nal scale (text-fig. 32*c*) is from 2·4 to 2·5 times as long as wide and the straight outer margin terminates in a sharp spine which reaches to, or a trifle beyond, the broad apex of the lamella.

The outer maxillipedes reach to the end of the second segment of the antennular peduncle and possess an epipod "en crochet." The terminal segment is stouter than the penultimate and is about one and three quarter times its length.

The first peraeopods of the female are both slender, as in *A. dimorphus*, and, if extended, would reach about to the end of the antennal scale; in both sexes they are, however, habitually flexed at the carpo-meral joint. In the female the legs of this pair are equal, or very nearly so, the carpus and ischium are almost equal in length, the merus sometimes just a trifle longer. The chela is about three-quarters the length of the carpus and the fingers are as long as the palm. The segments are

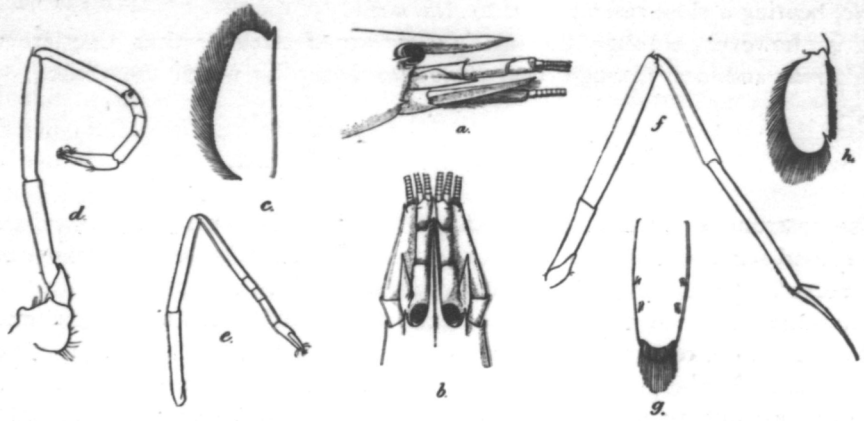

FIG. 32.—*Athanas polymorphus*, sp. nov.

a. Anterior part of carapace, rostrum, etc., in lateral view.
b. *do.* in dorsal view.
c. Antennal scale.
d. Second peraeopod.
e. Second peraeopod with abnormal segmentation.
f. Fifth peraeopod.
g. Telson.
h. Outer uropod.

devoid of spines and, except for a few hairs on the fingers, are glabrous (text-fig. 31*a*).

In males, as has already been explained (p. 291) the legs of the first pair are of three types. In Form I (text-fig. 31*b*) the limbs are very asymmetrical, one resembling that of the female, while the other is greatly enlarged. The slender limb

greatly enlarged chela; on its inner edge is a series of small teeth, varying in size, but for the most part ill-developed. The carpus is very short, about two-sevenths the length of the merus, and its breadth is about half its length. The chela is about four times as long as broad; the palm is 2·7 times as long as broad and about twice the length of the dactylus. In front of its middle point, on the antero-internal aspect, there are usually one or two small tubercles. The fingers are without teeth on their cutting edges; the dactylus is strongly curved and longer than the fixed finger, which is nearly straight and bluntly pointed apically.

In males of Form II (text-fig. 31*c*) the first peraeopods are symmetrical, or nearly so, each being similar to the large limb of Form I. The merus in the specimens of this form is a little longer than the chela and is less expanded than in Form I, being 5·4 times as long as broad. The carpus is longer, fully half the length of the merus, while the chela has much the same proportions, but is a little broader, about three and one third times as long as wide. A tubercle is sometimes seen on the antero-internal aspect of the palm and there are a few spines on the inferior margin of the merus.

In Form III (text-fig. 31*d*) the legs of the first pair are asymmetrical, though both are much enlarged. In both limbs the spines on the border of the merus are more numerous and better developed than in Forms I and II and there may also be small tubercles on the carpus and a series on the inner face of the palm. The smaller limb bears a close resemblance to those found in Form II. The merus is 4·7 times as long as wide, the carpus is a little less than half its length and is about twice as long as broad. The chela is about three times as long as broad and the dactylus is more than half the length of the palm. In the larger limb the merus is similar, 4·6 times as long as wide, while the carpus is distinctly shorter, about one-third the length of the merus. The chela is a little shorter than the merus and about three times as long as broad. The fixed finger differs conspicuously from that borne by the leg on the other side of the animal in the possession of a large rounded tooth or lobe near the middle of its inner margin.

The second peraeopods (text-fig. 32*d*) are folded like those of the first pair, being flexed at the mero-carpal articulation. The merus is a little longer than the ischium; the carpus is almost one and a half times the length of the merus and is fully three times as long as the chela. The carpus in all except two individuals is composed of five sub-segments: the first is much the longest, almost three times the length of the fifth, and the second, third and fourth are subequal and but little longer than broad, each being about half the length of the fifth. The dactylus is a little longer than the palm. As noted above (p. 295) the carpus in one male belonging to Form I is, on one side only, composed of four sub-segments, while in one of the females each limb of this pair has a similar development. The reduction in number is apparently brought about, in these abnormal individuals, by the fusion of the two proximal segments (text-fig. 32*e*).

The last three pairs of peraeopods are similar; their segments are devoid of spines and their dactyli are simple, not biunguiculate as in certain other species of

the genus. The third pair, which is the longest, reaches beyond the apex of the antennal scale by the length of the dactylus; the fifth reach almost to the end of the second segment of the antennular peduncle. In the third pair the carpus is a little longer than the propodus, nearly one and a half times the length of the ischium, and about three quarters as long as the merus. The latter segment is eight times as long as broad. The dactylus is slender, slightly curved, and terminates in a very fine claw which is nearly as long as the segment proper. The propodus is about 1·7 times the entire length of the dactylus.

In the fifth peraeopods there is a series of setae, not found on the two preceding pairs of limbs, at the distal end of the propodus on its inferior surface. The carpus is one-fifth shorter than the propodus, the latter segment being about equal in length with the merus. The merus is eight times as long as wide and about twice the length of the ischium; the dactylus has the same proportion to the propodus as in the third leg (text-fig. 32*f*).

The branchial formula is apparently the same as in other species of the genus; epipods "en crochet" (epipod « of Coutière's terminology) are present on the first three peraeopods.[1]

The abdominal pleura are rounded, except for that of the fifth somite, which is acutely pointed behind, and for the posterior angle of the sixth, which is also acute and articulated as in other species of *Athanas*.

The appendix masculina is well developed in all the males and is about the same length as the appendix interna.

The telson (text-fig. 32*g*) is as long as the uropods. It is a little less than four times as long as the breadth between the posterior angles and bears two pairs of dorso-lateral spinules. The margin between the two pairs of postero-lateral spinules is gently rounded and fringed with long setae, each seta being markedly swollen at the base. The inner of the two pairs of spinules is more than twice as long as the outer, both extending beyond the apex of the median portion. The outer uropod (text-fig. 32*h*) bears a fringe of setae on the under side, running parallel with, and close to, the external margin; it is a little more than twice as long as broad.

A large male is only about 15 mm. in total length; the ovigerous females do not exceed 13 mm.

Athanas polymorphus is evidently closely allied to Ortmann's *A. dimorphus*[2] and would find a place next that species in the admirable key which de Man has provided (*loc. cit.*, p. 289, footnote). Both sexes of the Chilka Lake species are readily distinguished from *A. dimorphus* by the presence of a spine near the antero-lateral angle of the carapace, while males may be separated at a glance by the spines on the inferior edge of the merus in the enlarged first leg. From all other species in the same section of the genus it is distinguished by the great length of the carpus in the first legs of the female.

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[1] See Coutière, *Ann. Sci. nat., Zool.* (8), IX, pp. 276, 277 (1899).

[2] Ortmann, in *Semon's Zool. Forschungsreis. in Australien, etc.*, V, p. 12, pl. I, fig. 1 (1894).

The species is beautifully coloured in life. The entire animal is very closely dotted with large maroon chromatophores, the gastric and hepatic regions sometimes showing faintly through the carapace as reddish or greenish masses. The following conspicuous patches of cream or lemon yellow occur:—a transverse bar, sometimes merely a spot, situated dorsally in the middle of the carapace and another, always well marked, at the posterior end of the carapace, occupying three-quarters of its breadth in dorsal view; a large spot on either side of the first abdominal somite; a similar spot on the second somite, with another lower down near the pleural margin, and a large mid-dorsal patch or transverse streak; a transverse band on the third somite and a large pleural spot; a similar band on the fourth somite, rarely broken into three patches. The fifth somite is maroon, rarely with a pair of small cream-coloured spots posteriorly, and the posterior half of the sixth is entirely lemon yellow or cream. The tip of the telson is sometimes cream, sometimes undifferentiated. The antennules and antennal scales are often maroon, resembling the other parts of the animal, or, in paler individuals, faintly mottled or wholly transparent. All the maxillipedes and legs are transparent with a slight purplish tinge. The eggs are very dull sage green.

When walking *A. polymorphus* used only the last three pairs of legs, the first two pairs being folded beneath the carapace. The antennules were held straight forwards and the antennae at right angles.

The species is described from twenty-seven specimens, eighteen females and nine males. Of the latter five are of Form I, two of Form II and two of Form III. All were obtained in the outer channel off Satpara and Barhampur I. on a muddy bottom at depths ranging from 6 to 10 ft. Examples were caught both in March, when the water was as salt as that of the Bay of Bengal near the lake, and in September when it was quite fresh. In the latter month only males of Form I and non-ovigerous females were found, whereas in March the males obtained belonged either to Form II or to Form III and three of the females were bearing eggs.

Genus **ALPHEUS**, Fabricius.

Alpheus crassimanus, Heller.

1865. *Alpheus crassimanus*, Heller, *Crust. 'Novara'-Reise*, p. 107, pl. x, fig. 2.
1888. *Alpheus crassimanus*, Bate, *Rep. 'Challenger' Macrura*, p. 554, pl. xcix, fig. 2.
1898. *Alpheus lobidens*, Coutière, *Notes Leyden Mus.*, xix, p. 199.
1899. *Alpheus crassimanus*, Coutière, *Ann. Sci. nat., Zool.* (8), ix, p. 230, text-fig. 293.
1902. *Alpheus crassimanus*, de Man, *Abhandl. Senckenb. Ges. Frankfurt*, XXV, p. 880, pl. xxvii, fig. 62.
1911. *Alpheus crassimanus*, de Man, *Rep. 'Siboga' Decap.*, II, *Alpheidae*, p. 417.

The characters on which I have relied for the identification of this species are the following:—

The rostrum reaches to a point midway between the margins of the orbital hoods and the end of the first antennular segment. It extends backwards nearly to the

base of the hoods as a thin well-marked crest (not flattened above) and is rendered the more conspicuous by the comparatively deep depressions which exist on either side of it. The dorsal edge, which is, as a rule, a little concave, is concealed in lateral view by the rather elevated eye-hoods.

The dactylus of the smaller chela of the male is subspatulate in form, "Balaeniceps"-shaped; in the female the dactylus of this chela is slender. In both limbs and in both sexes there is a sharp spinule at the distal end of the infero-internal margin of the merus, while there is no tooth on either side of the insertion of the dactylus.

In the large chela the depressed area on the supero-internal face is triangular in shape and the lobes on the upper and lower margins of the palm are distally rounded (not acutely produced). The small chela of the male is scarcely, if at all, more than three and a half times as long as wide and the palm is distinctly notched, both dorsally and ventrally, behind the fingers.

The merus of the third legs is without teeth and is rather less than five times as long as wide. The dactylus of the last three pairs of legs is simple.

The specimens which possess these characters were found among clumps of oysters in the outer channel of the lake and agree very closely with de Man's detailed description (*op. cit.*, 1902). When the antennule is dissected out, the second peduncular segment proves in reality to be but little longer than the first, though, if the measurements be taken along the inner edge, the former is, as in de Man's account, about one and a half times the length of the latter. In the large chela the total length is from 2·1 to 2·3 times the greatest width, the claw being therefore rather broader than in the specimens examined by de Man in which the same proportion varies from about 2·3 to 2·45.

Other examples found under rocks at the south end of the main area of the lake differ rather notably from those obtained in the outer channel, but must, I believe, be referred to the same species. In all these specimens the rostrum is less sharply carinate than in the others and the grooves on either side of it are broader and shallower. The large chela also is narrower—a difference readily noticed without measurement—the length being from 2·4 to 2·48 times the greatest breadth. In other respects these individuals agree with those from the outer channel.

Dr. de Man, when examining the 'Siboga' material of this species, notes that two specimens from a single locality differ notably from the remainder in having stouter limbs, and it is probable that phases showing more or less distinct minor characteristics, presumably adaptational, are to be found in different regions. The occurrence of two such phases in the Chilka Lake is of no little interest, owing to the close proximity of the localities in which they were found and to the wide differences in environment.

The form obtained in the outer channel lives among clumps of oysters, practically always submerged; the water, during some nine months of the year, is as salt as that of the Bay of Bengal outside the lake (sp. gr. 1·0265), while for the other three it is almost entirely fresh. The form occurring at the south end of the main area is subjected to much less violent changes in salinity and lives under stones and

boulders, which under certain conditions of flood, tide and wind are above water-level. According to our observations the specific gravity of the water in this part of the lake varies from 1·006 to 1·015. Our collections show that the species occurs in both localities throughout the year.

Ovigerous females were found at the south end of the main area in March and, on the oyster beds in the outer channel, in September and December. The eggs are a little more than ·5 mm. in diameter. The largest individual is about 36 mm. in length.

An individual from Rambha Bay was, in life, of a dull greenish colour with darker green markings on the large chela; there was also a small black spot on each side of the second and fourth abdominal somites. In the large chela the tips of the fingers are pink.

This species does not construct an elaborate burrow, although when found under stones on soft mud it appeared to have excavated a short horizontal tunnel, probably never more than a few inches in length. The sound made by the species is very loud and we frequently heard it when walking near the places in which specimens were living.

Alpheus crassimanus is known to have a distribution extending from Djibouti to Celebes.

Alpheus malabaricus, Fabricius.

1798. *Alpheus malabaricus*, Fabricius, *Ent. Syst. Suppl.*, p. 405.
1893. *Alpheus malabaricus*, Henderson, *Trans. Linn. Soc., Zool.* (2), V, p. 434, pl. xl, figs. 1-3.
1911. *Alpheus malabaricus*, de Man, *Rep. 'Siboga' Decapoda*, II, *Alpheidae*, p. 330 (in key to species).

In his account of the 'Siboga' Alpheidae de Man recognises two varieties of this species, var. *dolichognathus*, Ortmann, and var. *leptopus*, de Man, and the characters by which these three forms are differentiated are shown in his key.

The specimens from the Chilka Lake unquestionably represent the typical form of the species and agree precisely with Henderson's description. It is also clear, from de Man's key, that they should be referred to this form; but the carpocerite[1] resembles that of *A. macrodactylus*, Ortmann, being equal in length with the antennular peduncle.

In the large chela of the specimens from the Chilka Lake the proportion of length to breadth is apparently variable; it is 3·6 times as long as broad in an adult female, 2·76 times in an adult male and 3·16 times in a younger male. In the third pair of legs the merus is nearly 7 times and the propodus about 10 times as long as broad.

On the whole the typical form seems to resemble the var. *leptopus* more nearly than the var. *dolichognathus*; but in the former variety, as shown in de Man's key,

[1] By the term carpocerite I understand the fifth segment of the antennal peduncle (*see* Calman in *Lankester's Treatise on Zoology, Crust.*, p. 265, text-fig. 156B, 1909) and I am unable to understand de Man's reference (*op. cit.*, p. 430, para. 2) from which one would gather that the carpocerite is composed of three segments.

the fingers of the small chela gape[1] and in the detailed description it is stated that their inner margins are unarmed. In typical *malabaricus* the fingers are parallel and meet throughout their length when the claw is closed (there is a slight gape in one specimen) and at the base of the dactylus, as described by Henderson, there is a large tooth.

In young specimens the spine which terminates the outer margin of the antennal scale frequently reaches forwards beyond the apex of the lamella as in var. *dolichognathus*; in large individuals, as in var. *leptopus*, it does not exceed this point.

It may hereafter be found that the two varieties cannot be maintained, though, in the present state of our knowledge, the three forms may be distinguished by the parallel or gaping fingers of the small chela, by the presence or absence of a proximal tooth on inner margin of the dactylus and by the relative proportions of the segments of the last three pairs of legs.

The largest specimen in the collection has a length of 29 mm. In this example the length of the large chela is 17 mm.

The colour of living specimens is very striking. The entire animal is semi-transparent with chromatophores of bright red or reddish-brown pigment arranged in transverse bars on the carapace and abdomen. The gastric and hepatic organs show through the carapace as blackish and greenish masses. Each of the transverse bars of chromatophores is broadest in the middle, narrowed and directed forwards on either side. On the carapace are four such bars, the posterior much the broadest, while on the abdomen there are seven, the last extremely narrow. There are also red chromatophores at the base of the telson and in the centre of the uropods, while the tips of these segments and of the telson are heavily blotched with deep blue. The antennules and antennae are almost colourless. The chelae of the first legs are dull sage green, dotted with reddish-brown, the tips of the fingers in the larger claw being fawn-coloured or pink. The second legs are transparent, dotted with red distally, and the last three pairs are transparent with the mero-carpal and carpo-propodal joints bright yellow. The eggs borne by ovigerous females are dull yellow.

Alpheus malabaricus is not uncommon in the outer channel of the Chilka Lake, but has not been found in the main area. It was taken off Satpara and in the vicinity of Barhampur I. at depths varying from 6 to 12 ft. living on a bottom of soft mud. Its habits are thus strikingly different from those of *A. crassimanus*, which occurs only on rough ground,—on oyster-beds or under stones. The species was found both in March, when the water was as salt as that of the Bay of Bengal near the lake-mouth, and in September when it was quite fresh. The only ovigerous female in the collection was obtained in March.

Dr. Annandale found examples of this species, also on muddy ground, in the Ennur backwater near Madras in January 1915. The species occurred in water of specific gravity 1·002 and one individual was bearing eggs.

[1] The reference to this point in the full description of var. *leptopus* is obscure, for the fingers are described as having "their inner margins shutting together."

The original specimens examined by Fabricius were from the "Indian Ocean"; Henderson's material was obtained at Pulicat, a locality not far distant from Ennur. Ortmann's var. *dolichognathus* is recorded from the Bay of Tokyo and de Man's var. *leptopus* from the East Indian Archipelago, S. of Celebes. One specimen of the var. *leptopus* was found at the unusual depth of 289 metres.

Alpheus paludicola, sp. nov.

(Plate XIII, figs. 11-13.)

A species belonging to the *edwardsi* group, allied to *A. euphrosyne*, de Man, and *A. microrhynchus*, de Man.

The rostrum is exceedingly small, less conspicuous even than in *A. microrhynchus*, and consists of a minute triangular plate which reaches but little beyond the level of the extremities of the orbital hoods. Behind it the inter-orbital region is flattened and the post-rostral keel is quite obsolete, existing merely as an extremely feeble elevation, which can only be seen in dried specimens and disappears altogether before reaching the middle of the inter-corneal area. There are no perceptible inter-orbital grooves on either side of the middle line. The orbital hoods are well in advance of the anterior margin of the carapace on either side; their frontal edges are not strongly convex (pl. xiii, fig. 11). The carapace, except for a few microscopic punctuations, is smooth.

The lateral process of the basal antennular segment is broadly oval and terminates in a small spine which does not reach the end of the segment. The second segment is about equal in length with the first and about two and a half times as long as broad; the third segment is much shorter. The thickened portion of the outer flagellum is a little longer than the peduncle.

There is no anterior spine on the lower margin of the basicerite of the antenna. The carpocerite is slender and reaches beyond the antennular peduncle by a distance nearly equal to that of the last segment of the latter. The antennal scale (text-fig. 33*a*) is not so broad as in *A. euphrosyne*; the length is about 2·4 times the width. The spine which terminates the slightly concave outer margin reaches very little, if at all, beyond the apex of the lamella.

The ultimate segment of the outer maxillipede is fully one and three quarters the length of the penultimate; both these segments are much more slender than the antepenultimate.

In the large chelipedes the merus in large males may be only twice as long as broad; in a younger male 2·4 times and in an adult female 2·7 times. The upper edge is rounded and the spine found in *A. edwardsi* and *A. crassimanus* at the distal end of the infero-internal margin is absent. The carpus is very short, rounded above.

The large chela (pl. xiii, figs. 12, 13) is from 2·4 to 2·5 times as long as broad, the palm being about 1·5 times as long as broad. The rounded upper edge of the palm terminates obtusely in front of a well-defined transverse groove situated near the base of the dactylus; the lower edge ends more abruptly in a rounded prominence

at the base of the immobile finger. Near the upper edge of the palm, as in *A. crassimanus* and allied species, are two depressions, one on the inner surface and one on the outer: that on the inner surface is triangular in shape and that on the outer more or less quadrangular. These depressions are united by the transverse groove at the base of the dactylus. The inner surface of the palm, as in *A. crassimanus*, bears in its lower half a sharp transverse ridge near the base of the immobile finger; this ridge runs towards the prominence terminating the lower margin, but is separated from it by a longitudinal, infero-internal groove which extends backwards for almost the entire length of the palm. There is also another ridge, transverse in direction, which crosses the middle of the inner surface of the palm; it is bounded proximally by a curved groove which runs to the carpal articulation and between it and the more anterior transverse groove at the base of the immobile finger is a large shallow depression. These ridges and grooves on the inner surface of the palm appear to be characteristic of the species. Characteristic also is a very fine granulation on the inner side of the immobile and fixed fingers; the surface of the former is evenly rounded, but bears a short though conspicuous carina near the finger-tip. The outer surface of the chela more nearly resembles that of *A. crassimanus*; there is a broad shallow groove on the fixed finger and a feeble depression proximal to the transverse ridge which terminates on the marginal prominence at the end of the lower edge of the palm. In external view the inner margin of the fixed finger is prominently angled just in advance of the socket for the great tooth of the dactylus; near the apex the inner margin of the movable finger is decidedly sinuous. The fingers open somewhat obliquely, that is to say, in a plane different from that of the outer surface of the palm. The large chela of the female is proportionately a trifle broader than in the male, but has a closely similar structure.

As in most species of the *edwardsi* group the dactylus of the small chela is, in the male, subspatulate in form, "Balaeniceps-shaped," whereas in the female it is slender. In the male (text-fig. 33*b*) the small chela is nearly five times as long as broad and the fingers are about equal in length with the palm. On the upper edge of the latter there is a transverse groove behind the insertion of the dactylus and in lateral view the margin is consequently notched; there is a similar notch, rather less conspicuous, on the lower edge near the base of the fixed finger. On either side of the upper edge is a triangular depression reaching backwards to the middle of the palm and on the infero-internal aspect another longitudinal groove which extends almost the whole length. The palm is quite smooth, without the granulations found in *A. euphrosyne*. The greatest breadth of the dactylus is about one-third its total length. On its upper surface at the proximal end are two low crests, short, distally convergent and bearing a few setae. A sharp keel runs the whole length of the inner margin. Both fingers are strongly curved at the tips.

The small chela of the female is rather less than five times as long as broad and the fingers are a little longer than the palm. In both sexes the chela bears scattered setae, more numerous in the female than in the male.

In the second peraeopods (text-fig. 33*c*) the ischium is a little longer than the

merus, the latter segment being six and a half times as long as wide. The carpus is nearly one and a half times as long as the merus. Of the five segments of which it is composed, the first is about twice as long as the second; the fifth is nearly three quarters the length of the second and is nearly as long as the third and fourth combined, the two latter being sub-equal. The chela is a little longer than the second carpal segment; the palm is less than one and a half times as long as broad and is two-thirds the length of the fingers.

The merus of the third peraeopods is unarmed and is a little more than five times as long as broad. The propodus is slightly tapering, nine times as long as broad at the base; it bears long setae but no spines and is two and three quarter

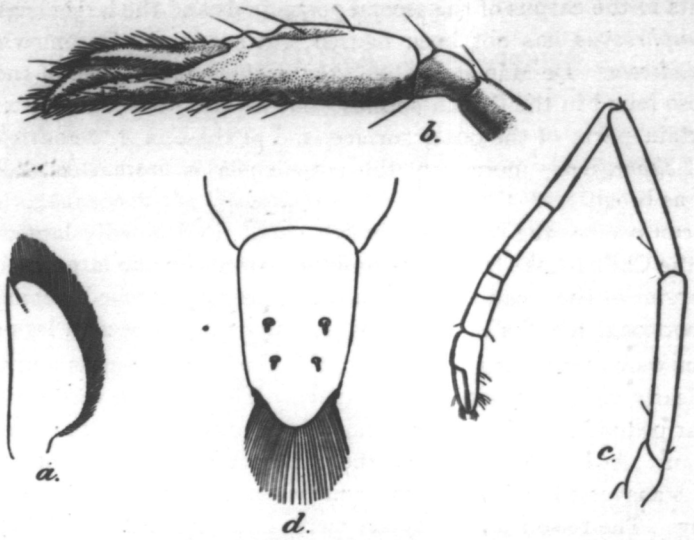

FIG. 33.—*Alpheus paludicola*, sp. nov.

a. Antennal scale.
b. Small chela of male.
c. Second peraeopod.
d. Telson.

times as long as the dactylus. The latter segment is spatulate as in *A. crassimanus* and is externally ridged. The remaining two pairs of legs are similar in form.

The telson (text-fig. 33*d*) reaches about as far as the uropods. The setose apex is rounded, but is produced far beyond the lateral spines. The breadth at the level of these spines is almost or quite two-thirds the basal breadth and is from one half to two-fifths the total length. The usual two pairs of dorso-lateral spinules are present, the proximal pair situated about in the middle of the telson. Both uropods are very broad; the exopod is nearly circular, little more than one and a quarter times as long as broad.

Large specimens of this species reach a length of about 22 mm. The eggs borne by females are very large, about 1·4 mm. in diameter.

Alpheus paludicola is allied to *A. euphrosyne*[1], de Man, and *A. microrhynchus*, de Man, and would find a place alongside these forms in the key which is supplied in the Report on the 'Siboga' Alpheidae. It agrees with these species and differs from *A. edwardsi*, And., *A. crassimanus*, Heller, and other closely related forms in the absence of a spine at the distal end of the infero-internal margin of the merus of the first peraeopods. It resembles *A. euphrosyne* in having both margins of the palm of the small chelipede of the male notched and *A. microrhynchus* in the diminutive size of the rostrum and large size of the eggs.

From *A. euphrosyne* the Chilka species may be distinguished by the much smaller rostrum, the narrower antennal scale, the more slender form of the small chela of the male (in *A. euphrosyne* it is only four times as long as broad), the different proportions of the segments in the carpus of the second peraeopods and the larger eggs. The large chela of *A. euphrosyne* has not been figured, but is apparently somewhat similar to that of *A. paludicola*. De Man describes granulations at the base of the fixed finger similar to those found in the Chilka species; but he also notes the existence of granulations on certain parts of the outer surface, and of these in *A. paludicola* there is no trace. In *A. euphrosyne*, moreover, the large chela is more slender, about three times as long as broad.

In *A. microrhynchus* the rostrum, though small, is decidedly larger than in the species from the Chilka Lake, there are no granulations on the large chela, the upper and lower margins of the small chela of the male are not notched behind the fingers and the proportional lengths of the carpal segments in the second legs are different.

Specimens were semitransparent in life, the black gastric mass and the intestinal canal being clearly visible through the carapace. The rostrum was brownish-red and the antennular peduncles and outer margins of the antennal scales were tinged with the same colour. At the hinder end of the carapace and of each of the abdominal somites was a transverse band of brown pigment, sometimes tending to a bluish-green shade laterally. The telson and uropods were as a rule dusky, often with a faint speckling of red and not infrequently suffused with light blue. The inner surface of the larger chela was reticulated proximally with dull brown. The base of the fingers and the ridges on the palm were greenish or greenish-blue, the tips of the fingers pink. The outer surface was pale. The small claw was feebly pigmented and the other legs entirely transparent.

Two individuals lived for about three months in a shallow dish, fresh water being added occasionally to compensate for evaporation. They constructed only the most rudimentary burrows, using the last three pairs of legs in excavation and their pleopods in wafting away the mud. Whenever possible the burrows were dug underneath shells or pieces of weed; they were entirely horizontal and never much longer than the animal. The large chela was used as a lever in removing obstructions.

Alpheus paludicola is common in the Chilka Lake; specimens were found at no less than twenty-one different stations. It was found over an area extending from

[1] For references to these species see de Man, *Decap. 'Siboga' Exped.*, II, *Alpheidae*, p. 413.

Rambha to Nalbano and also occurred off Barnikuda, in Seruanaddi, near Satpara and in the vicinity of Barhampur I. It was invariably obtained on a bottom of soft mud in water from 4 to 12 ft. in depth. Unlike *A. crassimanus*, it was never seen under stones at the margin of the lake. Specimens were found at all times of the year and the species is evidently able to tolerate changes in specific gravity varying from 1·000 to 1·0265. Ovigerous females were found in November and March. In the former of these months they occurred in water of very slight salinity, whereas in the latter months they were obtained in water as salt as that of the sea in the neighbourhood of the lake-mouth.

The type specimens bear the nos. 9020-2/10 in the Museum register.

Family ATYIDAE.

Genus CARIDINA, Milne-Edwards.

1905. *Caridina*, Bouvier, *Bull. sci. France Belgique*, XXXIX, p. 67.
1913. *Caridina*, Bouvier, *Trans. Linn. Soc., Zool.* (2), XV, p. 447.

Two species of this genus are commonly found in the Chilka Lake among weeds. Both occur abundantly in the Gangetic delta in brackish water.

Caridina nilotica (Roux).

var. bengalensis, de Man.

1908. *Caridina nilotica*, var. *bengalensis*, de Man, *Rec. Ind. Mus.*, II, p. 265, pl. xx, figs. 6, 6*a*, 6*b*.

For the form of *Caridina nilotica* which occurs in the Chilka Lake I have employed the varietal name given by de Man to the race found in the Gangetic delta.

There are numerous series of *Caridina nilotica* in the Indian Museum obtained at various points on the coasts of the Indian peninsula. Where precise data are available, it appears that these specimens were, with very few exceptions, obtained in brackish water or in water that, though fresh at the time of their capture, is occasionally subject to tidal influence.

These series of individuals all agree in possessing the characters of the var. *bengalensis* except that they show considerable variation in the dentition of the rostrum. Even in examples from the Gangetic delta the range of variation is much greater than is apparent from de Man's account, the teeth forming the basal crest on the upper margin varying in number from 15 to 30 and those on the lower margin from 11 to 22. On examining long series from different places it is evident that local distinctions exist in the number of rostral teeth; but these distinctions are so slight that it is only by taking the average of a large number of individuals that they can be detected and they are, of course, far too trivial to justify nominal recognition.

It is, however, interesting to note that the Chilka Lake examples agree more nearly with those from S. India than with those from the Gangetic delta, a fact which is shown in the following table:—

	Calcutta (Garia).	Chilka Lake.	Madras (Villy-vakkam).	Tuticorin.	Colombo.
No. of specimens examined	149	100	200	34	91
Dorsal teeth of rostrum, basal crest only ..	15—30	14—25	14—27	15 23	13—23
Ventral teeth of rostrum	11 –22	6—19	9—20	11—19	8—18
Average no. of dorsal teeth	22·7	19·1	19·7	19·0	16·8
Average no. of ventral teeth	14·7	12·0	13·6	15·6	13·2
Length of eggs (mm.)	·41—·48	·42—·48	·42—·49	·47—·475	·43

In his work on the varieties of *C. nilotica*, de Man notes that var. *bengalensis* is very closely related to var. *gracilipes*, de Man, a form found in Celebes and Saleyer. From this race the Indian form is separated by the greater number of teeth on the upper edge of the rostrum and by the larger size of the eggs; but it seems probable that a distinction based on these grounds is untenable. The number of dorsal teeth in Indian specimens ranges from 13 to 30 and in var. *gracilipes* from 12 to 20. In the former the average number varies from 16·8 in the case of Ceylon specimens to 22·7 in the case of individuals from the vicinity of Calcutta, while in the latter, according to the results of de Man's examination of twenty-five specimens[1], the average number is about 15·8. The eggs vary in length from ·33 to ·40 mm. in var. *gracilipes* and from ·41 to ·49 in var. *bengalensis*.

Should it prove that no other distinctions are available, the name *gracilipes* must be used for the Indian form.

In the Chilka Lake *Caridina nilotica* was found only in Rambha Bay and in the outer channel; but in both these localities it was abundant. In Rambha Bay it was plentiful among weed near the margin of the lake and was also found near the rocks at the foot of Ganta Sila. Ovigerous females were taken both in February in water of sp. gr. 1·011 and in September in water of sp. gr. 1·006.

In the outer channel it was obtained in February at Satpara and near Mahoss in water as salt as that of the Bay of Bengal near the lake (sp. gr. 1·0265), but no females bearing eggs were to be found. In September when the water was fresh and stood at a level some 5 ft. higher than in February, the species was common in the same localites, living among the roots of screw-pines, and was also found in submerged grass on islands near Manikpatna. At this time of the year numerous egg-laden females were obtained. Our observations seem to indicate that very saline water inhibits reproduction.

The absence of *C. nilotica* from the vicinity of Barkul and from other places in the main area where weed is plentiful and the conditions apparently favourable is perhaps to be explained by the enormous abundance of *C. propinqua* in these localities. This prolific species has perhaps ousted *C. nilotica* from situations in which it would otherwise have occurred.

[1] de Man, in *Weber's Zool. Ergebn. Niederländ. Ost-Ind.*, II, p. 394 (1892).

Caridina nilotica, sensu lato, is known from an area extending from N. and S. Africa to Celebes.

Caridina propinqua, de Man.

1908. *Caridina propinqua*, de Man, *Rec. Ind. Mus.*, II, p. 227, pl. xix, figs. 6, 6*a*—*f*.
1913. *Caridina propinqua*, Bouvier, *Trans. Linn. Soc., Zool.* (2), XV, p. 463.

The specimens of this species from the Chilka Lake agree closely with de Man's description and with individuals from the Gangetic delta.

According to de Man the species is allied to *Caridina fossarum*, Heller, and *C. laevis*, Heller; but these two forms are widely separated from *C. propinqua* in the valuable key to certain species of the genus which Bouvier has recently supplied. *C. propinqua*, in Bouvier's table, is distinguished from *C. laevis*, *C. fossarum* and numerous other species by the comparatively greater length of the antennular peduncle. This character is not easily determined with accuracy; but comparison between *C. laevis* (of which Javanese specimens are available) and *C. propinqua* indicates that in these two forms it affords a valid distinction.

As regards the rostral dentition, in 50 specimens from the Chilka Lake there are from 10 to 17 dorsal teeth (average 13·6) and of these from 2 to 5 (usually 3) are placed behind the orbit. On the ventral margin there are from 0 to 3 teeth (average 1·5). In examples from the Gangetic delta the teeth are as a rule rather more numerous. In 50 individuals from Durgapur the dorsal teeth vary in number from 9 to 22 (average 16·7) with from 2 to 5 (usually 4) situated on the carapace behind the orbit. On the ventral margin there are from 0 to 4 teeth (average 1·8).

There is also a slight difference between specimens from the two localities in the form of the first pair of peraeopods, these limbs being a trifle more slender in the Gangetic form than in that found in the Chilka Lake. The distinction is, however, too trifling to be expressed by means of measurements.

In both forms the propodus of the last leg is about 2·4 times the length of the dactylus and no differences are to be found in the number of dactylar and uropodial spines and other characters enumerated by de Man.

The eggs are of the same size as in individuals from the Gangetic delta; they vary from 0·51 mm. in length and 0·32 mm. in breadth when first extruded, to 0·6 mm. in length and 0·38 mm. in breadth, when on the point of hatching.

Caridina propinqua occurs in all parts of the main area of the Chilka Lake throughout the year and is especially abundant in thickets of *Potamogeton* off Cherria I., in Barkul Bay and near Nalbano. In the outer channel it was obtained only in the freshwater season (September) and then in no great abundance, specimens being found in Seruanaddi and, in company with *C. nilotica*, among roots of screw-pines near Arupatna and in submerged grass on the islands near Manikpatna.

In the main area the species appears to breed throughout the year; ovigerous females were obtained in the months of January, February, March, July, September and November. A few egg-laden females were also found in September in the outer channel.

From the records available it seems that *C. propinqua* is found only at the northern end of the Bay of Bengal. In addition to samples from the Chilka Lake and the Gangetic delta we have specimens from Chittagong, from Cuttack and, in the vicinity of Puri, from Athara nullah and the Sar Lake. The individuals from the last named locality and from Cuttack were obtained in water that remains permanently fresh; but the species is more usually found in places subject to tidal influence.

Family PASIPHAEIDAE.

Genus **LEPTOCHELA**, Stimpson.

1860. *Leptochela*, Stimpson, *Proc. Acad. Sci. Philadelphia*, XII, p. 42.
1896. *Leptochela*, Caullery, *Ann. Univ. Lyon*, XXVI, p. 372.

The species of this genus found in the Chilka Lake is also common in suitable localities on other parts of the Indian Coast and, as in *L. carinata*, Ortmann, from the Atlantic coast of America shows marked sexual distinctions. In the female the carapace bears a distinct median carina with an additional carina of considerable length on either side of it, whereas in the male the median carina is less distinct and the lateral carinae are wanting. This sexual distinction may be proper to several other species of the genus, a fact which should be borne in mind when the character is used for the discrimination of allied forms.

The following five species of *Leptochela* have been described; the first two from the Atlantic coast of America, the remainder from the Indo-pacific:—

1. *Leptochela carinata*, Ortmann[1]: distinguished by the presence of four teeth on the mid-dorsal carina of the fifth abdominal somite.

2. *Leptochela serratorbita*, Bate[2]: distinguished by the finely serrated or spinulose orbital margin.

3. *Leptochela gracilis*, Stimpson[3], the type species of the genus: distinguished by the presence of a sharp tooth at the distal end of the carina on the fifth abdominal somite. A fresh account of this species is badly needed. It is not certain that the specimens recorded under this name by Bate[4] are correctly identified.

4. *Leptochela robusta*, Stimpson, cannot be recognised with any certainty from the original description.[5] Bate's[6] subsequent account and figures are probably unreliable, but de Man's detailed description of a single male from Ternate[7] will afford a useful basis for future work. I am not convinced that the Hawaiian specimens

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[1] Ortmann, *Decap. Schizop. Plankton-Exped.*, p. 41, pl. iv, fig. 1 (1893) and Rathbun, *Bull. U.S. Fish Comm. for* 1900, XX, 2, p. 127 (1902).

[2] Bate, *Rep. 'Challenger' Macrura*, p. 859, pl. cxxxix, fig. 1 (1888) and Rathbun, *Bull. U.S. Fish Comm. for* 1900, XX, 2, p. 127 (1902).

[3] Stimpson, *loc. cit. supra*, p. 42.

[4] Bate, *Rep. 'Challenger' Macrura*, p. 860, pl. cxxxix, fig. 2 (1888).

[5] Stimpson, *loc. cit., supra*, p. 43 (1860).

[6] Bate, *Rep. 'Challenger' Macrura*, p. 862, pl. cxxxix, figs. 3, 4 (1888).

[7] de Man, *Abhandl. Senckenb. naturf. Ges. Frankfurt*, XXV, p. 902.

recorded by Miss Rathbun[1] are specifically identical with that described by de Man. The species, which should bear the name of *L. robusta*, Stimpson (de Man), is apparently characterized by the absence of the special features that distinguish *L. carinata*, *L. serratorbita* and *L. gracilis* and by the presence of three pairs of spinules on the dorsal surface of the telson in addition to those at the apex.

5. *Leptochela aculeocaudata*, Paulson[2], is probably a close ally of *L. robusta*, from which it is distinguished by the presence of only two pairs of spinules on the dorsal surface of the telson in addition to those at the apex.

Leptochela reversa, Bate[3], is apparently a *nomen nudum*.

The Indian form is provisionally identified with *L. aculeocaudata*, a determination which premises a considerable amount of error in Paulson's figures and that the marked sexual differences in the carination of the carapace escaped his notice.

Caullery (*loc. cit. supra*) in his account of the Decapoda collected by the 'Caudan' expedition has provided a valuable key to the five more well-established genera of Pasiphaeidae. *Leptochela* is distinguished from other genera by the possesion of a mandibular palp composed of a single segment and by the presence of laciniae on the inner margin of the second maxilla.

The branchial formula in the Indian species is apparently identical with that found in *Parapasiphaë*, Smith:—

	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.
Podobranchiae	ep.	ep.	ep	..	..	..	..	..
Arthrobranchiae	..	..	2	1	1	1	1	..
Pleurobranchiae	..	..	..	1	1	1	1	1

Leptochela aculeocaudata, Paulson.

(Plate XIII, fig. 14.)

1875. *Leptochela aculeocaudata*, Paulson, *Crust. Red Sea*, p. 100, pl. xvi, fig. 1.

1906. *Leptochela aculeocaudata*, Nobili, *Ann. Sci. nat. Paris*, (9), IV, p. 28, text-figs. 4*a-c*.

In dorsal view the rostrum is broad at the base, but narrows rapidly to a sharp apex. It is very short; in the male it reaches only to the middle of the cornea, while in the female it is rather longer and may reach to the end of the eyes; it is occasionally a little upturned at the apex. The rostrum bears a longitudinal dorsal carina which extends backwards on the carapace. In the male this carina is not sharp and disappears altogether before reaching the middle of the carapace. In the female (pl. xiii, fig. 14) it is much more conspicuous and is continued to the middle of the posterior quarter of the carapace as a thin compressed keel. In this sex there

[1] Rathbun, *Bull. U. S. Fish Comm. for* 1903, XXIII, p. 929 (1906).

[2] Paulson, *Crust. Red Sea*, p. 100, pl. xvi, fig. 1 (1875) and Nobili, *Ann. Sci. nat., Zool.* (9), IV, p. 28, text-figs. 4, *a-c* (1906).

[3] Bate, *Rep. 'Challenger' Macrura*, p. 722 (1888).

is also a smoothly rounded ridge on either side of the median carina, running parallel with it and commencing near the upper part of the orbital margin. In the male these ridges are non-existent. The carapace is strongly compressed and, as in other species of the genus, the posterior margin is deeply excavate mid-dorsally. The orbital and antero-lateral angles are bluntly rounded.

The eyes are short and globular, the breadth of the cornea being much greater than that of the stalk. The antennular peduncle (text-fig. 34*a*) reaches a little beyond the middle of the antennal scale. In lateral view the basal process is lanceolate in shape; its margins bear long setae and the apex reaches to the distal end of the segment to which it is attached. The third segment is longer than the second. The two antennular rami are stouter in the male than in the female. The outer ramus is

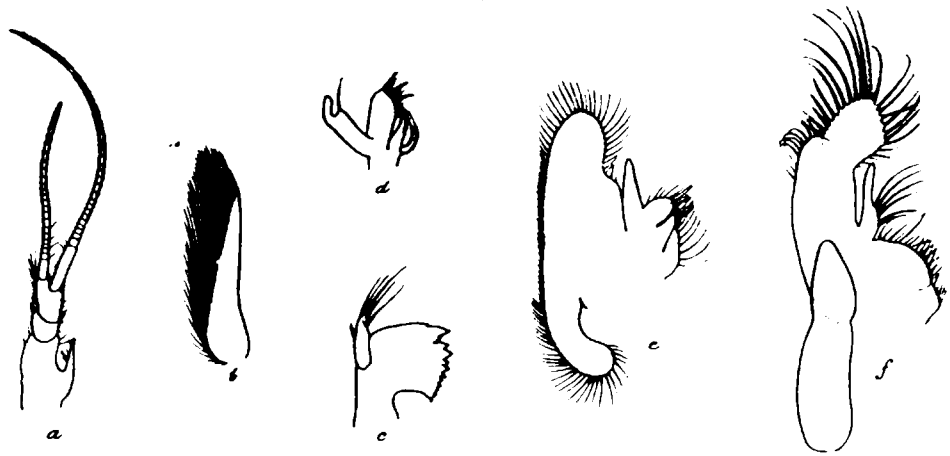

FIG. 34.—*Leptochela aculeocaudata*, Paulson.

a. Antennule of female.
b. Antennal scale
c. Mandible.
d. First maxilla.
e. Second maxilla.
f. First maxillipede.

the longer; when flexed backwards it reaches to the end of the carapace in the female and about to the middle of the third abdominal somite in the male.

The antennal scale (text-fig. 34*b*) is narrowly triangular, about four times as long as broad, the lamella at the distal end sloping rapidly away from the base of the terminal spine. The outer margin is sinuous in both sexes, concave behind the middle point and slightly convex onwards to the apex.

The cutting edge of the mandible (text-fig. 34*c*) in its outline resembles Paulson's figure, but bears from 12 to 15 teeth. It is not cleft in the middle as, according to Stimpson's account, it is in *P. gracilis*. The palp is composed of a single segment, somewhat expanded laterally and furnished with setae on its margins. Three laciniae are well developed on the inner edge of the second maxilla (text-fig. 34*e*).

The first maxillipede (text-fig. 34*f*) bears a large bilobed epipod (not shown in

Paulson's figure) and a curious rounded lobe on the external margin of the exopod near its apex. On the second maxillipede[1] (text-fig. 35*a*) there is a small epipod, but no exopod. The last two segments of the endopod bear conspicuous spines; the ultimate segment is acutely produced at the apex.

The third maxillipedes (text-fig. 35*b*) reach about to the end of the antennular peduncle and bear both epipod and exopod, the latter reaching the distal end of the antepenultimate segment. The ultimate segment bears a few stout setae at its apex and is a little shorter than the penultimate.

The first and second peraeopods (text-figs. 35*c*, *d*) reach about to the end of the antennal scale, the latter pair being slightly longer than the former. The exopod of the first pair reaches nearly to the end of the ischium; that of the second pair is a trifle shorter. The ischium is longer than the merus and decidedly shorter than the chela. The palm is about one and a half times the length of the carpus and the fingers are almost or quite one and a half times the length of the palm. On the inner edges of the fingers are numerous forwardly directed spinules, three or four of which are noticeably longer than the others. The spinulation on the lower edges of the segments varies according to sex; but in both male and female there are two or three large spinules on the basis. In the female there are a number of large spinules on the inferior margins of the merus, carpus, palm and dactylus; in one specimen in which they appear to be specially well developed there are 6 on the merus, 4 on the carpus, 5 on the palm and 6 on the dactylus. In the male the spinules are smaller and appear to be less numerous. There is always a strong spinule at the upper distal end of the ischium.

The third peraeopods (text-fig. 35*e*) reach to the carpus of the second pair; the exopod extends a little beyond the middle of the ischium. The ischium is the longest segment, its length exceeding that of the two following combined. The propodus is one half the length of the merus, nearly twice the length of the carpus and fully one and a quarter times as long as the dactylus. On the upper edge there are long setae at the distal end of the ischium and on the merus; on the lower edge there are numerous setae on all the segments and 3 spinules on the ischium, 4 on the merus and 1 on the carpus.

The fourth and fifth peraeopods are much reduced and do not reach the anterior margin of the carapace. The fourth legs (text-fig 35*f*) are remarkable for the large ventral spine borne by the ischium. This spine slopes strongly forwards and, just in advance of its base on the protruding margin of the segment, are two small movable spinules (text-fig. 35*g*). The apparatus is perhaps used for cleaning the appendages, acting as a comb. The exopod reaches a little beyond the end of the ischium. The merus and carpus are subequal in length, a little longer than the ischium. The dactylus is five sevenths the length of the carpus and one sixth longer than the propodus,

[1] Paulson's figure of this appendage seems to be wholly erroneous. Owing to faulty dissection he has in one of his preparations confounded the first and second maxillipedes, the exopods of the former appearing as a portion of the latter.

the latter segment being less than two and a half times as long as wide. There are stout setae on the ventral margins of all the segments except the ischium and, on the upper margin, on the carpus and at the distal ends of the ischium and merus.

In the fifth pair (text-fig. 35*h*) the exopod is short and broad, not reaching much beyond the middle of the ischium. The merus and carpus are subequal in length, about one and a half times the length of the propodus. The latter segment is a little shorter than the dactylus. On the ventral margins of the ischium and

FIG. 35.—*Leptochela aculeocaudata*, Paulson.

a. Second maxillipede.
b. Third maxillipede.
c. First peraeopod.
d. Second peraeopod.
e. Third peraeopod.
f. Fourth peraeopod.
g. Spines on lower margin of ischium of fourth peraeopod, further enlarged.
h. Fifth peraeopod.
i. Telson with outer and inner uropoda.
j. Apex of telson, further enlarged.

merus there is, among others of more slender build, a single stout seta; otherwise the limb is clad in setae much as in the fourth pair.

The first four abdominal somites are smoothly rounded dorsally; the pleura of the first two are greatly enlarged in the female. The fifth somite is very obscurely carinate in the mid-dorsal line, but the carina is not produced posteriorly as a spine. The sixth somite is smoothly rounded above; at its anterior end there is a short transverse ridge on the dorsal surface which, in lateral view, has the apearance of a tubercle. On the posterior margin there is a pair of small spinules, one on either side, overhanging the articulation of the telson. The ventral margins are fringed with

setae, among which, in the posterior half of each, a sharp backwardly directed spine may be detected.

The telson (text-fig. 35*i*) reaches beyond the end of the uropods and is strongly sulcate above. Apart from those at the apex there are only two pairs of dorsal spines; the first pair is situated near the anterior margin of the telson; the second about in the middle of its length. At the apex are *five* pairs of spines, the respective lengths of which are shown in text-fig. 35*j*.[1] Except for the outermost, all these spines are internally pectinate, the innermost being also pectinate externally.

The outer uropod is a little more than three times as long as wide. The straight outer margin terminates in two spines in front of which are from 8 to 11 additional spines interspersed among fine setae. At the apex of the inner uropod on its dorsal side there are also three or four slender spines.

Large specimens attain a total length of about 16 mm.

Indian specimens differ in several points from Paulson's figures and from the translation of his description which Nobili has supplied. The individual drawn by Paulson in fig. 1 is apparently a female and, if I am right in assuming that the Indian examples belong to the same species, the lateral ridges on the carapace on either side of the middle line are incorrectly shown. These ridges should be parallel and should extend further backwards

Leptochela robusta, Stimpson, judging from de Man's account of a single male[2], is apparently a very close ally of *L. aculeocaudata*; but, apart from less conspicuous details, differs from it in the armature of the telson. According to de Man's description there are in this species three pairs of spines on the upper surface of the telson, the posterior pair situated about in the middle of its length. In *L. robusta*, also, there are four pairs of spines at the apex of the telson in place of the five found in *L. aculeocaudata*.

In life specimens are transparent with the oral appendages, the bases of the thoracic limbs and pleopods, the hinder half of the last abdominal somite and telson bright red. The carapace, abdomen, antennae, antennules, uropods and the greater part of the thoracic and abdominal appendages are colourless. The eggs are opaque and whitish.

Of *Leptochela aculeocaudata* only a single individual was found in the Chilka Lake. It was obtained in the outer channel near Barhampur I. in March in water of specific gravity as high as that of the Bay of Bengal in the vicinity of the lake (1·0265). The species is clearly no more than a casual visitor to the lake.

There are numerous other examples of the species in the Indian Museum. In 1889 the R.I.M.S. 'Investigator' obtained a specimen 3 miles E.S.E. of Puri (a position not far distant from the mouth of the Chilka Lake) at a depth of 10 fms.

[1] The spines of the third pair are shorter than the second and fourth and are partially concealed by them.

[2] *loc. cit., supra*, p. 310

More recently the 'Investigator' found the species in large numbers in the Mergui Archipelago (lat. 11°58′20″ to 12°48′ N.; long 98°16′10″ to 98°26′30″ E.) at depths varying from 8 to 24 fms. During the present year I found a number of specimens, mostly on a muddy bottom, at Port Blair in the Andamans in from 1 to 10 fms. and in 1913 obtained a few examples in shallow water among weeds at Kilakarai in the Ramnad District at the northern end of the Gulf of Manaar.

The species has hitherto been recorded only from the Red Sea.

Tribe PENAEIDEA.

Family PENAEIDAE.

Five species belonging to this family occur in the Chilka Lake. Four of them are abundant and are caught in large numbers by the Uriya fishermen in special traps, which will be described in a subsequent paper in this volume. The trap depends for its efficacy on the habits of the prawns, which travel at night along the shore in very shallow water. If they meet with any obstruction they make their way along it and are thus, by means of training fences, easily led into an enclosure surrounded by traps, into the apertures of which they apparently force themselves on the approach of daylight. On Barnikuda I. there is a factory in which Penaeid prawns are dried for export, the greater part of the supply finding its ultimate destination in Burma.

The little knowledge we at present possess of the prawn fisheries in the Gangetic delta tends to show that there is an annual migration of Penaeidae to the sea. This migration takes place in the winter months and apparently coincides with the beginning of the breeding season.[1] In the Chilka Lake we found no clear evidence of migrations; three at least of the species are found throughout the year, but it is tolerably certain that none of them breed in the lake. The shallow waters of the main area with the dense beds of weed that exist in many parts would seem to afford an admirable nursery for young Penaeids. In such localities, however, we failed to find them: all the young specimens in our collection were obtained in the outer channel. It is only to adolescent prawns that the main area of the lake is attractive; early post-larval stages are seemingly unable to withstand the changes in salinity, while the fact that no very large specimens were obtained (though individuals with well-developed secondary sexual characters are not uncommon) tends to show that after they have returned to the sea for breeding purposes they do not again re-enter the lake.

Thanks to Alcock's memoir on the Indian prawns of the *Penaeus* group, the characters of most of the Indian species are now well known; but more recent work has unfortunately made necessary a number of changes in the nomenclature that he adopted.

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[1] On the British coasts somewhat similar migrations are known in the case of *Pandalus montagui* [*v.* Kemp, *Fisheries, Ireland, Sci. Invest. for* 1908, p. 87 (1910)].