus (Olivier).

1914. *Saron marmoratus*, Kemp, *Rec. Ind. Mus.*, X, p. 84.

A number of specimens of this well-known species were obtained at Port Blair; the majority were found under stones left

¹ Borradaile, *Ann. Mag. Nat. Hist.*, (8), XV, pp. 206, 208 (1915).

² Stebbing, *Ann. S. African Mus.*, XV, p. 94 (1915).

bare at low water, but one individual was dredged at a depth of two fathoms.

There are tufts of setae on the carapace and abdomen of all the specimens; the males are small and do not possess the enlarged third maxillipedes and first peraeopods characteristic of well-grown examples of their sex.

On close inspection the colouration of living specimens is very wonderful, resembling that of a rich Turkey carpet. At a casual glance, however, the animal is dull in tone and it is clear that the vivid tints blend and cause it to harmonise with its surroundings, just in the same way that the splashes of bright colour on gun-mountings are effective in rendering them inconspicuous.

On the carapace and abdomen are numerous large ocellar spots of an irregular shape; in the centre these spots are buff, dotted with red and circumscribed with white and reddish orange. Between the spots are patches, irregularly lobulate in form, but symmetrical on either side of the animal. They are of a deep reddish brown colour with numerous large bright blue spots. Each patch is sharply defined, its sinuous margin being outlined with black and pale grey. At the antero-lateral angle of the carapace there is a dull red spot. The rostrum, antennules and antennal scales are pale buff, barred with dark brown, the brown bearing numerous white flecks. The anterior two pairs of legs are reddish at the base; their distal segments and all segments of the last three pairs are pale yellowish green broadly barred with black. The tail-fan is obscurely mottled with brown and buff.

The largest specimen, an ovigerous female, is only 36 mm. in total length.

$\frac{9560}{10}$ Port Blair, Andamans.

S. Kemp.

Eleven.

Genus *Spirontocaris*, Bate.

Spirontocaris pandaloïdes (Stimpson).

1907. *Spirontocaris pandaloïdes*, de Man, *Trans. Linn. Soc., Zool.*, (2), IX, p. 418, pl. xxxii, figs. 47, 48.

A number of examples of this species were obtained by Dr. Annandale during his recent visit to Japan from Mr. Kuma Aoki. The teeth on the rostrum vary from 8 to 10 on the upper border and from 10 to 13 on the lower.

$\frac{9561}{10}$ Misaki, Japan.

Kuma Aoki.

Fourteen,
46-49 mm.

Spirontocaris rectirostris (Stimpson).

1907. *Spirontocaris rectirostris*, de Man, *Trans. Linn. Soc., Zool.*, (2), IX, p. 411, pl. xxxii, figs. 31-34.

Two fine specimens in Dr. Annandale's Japanese collection (presented by Dr. S. Yoshida) agree very closely with de Man's description of the male of this species. Both individuals have only 5 teeth on the upper border of the rostrum; on the lower

border there are 2 in one specimen and 3 in the other. The telson in one case bears four pairs of dorsal spinules, in the other five.

De Man has drawn attention to the great development of the third maxillipedes and first peraeopods in the male. In the two specimens obtained by Dr. Annandale this character is well shown, the proportions of the limbs agreeing precisely with de Man's description. The enlargement of these appendages in the adult male is a feature of considerable interest, for though apparently rare in the genus *Spirontocaris*, an almost precisely similar phenomenon is met with in the genera *Alope* and *Saron*.

$\frac{9.5 \times 2}{10}$ Tanabe, Kii prov., Japan. S. Yoshida. Two, 34, 36 mm.

The third maxillipedes in the larger specimen are 30 mm. in length; in the smaller they are 26 mm.

Genus *Thor*, Kingsley.

The definition of this genus requires modification in order to include *T. maldivensis*, Borradaile, in which supraorbital spines are found on the carapace. In addition to the greater number of segments in the carpus of the second peraeopods and the presence of a movable plate at the distal end of the antennular peduncle—characters by which the genus is readily distinguished from *Hippolyte*—the outer antennular flagellum, in *Thor*, is greatly swollen in both sexes.

An interesting species, hitherto undescribed, was obtained at Port Blair; it lives commensally with giant sea-anemones of the genus *Discosoma* and is very peculiar in its pigmentation.

The three known species of *Thor*, all of which have been found in the Andamans, may be distinguished as follows:—

- | | |
|---|--|
| I. Rostrum with two or more dorsal teeth;
supraorbital spines absent. | |
| A. Apex of rostrum bifid; lateral process
of antennule without a tooth at its
proximal end | <i>T. paschalis</i> (Heller). |
| B. Apex of rostrum simply pointed;
lateral process of antennule with a
small upstanding tooth at its prox-
imal end | <i>T. discosomatis</i> , sp. nov. |
| II. Rostrum with only a single dorsal tooth;
supraorbital spines present | <i>T. maldivensis</i> , Borra-
daile. |

Thor paschalis (Heller).

1914. *Thor paschalis*, Kemp, *Rec. Ind. Mus.*, X, p. 94, pl. i, figs. 6-10.

Additional specimens are from Singapore and from Port Blair in the Andamans. The species was found on several occasions in the latter locality, living among weeds at depths of from 2 to 5 fathoms in the neighbourhood of Ross I. The specimens are smaller than the majority of those obtained in the Gulf of Manaar; the largest is only 8 mm. in length and ovigerous females sometimes do not exceed 6.5 mm. The single individual from Singapore, a male, was obtained at low water under a block of coral.

$\frac{9.563}{10}$ Port Blair, Andamans.
 $\frac{9.561}{10}$ Tanah Merah Besar,
 Singapore I.

S. Kemp.
 N. Annandale.

Ten.
 One.

***Thor discosomatis*, sp. nov.**

(Plate xxxvi, fig. 1).

Thor discosomatis is a very close ally of *T paschalis* and agrees with that species in the great majority of its structural features. It differs, however, in the following points:—

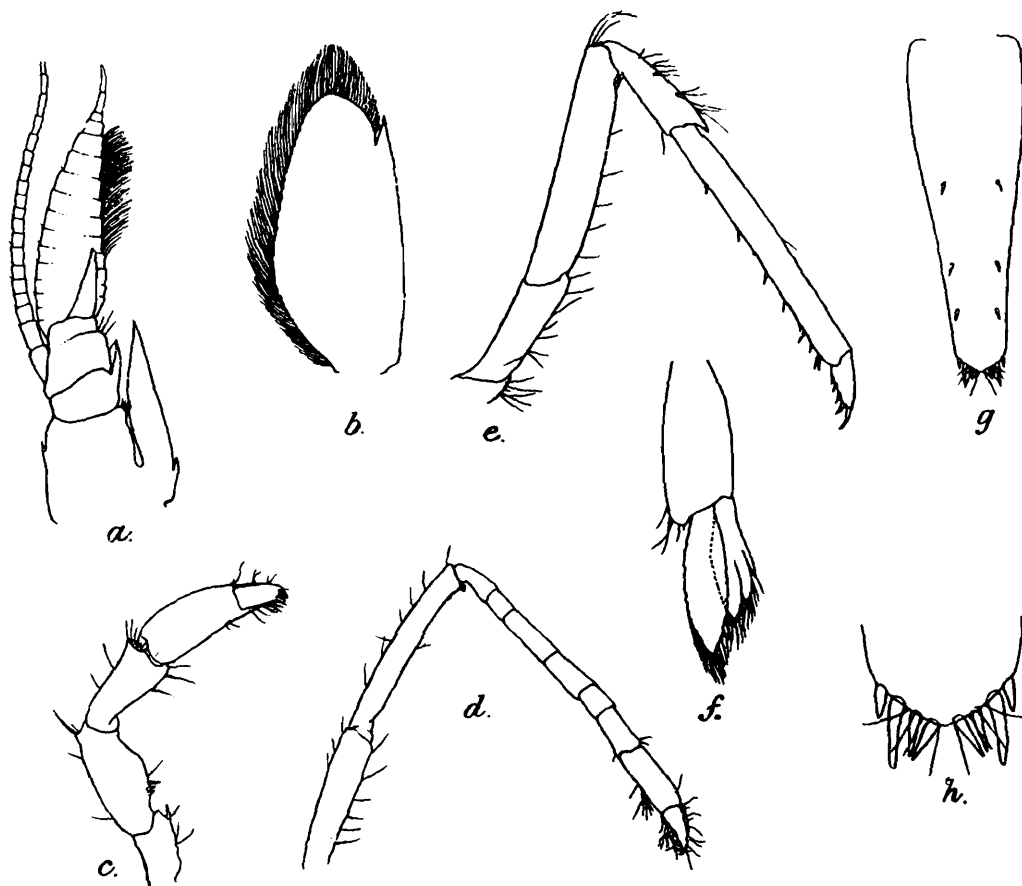


FIG. 1.—*Thor discosomatis*, sp. nov.

- | | |
|----------------------|----------------------------|
| a. Antennule. | e. Third peraeopod. |
| b. Antennal scale. | f. Second pleopod of male. |
| c. First peraeopod. | g. Telson. |
| d. Second peraeopod. | h. Apex of telson. |

The rostrum is a little shorter; at its apex it is sharply pointed, not bifid, and on its upper margin it bears only two or three teeth. These teeth are larger and all of them are situated on the rostrum in front of the hinder limit of the orbit. The basal segment of the antennular peduncle (text-fig. 1a) bears a spine on its infero-internal aspect, as in *T paschalis*; but the lateral process, though variable in length, is usually longer than in that species, often reaching the end of the third segment. The process bears, near the proximal end of its outer margin, a sharp upstanding tooth of which no trace exists in the allied species.

The peraeopods closely resemble those of *T. paschalis*. The carpus of the second pair (text-fig. 1*d*) is composed of six sub-segments the proportional lengths of which are much the same as in *T paschalis*, except that the third is comparatively a little shorter. There is practically no difference between males and females in the length of the third pair of legs (text-fig. 1*e*). On the lower border of the merus of the third and fourth pairs there is a small subterminal spine. This spine is present on all the last three pairs in *T paschalis*,¹ whereas in *T discosomatis* it is absent from the last pair.

On the telson (text-fig. 1*g*) as in *T paschalis* there are three or four pairs of dorso-lateral spinules. At the apex, however, there are four pairs of spines, the outermost the shortest, the second the longest and the two inner pairs sub-equal (text-fig. 1*h*). In *T paschalis* there are only three pairs of terminal spines.

In the shape of the antennal scale (text-fig. 1*b*) and in all other features, *T discosomatis* seems to bear the closest resemblance to *T paschalis*.

The largest specimen obtained, an ovigerous female, is 13 mm. in length.

The colouration of living specimens was very remarkable, the animal being of a deep reddish brown tint, semitransparent, with very large spots and patches of pale greenish yellow. On the carapace are two such spots, round and confluent in the mid-dorsal line; there is one on either side of the second abdominal somite, a broad transverse band on the fourth somite with a small spot on each side below it, a ventral transverse bar on the fifth somite and a patch, forming a complete ring, on the sixth somite. Each of these spots or patches is very pale green in the centre, with a broad margin of bright yellow, the whole being narrowly circumscribed by blue. The central portions are traversed by streaks of yellow extending inwards from the margin. The apex of the telson is greenish yellow and there is a circumscribed spot in the middle of each uropod. On the upper side of the eyestalk there is a greenish yellow patch; all the other appendages are reddish brown.

The specimens of *Thor discosomatis* were found along with a Palaemonid in the immediate vicinity of large anemones of the genus *Discosoma*. Two very small individuals were obtained in the dredge, but it is probable that on this occasion the net was drawn over an anemone in the course of its passage along the bottom.

The Palaemonid has been described by Nobili under the name *Ancylocaris aberrans*,² and of this species Miss Rathbun's *Perichimenes hermitensis*³ is apparently a synonym. Coutière,⁴ who

¹ These spines are omitted in the figure given in pl. i, fig. 6, *op. cit.*, 1914.

² Nobili, *Bull. sci. France Belgique*, XI., p. 52, pl. iv, figs. 9-9*b* (1906).

³ Rathbun, *Proc. Zool. Soc. London*, 1914, p. 655, pl. i, figs. 1-3.

⁴ Coutière, *Bull. Mus. d'Hist. nat., Paris*, IV, p. 198 (1898).

refers to the same form as a species of *Bithynis*, has given the following account of its habits.—“ Un Palémonidé du genre *Bithynis* Dana mérite une mention spéciale par son habitat et sa coloration. Il est absolument transparent, mais se signale par quelques anneaux d'un violet pâle sur les appendices et l'abdomen, et surtout par des taches d'un blanc nacré éclatant, occupant la région stomacale tout entière, le coude de l'abdomen, l'extrémité des rames caudales et les épimères du deuxième segment. Ce magnifique Crustacé se tient obstinément dans la zone de protection que circonscrit une grande Actinie assez commune dans les flaques profondes qui séparent les Madrépores. Étalaé sur le sable, le disque oral de l'Actinie de couleur blanchâtre, armé d'un très grand nombre de courts tentacules urticants, atteint souvent 0 m. 30 de diamètre. *Bithynis* se tient dans ce cercle, nageant à peu de distance au-dessus, souvent par couples, et se laisse assez aisément capturer à l'aide d'une éprouvette pleine d'eau que l'on descend doucement sur l'animal.”

The anemone at Port Blair was one with greenish tentacles, not whitish as in Coutière's description. It was not uncommon at low water on the foreshore at “ Aberdeen ” and was sometimes left high and dry by the tide. On anemones from which the water had completely retreated we failed to find any shrimps, even though the whole specimen was dug up and most carefully examined. On the other hand the shrimps were seldom absent from anemones living in a few inches of water, and were easily caught in a tube full of water as described by Coutière. The *Ancylocaris*¹ was found swimming and crawling on the column of the anemone beneath the fringe of tentacles and wandering occasionally on to the disc. *Thor discosomatis* had similar habits, but seemed to wander further afield and rarely ventured among the tentacles.

The curious feature of the shrimps is that in both species the pigmentation takes the form of very large spots almost pure white in colour. This, too, is a characteristic of certain fish, *Amphiprion percula* (Lacép.) and *Tetradrachnum trimaculatum* (Rüpp.),² which also appear to live commensally with the *Discosoma*; the latter was found beneath the fringe of tentacles and was black with a broad transverse band of white at the back of the head, extending downwards to the eye, and a large white spot below the dorsal fin; the former, which was commonly found swimming among the tentacles, was bright orange with three broad bands of white tinged with green and narrowly margined with black. The presence of white patches in all four commensal species is a most curious

¹ Coutière, in this brief description, has scarcely done justice to the marvellous colouration of *Ancylocaris aberrans*; the large white patches are frequently circumscribed by red or orange pigment and on the tail-fan are eye-spots with reddish centres. A complete account of the colouration of this Palaemonid would be out of place in the present paper, but it may be mentioned that the pigmentation varies somewhat in the two sexes and alters considerably with age. The colouration of *Thor discosomatis*, on the other hand, is apparently constant throughout life.

² I am indebted to Dr. B. L. Chaudhuri for these determinations.

feature and one of which it is impossible to offer an explanation.

$\frac{9261-4}{10}$ Port Blair, Andamans. S. Kemp. Fourteen.

The types bear the number 9261/10.

Thor maldivensis, Borradaile.

1915. *Thor maldivensis*, Borradaile, *Ann. Mag. Nat. Hist.*, (8), XV, p. 208.

A single ovigerous female, about 9 mm. in length, doubtless belongs to this species. It differs, however, from Borradaile's brief description in possessing six distinct segments in the carpus of the second peraeopods. The presence of strong supraorbital spines and the very short rostrum, armed with only a single dorsal tooth are characters which readily distinguish it from the two preceding species. According to Borradaile the first leg is enlarged in adult males.

$\frac{9221}{10}$ Port Blair, Andamans. S. Kemp. One.

The specimen was found at low water on the coral reef in North Bay and was, when living, rather conspicuously mottled.

Thor maldivensis was described from Minikoi, the Maldives and Salomon Atoll.

Genus **Hippolyte**, Leach.

Hippolyte ventricosus, Milne-Edwards.

1914. *Hippolyte ventricosus*, Kemp, *Rec. Ind. Mus.*, X, p. 96, pl. ii, figs. 1-3.

This species is not very abundant in Port Blair harbour. The majority of the specimens obtained were taken at Corbyn's Cove North, not far from the entrance to the harbour, living in a fucoid weed washed by the waves. All the individuals taken in this situation were of a dull olive-brown colour closely resembling that of the sea-weed.

The collection includes many ovigerous females, an unusually large specimen being 21 mm. in length.

$\frac{9277}{10}$ Port Blair, Andamans. S. Kemp. Many.

Genus **Phycocaris**, nov.

Carapace with supraorbital and antennal spines; anterolateral (pterygostomian) spine absent. Lateral process of antennular peduncle spiniform; upper flagellum uniramous. Mandible with incisor-process, but without palp. Third maxillipede with exopod. Neither epipods nor arthrobranchs at base of first four peraeopods. Carpus of second peraeopods composed of two segments. Endopods of second to fifth pleopods very large in female, small and slender in male.

Type and only species, *Phycocaris simulans*, sp. nov.

This genus is formed for the reception of a small and peculiar Hippolytid of the most grotesque appearance, that lives on weeds in the vicinity of Port Blair. On its appendages, including the eyestalks, are long straggling hairs and these, in conjunction with its colour and the unusual attitude it adopts, combine to give it a most extraordinarily close resemblance to small tufts of algae.

In most of the characters mentioned above the genus agrees with Calman's *Trachycaris*,¹ though in outward appearance there is the widest possible difference between them. The type and only known species of *Trachycaris*² is that described by Spence Bate from the West Indies under the name *Platybema rugosum*. It agrees with *Phycocaris* in having only two segments in the carpus of the second peraeopods and in the great size of the endopods of the second to fifth pairs of pleopods. The latter character, though given without qualification in Calman's diagnosis, is probably found only in females.

Phycocaris differs from *Trachycaris* in the absence of the anterolateral spine of the carapace and in the presence of an incisor-process on the mandible.³ The latter feature is of considerable importance and indicates that the genus is in reality allied to *Thor* and *Hippolyte* rather than to *Trachycaris* and other genera of the Latreutid section of the family. From *Thor*, *Hippolyte* and the peculiar N. Atlantic genus *Cryptocheles*, it is easily distinguished by the number of segments in the second legs.

Phycocaris simulans, sp. nov.

(Plate xxxvi, fig. 2).

The carapace is arched above and is produced anteriorly to a short and simple rostrum that reaches only a little beyond the end of the basal antennular segment. On the frontal margin above the eye there is, on either side, a short and stout supraorbital spine. The antero-lateral (pterygostomian) spine is absent, but there is a small spine at the base of the antenna; the antero-inferior angle is rounded. The carapace is not carinate in the middle line and bears a few long scattered hairs.

The eyes are comparatively long and slender. In dorsal view the cornea is not broader than the stalk and is about half its length. There is no ocellus; but at the junction of the cornea and stalk there is a cirlet of long hairs, a remarkable feature not known in any other Hippolytid.

The basal segment of the antennular peduncle (text-fig. 2a) is fully as long as the two following combined; its lateral process is

¹ Calman, *Ann. Mag. Nat. Hist.*, (7), XVII, p. 33 (1906).

² *Platybema pristis*, Nobili, [*Ann. Mus. civ. Genova*, (2), XX, p. 233 (1899)] should doubtless be referred to the genus *Latreutes*.

³ The statement that the mandible in *Trachycaris* is without incisor-process is given by Calman on the authority of Spence Bate. I have examined a specimen *T. rugosus* and am able to confirm the accuracy of the observation.

slender, incurved and spine-like, extending a little beyond the end of the segment and bearing a few hairs externally. The second and third segments are nearly equal in length, each bearing near its distal end one or two very long plumose setae. The outer flagellum is longer and stouter in the male than in the female. In the former sex the thickened portion is composed of some seven segments and is longer than the peduncle; in the latter it is shorter than the peduncle and consists only of five more slender segments.

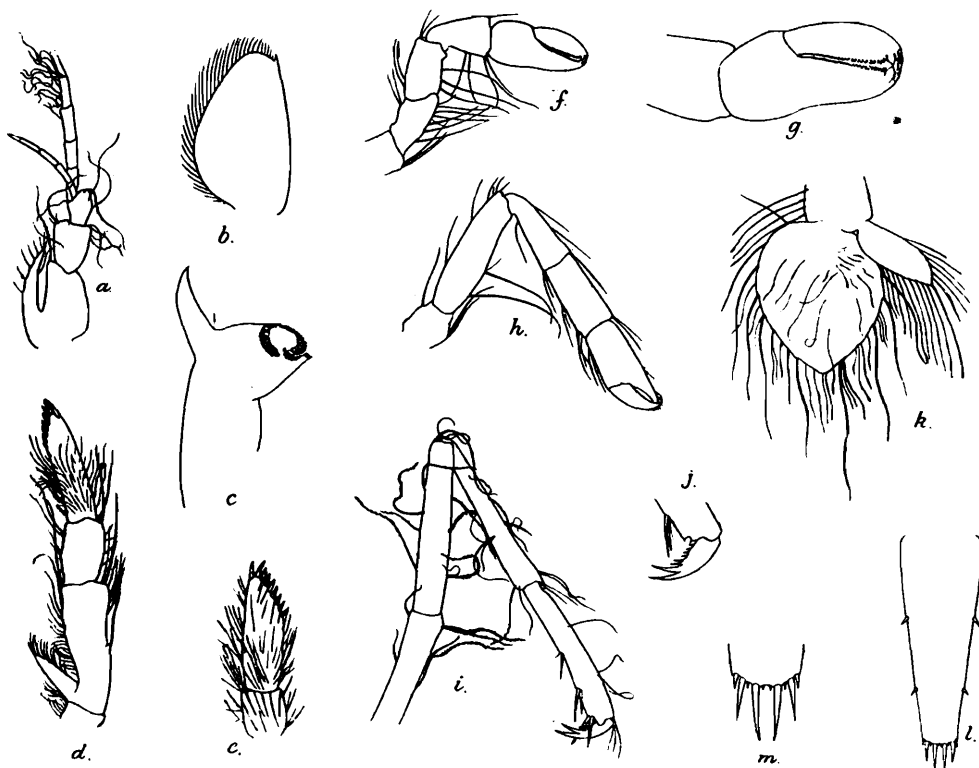


FIG. 2.—*Phycocaris simulans*, gen. et sp. nov.

- | | |
|--|--------------------------------|
| a. Antennule. | g. Chela of first pereopod. |
| b. Antennal scale. | h. Second pereopod. |
| c. Mandible. | i. Third pereopod. |
| d. Third maxillipede, the distal segment seen obliquely. | j. Dactylus of third pereopod. |
| e. Distal segment of third maxillipede. | k. Second pleopod of female. |
| f. First pereopod. | l. Telson. |
| | m. Apex of telson. |

The inner flagellum is short and is usually carried reflected backwards.

The antennal scale (text-fig. 2b), which reaches a little beyond the antennular peduncle, is broadest near the base and is less than twice as long as wide; the outer margin is convex, terminating in a spine that reaches as far forwards as the apex of the lamella. The peduncular segments bear long setae similar to those on the antennule.

The mandible resembles that found in the genus *Thor*; the incisor-process is well developed and is furnished with about seven teeth at the apex. The palp is entirely absent and the molar process is cleft and furnished with slender spines, many of which are serrate.

The second maxilla is normally developed; the distal endite of the endopod is divided into two parts of equal breadth. The first and second maxillipedes possess epipods, that of the former being emarginate distally, while that of the latter is deeply bilobed. The ultimate segment of the endopod of the second maxillipede is placed terminally at the end of that which precedes it and is not applied as a strip along the outer margin of the latter as in the great majority of the Caridea. The third maxillipede (text-fig. 2*d*) does not possess an epipod; the exopod is small but foliaceous, reaching about to the middle of the antepenultimate segment. The ultimate segment (text-fig. 2*e*) is less than twice the length of the penultimate and is not three times as long as broad; in addition to numerous hairs it bears a series of nine or ten sharp spinules in its distal half.

The first peraeopods (text-fig. 2*f*) are stout, but very short; the ischium and merus and carpus are sub-equal, a little shorter than the chela. The segments bear long setae but are otherwise unarmed. The chela (text-fig. 2*g*) is rather more than twice as long as broad and the fingers are distinctly longer than the palm. On the internal surface of the chela the fingers are deeply hollowed or spooned near the cutting margin, while externally each forms a thin blade with a saw-like edge, the two meeting throughout their length when the claw is closed. At the extreme tip each finger is provided with three large teeth.

The second peraeopods (text-fig. 2*h*) are much longer, reaching nearly to the tip of the antennal scale. The carpus is almost as long as the ischium and merus combined and consists of two segments, the second a little shorter than the first and about twice as long as broad. The chela is almost two-thirds the length of the carpus and nearly two and a half times as long as wide, the fingers being about one-third shorter than the palm. When the claw is closed the fingers meet only at the tips where they cross each other.

The last three pairs of peraeopods (text-fig. 2*i*) are similar and show no sexual differences. The carpus is scarcely shorter than the merus and is a trifle longer than the propodus. The propodus is armed beneath with five or six spines, two pairs towards the distal end and one or two others, which are smaller, near the middle. When the dactylus is folded inwards it lies between the two spines constituting the distal pair and thus forms a poorly developed grasping organ. The dactylus (text-fig. 2*j*) is short, spines included about two-fifths the length of the propodus; on its inferior edge it bears a series of seven or eight spinules which increase in size distally, the two terminal ones being large spines. All the legs bear very long plumose setae, especially conspicuous on the ischium, merus and carpus.

The abdominal somites are not carinate dorsally. The third is very strongly humped and the sixth, which is but little longer than the fifth, is produced to a rounded prominence in the middle of its posterior margin. The endopod of the last four pairs of pleopods bears an appendix interna and is enormously expanded in the female (text-fig. 2*k*); in the male it is not broader than the exopod. The margins of both rami bear long setae.

The telson (text-fig. 2*l*) is nearly twice the length of the sixth somite and is feebly sulcate above. It bears two or three pairs of small dorso-lateral spines and terminates in a broad, almost truncate apex (text-fig. 2*m*) armed with three pairs of spines, the innermost the longest, about equal to the breadth of the apex, and the outermost much the shortest. Between the innermost pair of spines are two minute spinules, while a similar spinule occurs on either side between the bases of these spines and those of the intermediate pair. The outer uropods do not reach the apex of the telson; they are shorter than those of the inner pairs and are rather more than two and a half times as long as wide.

The long setae that have been described above as plumose differ considerably from those to which this term is generally applied, for the plumes have not the form of very fine microscopic hairs, but are comparatively short and blunt processes from the main axis of the seta.

The largest specimen obtained, an egg-bearing female, is barely 9 mm. in total length; other ovigerous individuals do not exceed 7 mm.

This curious little species was found at Port Blair near Ross I., living among weeds in water from 2 to 4 fathoms in depth. We found it impossible to obtain specimens at all freely by the usual methods, but if the contents of the net were immediately transferred to a bucket of sea-water, individuals were sometimes found swimming at the surface and alighting on floating fragments of weed.

The illustration on Plate xxxvi, which is based on sketches made from living specimens, will give an idea of the peculiar attitude that the species adopts. The abdomen is strongly flexed near its junction with the cephalothorax, so much so that the third segment as a rule almost touches the carapace, and the antennules are bent upwards and backwards. In this attitude, and with the help of the long plumose setae that the species possesses,¹ *Phycocaris* bears the most extraordinarily close resemblance to small tufts of algae that are plentiful on the weeds: it was only after considerable experience that we were able to distinguish the one from the other. The resemblance, which is undoubtedly protective, is further enhanced by the colour. The tufts of algae vary in shade and are sometimes dull olive-yellow and sometimes almost black. Two colour varieties of the prawn, corresponding

¹ These setae are very easily broken off in preserved specimens and are in life more numerous and longer than is shown in the figure.

exactly with these tints, were obtained and a few specimens of a bright red tone were also caught on occasions in which much red alga was brought up in the net.

$\frac{9255-60}{10}$ Port Blair, Andamans. S. Kemp. Twenty-four.

The type specimens bear the numbers 9255-6/10 in the Indian Museum register.

Genus *Latreutes*, Stimpson.

Latreutes pygmaeus, Nobili.

1914. *Latreutes pygmaeus*, Kemp, *Rec. Ind. Mus.*, X, p. 99, pl. ii, figs. 7, 8; pl. iii, figs. 1-7.

The species was very common in the vicinity of Ross I., living among weeds. Most of the females were ovigerous.

$\frac{9276}{10}$ Port Blair, Andamans. S. Kemp. Many.

Latreutes planirostris (de Haan).

1907. *Latreutes planirostris*, de Man, *Trans. Linn. Soc., Zool.*, (2), IX, p. 421.
1914. *Latreutes planirostris*, Balss, *Abhandl. math.-phys. Klasse K. Bayer. Akad. Wiss.*, Suppl. Bd. II, abh. 10, p. 46.

This species is represented in the Museum collection by two female specimens, in both of which, as in those examined by Miss Rathbun,¹ the median spine in the posterior third of the carapace, figured by de Haan, is obsolete.

Miss Rathbun cites *L. mucronatus* as a synonym of *L. planirostris*, but this view is not held by Balss. *L. planirostris* is a larger species, with even more perfectly orbicular rostrum than in any examples of *L. mucronatus* that I have seen; the carapace, moreover, is carinate in the mid-dorsal line almost up to the posterior margin.

$\frac{8880}{10}$ Sagami Bay, Japan. Munich Mus. One, 25 mm.
 $\frac{9267}{10}$ Misaki, Japan. Kuma Aoki. One, 28 mm.

Latreutes mucronatus (Stimpson).

1914. *Latreutes mucronatus*, Kemp, *Rec. Ind. Mus.*, X, p. 101, pl. iii, figs. 8-15; pl. iv, figs. 1, 2.
1914. *Latreutes mucronatus*, Balss, *Abhandl. math.-phys. Klasse K. Bayer. Akad. Wiss.*, Suppl. Bd. II, abh. 10, p. 47, fig. 27.

The additional specimens agree with those recorded from Kilakarai and Pamban in S. India, but are rather smaller; the largest is only 10.5 mm. long and one of the five ovigerous females is less than 8 mm. in length. The remarkable sexual differences noted in the case of the S. Indian specimens are clearly shown in the Andaman series, the females have the carapace more strongly arched and the rostrum more orbicular than in the males. Out of a total of thirty individuals only five, all males, possess more than a single tooth on the carapace behind the orbit; in three specimens

¹ Rathbun, *Proc. U.S. Nat. Mus.*, XXVI, p. 46 (1902).

there are 2 teeth and in two specimens 3 teeth in this position. In no case is there a tooth in the posterior third of the carapace as in de Haan's figure of *L. planirostris*. The teeth on the upper edge of the rostrum in the male may be as many as 10.

Living specimens were as a rule inconspicuously mottled; two examples were, however, found in which the carapace and the greater part of the abdomen were of a uniform rich red-brown, the tail-fan and the posterior half of the last abdominal somite being pure white.

Balss, who has recently recorded this species (*l.c. supra*) from Sagami Bay in Japan, from the Gulf of Siam and from Chemulpo in Korea, notes that the specimens recorded by Doflein in 1902 as *L. mucronatus* are in reality examples of *L. planirostris*, de Haan.

$\frac{9.5.6.5}{10}$ Port Blair, Andamans, 2-6 fms. S. Kemp. Thirty.

Most of the specimens were obtained among weeds in the channel off Ross I.; a few were found in Brigade Creek.

Latreutes porcinus, sp. nov.

(Plate xxxvi, fig. 3).

In general form there is very little difference between the sexes; in both the carapace is sharply carinate dorsally, the carina being very high and abruptly declivous in its anterior third. The carina is armed with rather irregular procurved teeth, 6 to 12 in number (usually 9 to 11 in large specimens). The series begins behind the middle point of the carapace and the foremost 3 or 4 are usually in advance of the orbit, though separated, in the majority of the specimens, by an unarmed interval from the teeth on the rostrum proper. The antennal spine is present and there are 7 or 8 spinules on the antero-lateral margin.

The rostrum resembles that found in female *L. mucronatus*, being semiorbicular and rounded anteriorly or broadly lanceolate and more or less pointed at the apex. The teeth are on the whole less numerous than in the allied species; the dorsal series consists of from 4 to 8 and the ventral of from 3 to 8; in most specimens there are from 5 to 7 on each margin. In two out of the fifteen specimens examined there are three minute teeth in the interval between the upper rostral teeth and the series on the carapace.

The antennule (text-fig. 3a) is more slender than in *L. mucronatus*; the antennal scale (text-fig. 3b) is closely similar in form. The second peraeopods (text-fig. 3e) are a trifle more slender and of the three segments of which the carpus is composed the second is proportionately longer, exceeding the length of the first and third combined. The last three peraeopods are similar to those of *L. mucronatus*, but the terminal spine of the dactylus is usually more slender than the next of the series. In a few individuals two spines are to be found at the distal end of the lower margin of the merus of the third pair (text-fig. 3f); in most cases, however, as in *L. mucronatus*, single spines occur in this position.

The third abdominal somite is distinctly carinate in its posterior half. The telson and uropods (text-figs. 3g, h) are not greatly dissimilar from those of *L. mucronatus*.

The largest specimen, an ovigerous female, is about 15.5 mm. in length.

In general appearance this species bears some resemblance to *Trachycaris rugosus*, a West Indian form with which it has, of course, no real affinity. From all species of *Latreutes* hitherto

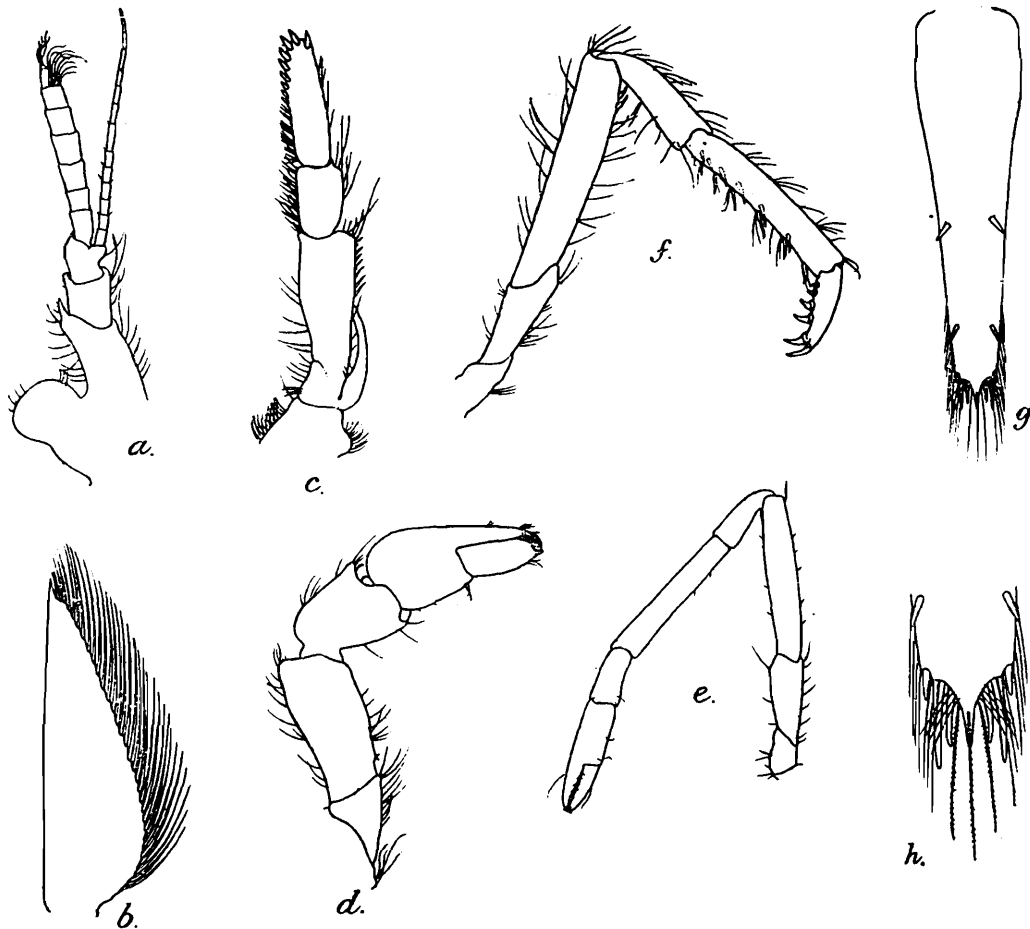


FIG. 3.—*Patreutes porcinus*, sp. nov.

- | | |
|-----------------------|----------------------|
| a. Antennule. | e. Second peraeopod. |
| b. Antennal scale. | f. Third peraeopod. |
| c. Third maxillipede. | g. Telson. |
| d. First peraeopod. | h. Apex of telson. |

known it is at once distinguished by the great number of teeth on the carapace.

Living specimens were variously banded and mottled, sometimes with pure white on a ground colour of reddish brown; one individual was pale pink throughout.

$\frac{9269-71}{10}$ Port Blair, Andamans.

S. Kemp.

Fifteen.

The specimens were all obtained off the jetty on Ross I., living among weed in company with *Latreutes pygmaeus*, *L. mucronatus* and *Tozeuma armatum*. The types bear the number 9269/10.

Latreutes anoplonyx, Kemp.

1914. *Latreutes anoplonyx*, Kemp, *Rec. Ind. Mus.*, X, p. 104, pl. iv, figs. 3-5.

Numerous additional specimens of this species have recently been obtained by the 'Investigator' off the Burma coast; they agree closely with the type. The rostrum is rather unusually constant in form, being always narrowly triangular in shape and extending, in all except extremely young specimens, well beyond the apex of the antennal scale. The dorsal margin is, however, straight in some examples, markedly concave in others. The number of teeth is variable; there are from 7 to 15 on the upper margin and from 6 to 11 on the lower. As was pointed out in the original description, *L. anoplonyx* differs from all other Indian species of the genus in that the dactyli of the last three legs are unarmed except for a few microscopic spinules.

The largest individual, an ovigerous female, is only 28 mm. in length, and is thus considerably smaller than the type.

335	Bombay.	H. P. le Mesurier.	One.
$\frac{8272-5}{10}$	Burma coast, 7-8½ fms.	Investigator.'	Many.

The only other known example was found at Bombay.

When describing this species I remarked that its nearest ally appeared to be Ortmann's *L. laminirostris*. It is perhaps at least as nearly related to *L. unidentatus*, Bate,¹ imperfectly described from a single specimen only 5.5 mm. in length obtained off Samboangan in the Philippine Is. Very young examples of *L. anoplonyx* do not differ greatly from Bate's figure; but in the description it is stated that the last three legs agree with those of *L. planus* in which, according to the figure, the dactylus is biunguiculate. Neither *L. planus* nor *L. unidentatus* have been recognised since they were first described and it seems likely that their identification will remain uncertain until the Hippolytid fauna of the Philippine Is. is investigated in detail; it is not even certain that they are correctly referred to the genus *Latreutes*.

Genus *Tozeuma*, Stimpson.***Tozeuma armatum*, Paulson.**

1914. *Tozeuma armatum*, Kemp, *Rec. Ind. Mus.*, X, p. 106.

1914. *Angasia armata*, Balss, *Abhandl. math.-phys. Klasse K. Bayer. Akad. Wiss.*, Suppl. Bd. II, abh. 10, p. 48.

The additional specimens of this species, though a number of them are ovigerous females, are much smaller than those previously recorded from the Indian coast, a feature correlated perhaps with the shallower water in which they were obtained. The largest individual is only 43 mm. in length.

The number of teeth on the lower margin of the rostrum is variable and in one example is as high as 39. This specimen, obtained by Mr. Hornell in S. India, also possesses the additional

¹ Bate, *Rep. Challenger Macrura*, p. 584, pl. lxxix, fig. 5.

spine near the postero-inferior angle of the fifth abdominal somite, noticed in one of the examples previously recorded. In the latter, however, the number of rostral teeth is not abnormal.

A remarkable larval Carid found by the 'Investigator' in the Mergui Archipelago almost certainly belongs to this species (text-fig. 4). Although the rostral apex is broken the specimen is no less than 31 mm. in length. On the carapace are two large supra-orbital spines (which are absent in the adult) and the spines on the lower edge of the rostrum are represented merely by fine spinules. The legs are imperfectly formed, the first being chelate and the second simple with unsegmented carpus; attached to the first three pairs are long exopods. The hook-like projection on the dorsum of the third abdominal somite, a characteristic feature of adults of this species of *Tozeuma*, is represented by an enormously long, flattened, outstanding process, the tip of which is sickle-shaped and curved forwards. The sixth abdominal somite is proportionately much longer than in adults, while the telson

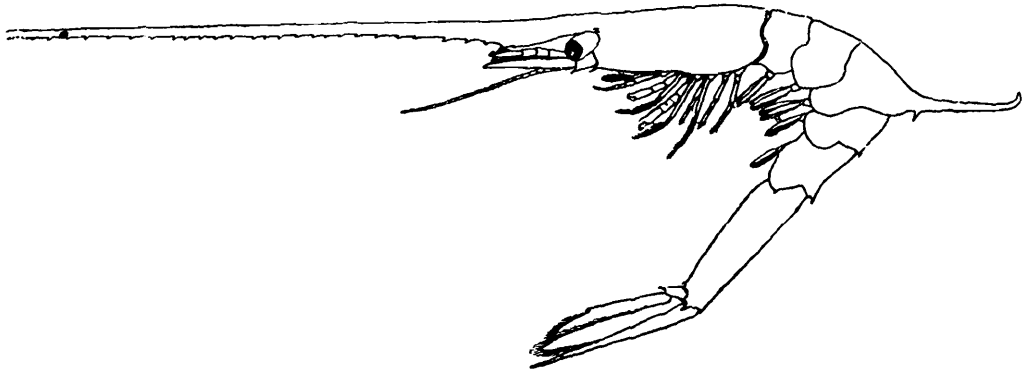


Fig. 4.—*Tozeuma armatum*, Paulson.
Late larval stage.

exceeds the tips of the uropods and is deeply bifurcate at its apex. Apart from its structure this post-larval specimen is remarkable for its great size. It is probable that (as is known to be the case with some other Caridea) there is an actual shrinkage in length at the final moult of the larval metamorphosis; other specimens in the collection, possessing all the adult characters, are 1 or 2 mm. shorter than the post-larval individual.

The colouration of living individuals, as observed in the Andamans, is peculiar. The specimens were deeply mottled with closely aggregated dark red chromatophores, slightly paler dorsally and especially dark on the lower portion of the rostrum which was fringed with bright red hairs. On the second and fifth abdominal pleura there were large eye-spots, each being deep blue in the centre, surrounded with concentric rings of black, pale yellow and red, in the order named. Just beyond its middle each of the inner uropods bore half a similar eye-spot, the two uropods, when juxtaposed, presenting a single perfect spot when seen from below. In dorsal view the spot is partially covered by the telson which is

not marked correspondingly. The inferior portions of the sixth somite were tinged with blue and there were pale pink chromatophores on the hook-like process on the third somite. The outer maxillipede was dark red, the first legs tinged with red and the remainder transparent.

Not infrequently specimens of a uniform bright green colour were met with. In these the rostral setae were also bright red, but the eye-spots were merely of a darker green surrounded by narrow bands of black and white. In the weed among which it is found *T. armatum* is very inconspicuous, extending its body almost perfectly straight and holding tightly to the stem.

$\frac{0267}{10}$	Mandapam, Ramnad Dist., S. India, 3 fms.	J. Hornell.	One.
$\frac{0265}{10}$	Port Blair, Andamans, 2-5 fms.	S. Kemp.	Nineteen.
$\frac{0268}{10}$	Burma coast, 8 fms.	Investigator.'	One, larval.

Balss (*loc. cit. supra*) has recently recorded this species from Japan, thereby making a considerable increase in its known geographical range.

Genus *Gelastocaris*, Kemp.

Gelastocaris paronae (Nobili).

1914. *Gelastocaris paronae*, Kemp, *Rec. Ind. Mus.*, X, p. 107, pl. v, figs. 1-11.

An additional specimen of this curious species was obtained at Port Blair. It was dredged in 5 fathoms of water along with the sponge *Petrosia testudinaria*, Lamarck.¹ When alive the individual was remarkable for its strangely depressed form, the carapace and abdomen being so much flattened that it resembled an Isopod of the genus *Idotea*. In colour the specimen was pale pink throughout with a speckling of darker pink chromatophores on the antennal scale and tail-fan and at the sides of the carapace and abdomen. The *Petrosia* was of a similar pink shade and the colouration is doubtless protective.

The specimen is a male, about 10 mm. in length, and, except for the thickened outer antennular flagellum, differs little from the two females previously recorded; in lateral view, however, the carapace is less strongly arched anteriorly.

$\frac{0568}{10}$	Port Blair, Andamans, 5 fms.	S. Kemp.	One.
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Genus *Hippolysmata*, Stimpson.

1914. *Hippolysmata*, Kemp, *Rec. Ind. Mus.*, X, p. 112.

1915. *Exhippolysmata*, Stebbing, *Ann. S. African Mus.*, XV, p. 94.

Stebbing has recently proposed to separate *Hippolysmata ensirostris*, along with a closely allied S. African form, as a distinct genus under the name *Exhippolysmata*. The characters employed

¹ I am indebted to Dr. Annandale for this determination. Mr. Southwell informs me that the specimen from the Ceylon Pearl banks, recorded in the paper cited above, was also found on this sponge.

are those made use of in my key to the Indian species (*loc. cit.*, p. 113): the rostrum is longer than in other species of the genus and is provided with an elevated dentate basal crest; the telson is lanceolate, with the apex acute and unarmed.

These characters appear to me to be altogether unsuitable for generic definition and are clearly of far less morphological value than those hitherto employed in the generic subdivision of the family. In young specimens of *H. ensirostris* there is a pair of long spines at the tip of the telson, reaching far beyond the produced median point and these may still be seen in a reduced condition, even in individuals 40 mm. in length. Stebbing also, when describing *Exhippolysmata tugelae*, notes the presence of a very small spine on either side of the telson tip. The claims of *Exhippolysmata* to generic rank rest therefore on the rostral characters and in the fact that the telson has a median point instead of being rounded. If it be retained, its recognition requires to be balanced by the institution of a considerable number of other "new genera," a procedure which seems unlikely to serve any useful purpose, while tending to confuse the natural affinities of the component species of the family.

Lysmatella, recently instituted by Borradaile for a species from the Maldives, is based on surer structural differences, but is none the less very closely allied to *Hippolysmata*. In the very brief preliminary diagnosis that Borradaile has given,¹ it is merely described as "related to *Lysmata*, but without mastigobranchs on the legs." The type species of the genus, *Lysmatella prima*, is described in the same paper.

Three specimens, recently obtained in the Andamans, agree in every particular with the generic and specific descriptions that Borradaile has given; but, unfortunately, the information is so meagre that it is impossible to be certain of their identity. The Andaman specimens are, however, clearly related in a very close manner with the species of *Hippolysmata* belonging to the *vittata* group, the affinity being shown not only by the almost exact correspondence in all structural details (except for the absence of epipods), but also in colour, the specimens when alive exhibiting the brilliant longitudinal red streaks that characterise *H. vittata* and *H. dentata*.

If my identification of the Andaman specimens is correct it appears to me unwise, in the present state of our knowledge, to recognise *Lysmatella* in full generic significance. The presence or absence of epipods is in many cases a valuable aid to generic diagnosis in the Hippolytidae, but the number of these structures is variable in the genera *Spirontocaris* and *Latreutes* and in *Hippolysmata ensirostris* the entire series is rudimentary. In many species referred to *Hippolysmata* the epipods have not been examined and, on analogy with other genera, it would occasion no surprise if some were found to possess a reduced number.

¹ Borradaile, *Ann. Mag. Nat. Hist.*, (8), XV p. 206 (1915).

Hippolysmata ensirostris, Kemp.

1914. *Hippolysmata ensirostris*, Kemp, *Rec. Ind. Mus.*, X, p. 118, pl. vii, figs. 1-4.

A number of very interesting larval and post-larval specimens belonging to this species have recently been found off the Orissa coast. The post-larval specimens are about 14 to 16 mm. in length and in most of their characters agree closely with adults. The rostrum, however, is much shorter, usually not reaching the end of the antennal scale and the peraeopods, though well-formed, with perfect chelae, and with apparently the full number of sub-segments in the carpus of the second, possess rudimentary exopods on all pairs except the last. The apex of the telson is compara-

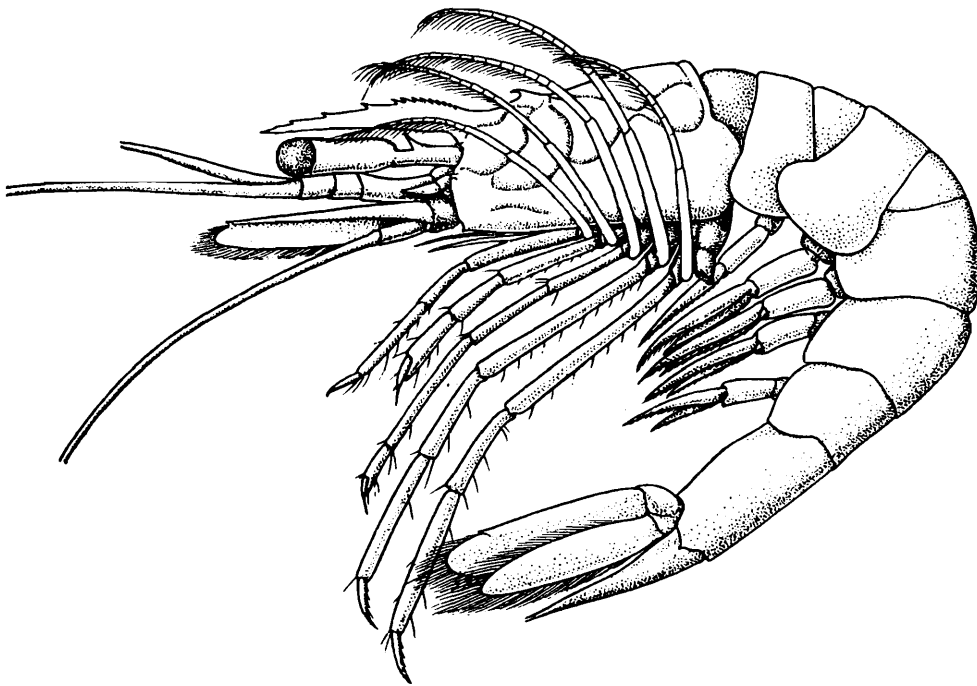


FIG. 5.—*Hippolysmata ensirostris*, Kemp.
Late larval stage.

tively broad, with a pair of long spines that extend beyond the small median point by more than half their length. These spines appear to dwindle slowly in the course of further development and, though not mentioned in my original description, traces of them may still be found in specimens 40 mm. in length.

Judging by the number of teeth on the basal crest of the rostrum, these post-larval specimens belong to *H. ensirostris* rather than to its variety *punctata*.

Other specimens, found with the above, almost certainly represent the same species in its last larval stage, but show remarkable differences in structure (text-fig. 5). The rostrum is short, dorsally convex and bears teeth only on its dorsal margin and that on the carapace, which is deeply grooved on either side

of the mid-dorsal line, is large and procurved. The eye is exceedingly long, reaching beyond the end of the antennular peduncle; it is composed of two distinct segments, the proximal and more slender of the two bearing a conspicuous dorsal spine. The antennules and antennae are normally developed, except that the lateral process on the basal segment of the former is rudimentary. The third maxillipedes and all the peraeopods except the last bear very long exopods. The chelae of the first and second pairs are more rudimentary. The full series of gills appears to be present but there is no trace of epipods. The pleopods and uropods are well formed and the apex of the telson resembles that of the post-larval specimens, but possesses a pair of setae near the middle.

So far as I am able to discover the larva differs from that of all other Carids hitherto described in the possession of a large spine on the eyestalk.

$\frac{9.5.8.3-1}{10}$	Off Puri, Orissa coast, 4-4½ fms.	S. Kemp.	Fourteen, post-larval five, larval.
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Hippolysmata (Lysmatella) prima (Borradaile).

1915. *Lysmatella prima*, Borradaile, *Ann. Mag. Nat. Hist.*, (8), XV
p. 209.

Borradaile's description of this species runs as follows:—
"Rostrum $\frac{8-11}{5-9}$, straight but upcurved at end, outreaching antennular stalk. Third maxilliped as stout as first leg, in which hand and arm are subequal, wrist a little shorter. Second wrist has 20-22 joints, the last the longest. Maldives Is."

The Andaman specimens agree well with this description as far as it goes. The rostrum reaches beyond the end of the antennular peduncle and is almost or quite as long as the carapace; it is furnished with 9 or 10 teeth above and with 5, 6 or 7 below. The posterior tooth of the dorsal series is situated a little in front of the middle of the carapace and is separated by a marked interval from the rest; the latter are rather crowded posteriorly but more distantly spaced on the rostral blade; two of them (that is to say three teeth in all) are situated on the carapace behind the orbital notch. The teeth on the lower margin are as large as those on the upper. There is a large antennal spine on the carapace and another, which is smaller, at the pterygostomial angle.

The lateral process of the basal segment of the antennular peduncle is short, not reaching to half the length of the segment; its outer margin is strongly convex. The outer antennular flagellum is thickened at the base, but is devoid of the accessory ramus found in species of *Lysmata*. The antennal scale is narrow, scarcely broader behind than in front, and four times as long as wide. The outer margin is conspicuously concave and terminates in a sharp spine that reaches beyond the distal end of the lamella. The mouth-parts closely resemble those of *H vittata*. All three maxillipedes bear epipods; the exopod of the last pair reaches beyond the middle of the antepenultimate segment.

The first peraeopods are as described by Borradaile ; the chela resembles that of *H. vittata*, the fingers being shorter than the palm and meeting only at the tips when the claw is closed. The second legs are very slender, reaching beyond the antennal scale by nearly two-thirds the length of the carpus; the merus is indistinctly divided into 13 or more segments, while the carpus is composed of from 21 to 24 segments. The last carpal segment is the longest, about equal in length with the palm and one and a half times as long as the fingers.

Of the remaining pairs of the peraeopods the third is the longest reaching beyond the antennal scale by almost the entire length of the propodus. In each pair the merus bears conspicuous teeth externally near the lower border: 5 in the third pair, 5 or 6 in the fourth and 3 or 4 in the fifth. The posterior edge of the propodus is set with fine setae and some seven or eight very slender spinules. The toothing of the dactylus is characteristic. As in *H. vittata* it bears 3 or 4 teeth on its posterior margin which increase in size distally; the actual apex of the dactylus does not, however, take the form of a tooth, comparable to the others, but is extremely slender and, at the base, less than half the breadth of the adjacent tooth of the marginal series.

The abdomen, telson and uropods do not appear to differ in any marked degree from those of *H. vittata*.

The three specimens obtained are all ovigerous females; the largest is about 21 mm. in length.

The colouration of living specimens is striking, the entire carapace and abdomen being marked with longitudinal stripes composed of small bright red chromatophores. On the carapace at the base of the rostrum the first three pairs of lateral stripes meet in the middle line. The three succeeding pairs are strictly longitudinal, but beneath them the striping on the carapace is oblique. In the middle of the abdomen there are about twenty longitudinal stripes. The eyestalks are heavily blotched with red; the antennules and antennae are transparent with a faint yellowish tinge; the third maxillipedes and all the legs, except the second pair, are conspicuously banded with red. The tail-fan is dotted with red and the eggs are sage green. In colour, therefore, the species bears a striking resemblance to *Hippolysmata vittata* and *H. dentata*, but lacks the transverse bands on the abdomen that are found in the former of these species.

$\frac{9252-4}{10}$

Port Blair, Andamans, 8 fms.

S. Kemp.

Three.

The three specimens were all obtained in a single haul of the net on rough ground in the southern entrance to the channel off Ross I.

EXPLANATION OF PLATE XXXVI.

- FIG. 1.—*Thor discosomatis*, sp. nov., $\times 8\frac{1}{3}$.
,, 2.—*Phycocaris simulans*, gen. et sp. nov., $\times 11$.
,, 3.—*Latreutes porcinius*, sp. nov., $\times 8\frac{1}{3}$.

