

XI. *On a Collection of Crustacea, Decapoda and Stomatopoda, chiefly from the Inland Sea of Japan; with Descriptions of New Species.* By Dr. J. G. DE MAN, of Ierseke (Holland). (Communicated by the Rev. T. R. R. STEBBING, M.A., F.R.S., F.L.S.)

(Plates 31-33.)

Read 1st November, 1906.

THE present collection, which was entrusted to me by Prof. F. Jeffrey Bell, of the British Museum, London, consists, firstly, of 30 species of Decapod and 2 of Stomatopod Crustacea, collected in the Inland Sea of Japan, mostly in deep water; secondly, of 7 Decapod species from four other different localities. The last named are interesting not only on account of two novelties, a new *Parathelphusa* and a new *Palæmon*, discovered respectively in the Chinese province of Yunnan and at Darjeeling, but also by the Mediterranean *Sicyonia sculpta* having been captured off Bahia; the most western limit of geographical distribution of this species was, indeed, hitherto the Cape Verde Islands, so far as I am aware. For *Potamon spinescens*, Calm., a new subgenus, *Parapotamon*, is created.

The Crustacea from the Inland Sea of Japan proved also to be of much interest. Five species are new to science, viz., a remarkable small *Lambrus*, for which a new subgenus, *Oncodolanbrus*, is created, two new species of *Crangon*, and two of the genus *Spirontocaris*. Most of the other species are also remarkable. Thus a small species of Pinnotheridæ, viz., the rare *Asthenognathus inæquipes*, Stimps., was captured, a form described in 1858 and not found again since that year. I wish also to draw attention to the rare *Arcania globata*, Stimps., *Galathea acanthomera*, Stimps., and *Leander longipes*, Ortm. The discovery of the male of *Spirontocaris rectirostris* (Stimps.) is interesting; it shows considerable sexual differences from the hitherto only known female. *Spirontocaris pandaloides* (Stimps.), of which several specimens were caught, is also one of the numerous rare forms described, almost half a century ago, by that eminent American naturalist, which have not occurred in literature since that time.

Preliminary diagnoses of six new species have already been published in the 'Annals and Magazine of Natural History,' ser. 7, vol. xvii. 1906, pp. 400-406, and of the new *Parathelphusa* in the 'Zoologischer Anzeiger' of March 20, 1906.

*List of Species.*

## A.—INLAND SEA OF JAPAN.

<i>Lambrus (Oncodolambrus) prædator</i> , de Man.	<i>Spirontocaris propugnatrix</i> , de Man.
<i>Lupa (Hellenus) hastatoides</i> (Fabr.), de Haan.	<i>S. alcimede</i> , de Man.
<i>Platygrapsus depressus</i> (de Haan).	<i>S. pandaloides</i> , Stimpson.
<i>Asthenognathus inæquipes</i> , Stimpson.	<i>Latreutes planirostris</i> (de Haan).
<i>Trigonoplax unguiformis</i> (de Haan).	<i>L. acicularis</i> , Ortmann.
<i>Leucosia rhomboidalis</i> , de Haan.	<i>L. laminirostris</i> , Ortmann.
<i>Myra fugax</i> (Fabr.).	<i>Hippolysmata vittata</i> , Stimpson.
<i>Arcania heptacantha</i> (de Haan).	<i>Alpheus brevirostris</i> (Olivier).
<i>A. globata</i> , Stimpson.	<i>A. japonicus</i> , Miers.
<i>Galathea acanthomera</i> , Stimpson.	<i>Penæus (Metapenæus) lamellatus</i> , de Haan.
<i>Crangon consobrinus</i> , de Man.	<i>P. (Metapenæus) akayebi</i> , Rathbun.
<i>C. cassiope</i> , de Man.	<i>P. (M.) acclivis</i> , Rathbun.
<i>Sclerocrangon angusticauda</i> (de Haan).	<i>P. (Parapeneopsis) tenellus</i> , Sp. Bate.
<i>Leander longipes</i> , Ortmann.	<i>P. (Trachypenæus) curvirostris</i> , Stimpson.
<i>L. paucidens</i> , de Haan.	<i>Chloridella affinis</i> (Berthold).
<i>Spirontocaris rectorostris</i> (Stimpson).	<i>C. fasciata</i> (de Haan).

## B.—LAKE AT YUNNAN-FU, CHINA.

<i>Potamon (Parapotamon) spinescens</i> , Calman.	<i>Potamon (Parathelphusa) endymion</i> , n. sp.
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## C.—DARJEELING, BENGAL.

*Palaemon (Parapalaemon?) hendersoni*, de Man.

## D.—THURSDAY ISLAND, TORRES STRAITS.

*Penæus (Penæus) latisulcatus*, Kishinouye, var.?

## E.—COAST OFF BAHIA.

<i>Penæus (Penæus) brasiliensis</i> , Latr.	<i>Sicyonia carinata</i> (Olivier).
<i>Sicyonia sculpta</i> , H. M.-Edw., var.?	

## A.—INLAND SEA OF JAPAN.

## LAMBRUS, Leach.

## ONCODOLAMBRUS, de Man.

*Oncodolambrus*, de Man, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. 1906, p. 400.

Carapace broadly triangular, much broader than long. Rostrum acute, projecting and strongly deflexed. No postocular constriction. Branchial regions extraordinarily swollen, globulate, rounded, much higher and broader than the narrow cardiac region and devoid of tubercles and spines. Pterygostomial regions traversed by a ridge that runs parallel with the antero-lateral border. Chelipeds of moderate length, their margins dentate, their surfaces smooth. Ambulatory legs short.

Related to *Platylambrus*, Stimps., but distinguished by the considerably inflated and swollen branchial regions that are not tuberculate. The subgenus *Parthenopoides*, Miers, differs by the postero-lateral margins of the carapace running nearly in a straight line with the posterior margin.

## LAMBRUS (ONCODOLAMBRUS) PRÆDATOR \*, de Man. (Pl. 31. figs. 1-3.)

*Lambrus (Oncodolambrus) prædator*, de Man, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. 1906, p. 400.

One male from Japan, the locality not defined.

Probably a species of small size. Measured in the middle line the carapace appears to be 7 mm. long, the front included, and the greatest breadth at the angles between the antero- and postero-lateral borders measures 10 mm.: the broadly triangular carapace is thus nearly *once and a half* as broad as long. The triangular, subacute front is prominent, but strongly, obliquely, deflexed. The lateral margins are parallel, though slightly concave, between the eyes and then curve inward; they are *smooth and entire*, but, on each side, the subfrontal process is visible as a small tooth or prominence, when the front is looked at from above, the subfrontal process being situated almost as far distant from the tip of the rostrum as from a transverse line that runs along the posterior border of the orbits. The breadth (1.8 mm.) of the front at its base is almost *one-fifth* of the greatest breadth of the carapace. The smooth upper surface of the front is concave between the eyes; the groove, here rather broad and deep, becomes gradually more shallow anteriorly; the groove gradually narrows backward on the upper surface of the somewhat elevated gastric region until its posterior end, when one observes a low rounded tubercle in the middle line.

The gastric region is slightly inclined from behind forwards. A little in front of the round tubercle the gastric region carries, on either side of the middle line, another obtuse tubercle that is much smaller and much less prominent. The cardiac region carries, in the middle line, two obtuse tubercles one behind the other, which are as large as the tubercle at the posterior end of the gastric region; the anterior cardiac tubercle is once and a half as far distant from the gastric tubercle as are the two cardiac from one another. Behind these prominences, which are, however, not so high as the swollen, branchial regions, one observes, on the posterior slope of the cardiac region, two other smaller tubercles, the anterior of which is probably double. The slightly convex and granulated posterior margin of the carapace carries five tubercles, namely, in the middle three smaller ones, of which the median one is a little larger than the two others and are contiguous to one another, and a larger tubercle on each side more laterally. The tubercles of the gastric and cardiac regions as also those of the posterior border of the carapace appear granulated under a very strong lens. The intestinal region carries, on each side, in the angle between the cardiac and branchial regions, two very low prominences, separated by a shallow groove, the anterior being somewhat larger than the other.

The distance between the external orbital angles, which are not at all prominent, measures almost one-third of the greatest breadth of the carapace. The hepatic areae situated between the orbits and the swollen, branchial regions are deeply concave; they are smooth, like the gastric and branchial regions, but finely punctate, the punctuation being more crowded on the gastric region. The *considerably swollen and inflated*

\* *Prædator*, robber: because, when looked at from in front, the crab seems to be burdened on each side with its prey.

branchial regions are nearly *globular* and very large, being twice as broad as the gastric region. There is no postocular constriction of the carapace. The antero-lateral margins which run at first outward, then curve backward and upward, terminating on the outer surface of the branchial globes in a triangular, compressed tooth which is directed outward; at the level of the subacute tips of these teeth the carapace shows its greatest breadth. The cristiform, antero-lateral margins are thus curved *S*-like; the described largest tooth is followed anteriorly by three or four others, that gradually become smaller, which, like the former, are granulated or denticulate on their margins. The anterior part of the antero-lateral border, defining the hepatic region laterally, is entire, not granulate. From the largest tooth the likewise cristiform and finely denticulate postero-lateral margin runs at first backward and upward, then it turns suddenly downward and inward at a right angle until near the base of the branchial regions; at this angle the postero-lateral margin carries another, rather obtuse tooth, which is smaller than that at the posterior end of the antero-lateral border and which is directed backward and outward. At the base of the branchial regions, finally, the postero-lateral margins curve for a short distance forward, not uniting therefore with the posterior border of the carapace; just at this curve they carry a rounded, obtuse tooth or prominence. From the angle where the postero-lateral margin turns suddenly downward a finely granulated ridge runs upon the upper surface of the branchial region forward and inward; just outside of this ridge the upper surface is a little concave, but more outward and forward it is regularly convex and also on the inner side of that ridge. For the rest the branchial regions are *smooth*, very finely punctate, the puncta being not crowded, except just near the granulated ridge above.

The orbital margins are smooth. The posterior wall of the orbits is marked with a narrow, linear fissure, the lower wall has a large triangular notch, and the obtuse, internal angle is little prominent. From the inner infraorbital tooth a ridge extends backward that makes a right angle with the acute tooth at the antero-lateral angle of the buccal frame. From the last-mentioned tooth a prominent granulated ridge runs obliquely backward on the pterygostomian regions, parallel with the antero-lateral border of the carapace; between the latter and the granulated ridge the subhepatic region is, just below the orbits, deeply concave. At the level of the middle of the buccal frame the pterygo-stomian ridge has a triangular notch.

The external maxillipeds are granular; on the inner half of the merus-joints the granules are larger. The sternum is granulated. The abdominal somites carry each a compressed, transverse tooth in the middle and another smaller one at the lateral angles; the teeth are granulated and there are granules between them; the second somite is visible when the carapace is looked at from above.

The chelipeds are subequal, the right a little longer than the left. The right cheliped, 16 mm. long, is *little more than twice as long as the carapace*, it is thus of moderate length. The arm, 7 mm. long, is quadrilateral and projects only one-third of its length beyond the carapace; its surfaces are smooth. The anterior surface makes a right angle with the lower; the edge between both is beset with small, subacute teeth. Both the anterior and the posterior borders carry small, compressed, triangular teeth, which

are unequal; the upper border is also somewhat denticulate. The posterior margin of the carpus, which is smooth above and below, is sharp; it carries one tooth just beyond the middle and one at the distal end. The anterior border of the upper surface is granulate. The three sides of the trigonal palm are also smooth; the anterior edge is crenulate, the upper denticulate; the teeth are small, little prominent, but one, just beyond the middle, is somewhat larger than the rest. The sharp, cristiform, posterior margin carries four triangular teeth, one at each extremity and two in the middle; teeth and margin are, moreover, finely denticulate: that of the left cheliped carries six or seven teeth. The sharply-pointed fingers are much turned inward, the dactylus being at a right angle with the upper surface of the palm. The upper border of the dactylus is granulated, the first granule or tubercle near the articulation is much larger than the following, which become gradually smaller; the cutting-edge of the dactylus of the larger cheliped carries five low, obtuse teeth, of which the fifth, near the tip, is a little larger than the preceding. The immobile finger carries two much larger, obtuse teeth in the middle, the second of which is larger than the preceding one. The fingers of the left leg are less denticulate.

The ambulatory legs are also of moderate length, those of the first pair extend with only half their dactylopodite beyond the distal end of the arm of the chelipeds; their joints are laterally compressed. The upper margin of the merus is sharp, lamellar, and, in the legs of the last pair, faintly denticulate; the lower edge of the outer surface is, in the last pair of legs, beset with prominent, rather acute and unequal granules; on the meri of the two preceding pairs they are smaller, and on the legs of the first pair it is not the lower edge of the outer, but that of the inner surface which is granular. The upper margin of the two following joints is also lamellar and sharp, and the lower margin of the propodites is finely granulated. The terminal joints, slightly longer than the propodites, are tomentose, except at their tips. The coxæ of the fifth pair carry two acute teeth posteriorly, the outer larger than the inner.

The upper surface of the carapace is cream-coloured, the sides of the median regions are marked with wine-red spots; the chelipeds are red, and the fingers dark brown on their distal half, the tips being paler.

*Lambrus (Parthenopoides) pteromerus*, Ortm., from Japan, of which the type was examined by me, is a quite different, much larger species.

#### LUPA, Leach.

##### LUPA (HELLENUS) HASTATOIDES (Fabr.), de Haan.

*Portunus (Amphitrite) hastatodes*, de Haan, Fauna Japon., Crust. 1835, p. 39, Taf. 1. fig. 3.

*Neptunus (Amphitrite) hastatoides*, de Man, in Spengel, Zool. Jahrb., Syst. viii. 1894-95, p. 557.

*Neptunus (Hellenus) hastatoides*, Alcock, in Journ. Asiat. Soc. Bengal, vol. lxxviii. pt. II. 1899, p. 38.

One male from the Inland Sea of Japan, deep sea.

The two median teeth of the front are *distinctly less prominent* than the others, just as in de Haan's type specimen, mentioned by me (*l. c.*); in Indian specimens the two median teeth are usually as prominent as or even more prominent than the others, as was stated by me, and later also by Alcock, by whom a large number of individuals were examined.

The cephalothorax is 13·5 mm. long, measured in the middle line, the abdomen excluded; the external orbital angles are 10·75 mm. distant, and the tips of the large lateral spines 30·5 mm. The lateral angles of the posterior margin are spiniform. Penultimate joint of the abdomen 3 mm. long, its posterior margin straight, 2 mm. broad.

In both chelipeds the anterior border of the arm carries 4 spines; the right cheliped is a little larger than the left, the arms project nearly their whole length beyond the carapace.

The tip of the dactylus of the last pair of legs shows no trace at all of a dark fleck.

### PLATYGRAPSUS, Stimpson.

#### PLATYGRAPSUS DEPRESSUS (de Haan).

*Grapsus (Platynotus) depressus*, de Haan, Fauna Japonica, Crust. 1835, p. 63, tab. 8. fig. 2.

*Platygrapsus depressus*, Ortmann, in Spengel, Zool. Jahrb., Syst. vii. 1894, p. 716.

One male of medium size from the Inland Sea of Japan, caught in deep water.

This specimen, which has been compared with an adult typical male from the Leyden Museum, is 14·25 mm. broad and 12 mm. long; breadth of the anterior border of the front 6·6 mm. The right cheliped is much larger than the left, in both the inner angle of the carpus is subacute; the fingers of the right cheliped, which is just as long as the carapace, viz. 12 mm., are gaping and meet only at the tips; the arcuate and tapering dactylus carries a denticulate prominence in the middle, and between it and the tip six or seven small rounded teeth; the inner border of the lower finger carries also seven or eight small, somewhat unequal teeth. The smooth outer surface of the chela is finely punctate. The fingers of the other chela, which is 9·5 mm. long, are just as long as the palm, straight and shut almost close together; the cutting-edge of the immobile finger shows a dozen somewhat unequal conical teeth; as many teeth occur on the dactylus, but here they are very small, those near the tip being a little larger than the rest.

The legs are of a beautiful scarlet colour; the upper surface of the carapace is greenish, but the front and the antero-lateral margins are also red.

### ASTHENOGNATHUS, Stimpson.

#### ASTHENOGNATHUS INÆQUIPES, Stimpson. (Pl. 31. figs. 4-6.)

*Asthenognathus inaequipes*, Stimpson, in Proc. Acad. Nat. Sciences Philadelphia, 1858, p. 107.

One egg-laden female from the Inland Sea of Japan, caught in deep water.

So far as I am aware, this species has not been found again since its first discovery almost half a century ago. It is a little smaller than Stimpson's type, also a female, the carapace of which was 6·8 mm. long and 9·5 mm. broad. The carapace of our specimen from the Inland Sea is 4·8 mm. long, measured in the middle line; the well-defined and granular antero-lateral borders are slightly arched, diverging backward, and they meet with the

somewhat shorter postero-lateral nearly at the level of the median part of the cervical groove, *i. e.* a little behind the middle of the carapace. The upper surface shows here its greatest breadth of 6.5 mm.; the proportion between this breadth and the length fully agrees with that of the dimensions indicated by Stimpson. The likewise granulated postero-lateral borders are also slightly arched, converging backward, but, different from *Tritodynamia* (confer Nobili, in 'Annales Mus. Nat. Hungarici,' iii. 1905, tab. 10. figs. 1 & 2), their concave side is turned inward, in *Tritodynamia*, however, outward. The postero-lateral borders almost reach to the posterior margin of the carapace. From the point where the antero- and postero-lateral borders meet, a granulated line proceeds backward on the side wall of the carapace, terminating above the antepenultimate legs; it is here that the carapace has its greatest width of 7.2 mm.

The upper surface, which is *one-third* broader than long, is slightly convex longitudinally; the median transverse groove, which is situated a little behind the middle and occupies about one-third of the breadth of the carapace, is broad and shallow; but the gastric region, which regularly curves into the strongly deflexed front, is barely demarcated from the hepatic regions. Whereas the larger anterior half of the cardiac region is slightly convex longitudinally, a shorter posterior part is somewhat depressed. Just in front of the posterior margin of the carapace, parallel with it, a *straight* ridge runs between the bases of the last pair of legs; at its lateral extremities this ridge curves forward and, running above the last pair of legs, appears here granular. The carapace is also slightly arched from side to side. Its upper surface is finely punctate, for the rest smooth; examined under the microscope it appears very finely granulate ("subtilissime granulata," Stimpson).

The distance, 3.7 mm., between the external orbital angles, which are not at all prominent, measures almost three-fifths of the greatest breadth of the upper surface and three-fourths the length. The upper orbital margins regularly curve into the lateral margins of the front, which converge forward, so that the much deflexed front appears somewhat broader at its base than at its anterior border; the anterior border is 1.28 mm. broad, *about as broad as the orbits* and *one-fifth* of the breadth of the upper surface; at its base, however, the breadth of the front is almost one-third the greatest width of the carapace. When the latter is looked at from above the anterior margin of the front appears very slightly arcuate, but when the front itself is looked at from above the anterior margin appears broadly triangular, because it projects a little forward in the middle; the lateral margins of the front make distinct, somewhat obtuse angles with the anterior border. The frontal and supraorbital margins are smooth; frontal median furrow short and quite shallow.

Interantennular septum very narrow, if complete; antennular fossæ barely broader than long, well developed, like the antennulæ, which fold transversely (Pl. 31. fig. 4). The basal joint of the outer antennæ, situated between the basal antennular joint and the small obtuse tooth at the inner lower angle of the orbits, is about as long as broad; the second joint, which is just as long, but only half as broad, reaches to the level of the front, and the much smaller third joint extends beyond it; the flagellum is 1.65 mm. long, longer than the breadth of the anterior border of the front, and reaching beyond

the orbits. The orbits are well developed but incomplete below; the movable eye-peduncles are *of a stout shape*, being a little more than half as thick as long; the red-brown corneæ are distinctly faceted. The eye-peduncles are a little pubescent, and these minute hairs are, like those of the carapace, a little setose or ramified. Infraorbital ridge smooth, prominent, running a little below the orbits.

Epistome extremely short. The buccal cavern broadens backward, as the slightly arcuate lateral margins distinctly diverge; posteriorly it is 2.5 mm. broad, *little more than one-third* the greatest width of the carapace, and the buccal cavern appears *once and a half as broad* as it is long. The greater median part of the anterior border of the buccal frame is straight, whereas the smaller lateral parts are slightly convex. Palate quite *smooth*, without any trace of a median or lateral ridges.

The external maxillipeds are *widely distant*; the greatest width of the gap, at the boundary between merus and ischium, is *more than once and a half as large* as the breadth of each footjaw at that place; these maxillipeds are rather feeble (hence the name of *Asthenognathus*), for they do not quite reach to the anterior border of the buccal frame, leaving a small gap between them and this border. The ischium is 0.72 mm. long, quadrangular, its slightly concave anterior border is 0.38 mm. broad; it becomes somewhat broader backwards, so that it is 0.6 mm. broad in the middle; the ischium appears thus *a little longer than broad in the middle*. The slightly arcuate inner border is granulate, and one observes on its outer surface a shallow groove that runs nearer to the inner than to the outer border, with which it is parallel. The merus-joint is also quadrangular, but *smaller* than the ischium, for it is only 0.62 mm. long between the antero-external angle and the posterior border; this joint, 0.54 mm. broad in the middle, is but *little longer than broad*; the outer margin runs at first parallel with the somewhat arched inner (Pl. 31, fig. 4), but then it runs inward towards the ischium, so that it shows an obtuse angle in the middle. The anterior border of the merus is barely broader than the posterior, viz. 0.4 mm., makes right angles both with the inner and outer margins, and the antero-internal angle is rounded; a longitudinal groove runs, on the outer surface, near and parallel with the inner border along the whole length of the merus-joint. The palp is of moderate size and articulates *near the antero-external angle* of the merus; it consists of *three* joints that articulate at their distal ends. The carpus, 0.55 mm. long, measured along its outer border, is a little shorter than the merus and nearly twice as long as the following joint; the terminal joint is 0.38 mm. long, almost three times as long as thick at base, conical or rather sugarloaf-shaped; it is furnished with long setæ, and the inner borders of ischium and merus are also setose. The exognath, which is not concealed, reaches almost to the distal third or fourth of the outer border of the merus; near the middle of the ischium it is 0.23 mm. broad, about one-third of the breadth of this joint, but it distinctly narrows anteriorly. The gap between the outer footjaws is a little broader between the antero-internal angles of the merus-joints than at the base of the ischium-joints. The anterior border of the sternum is coarsely granulate.

The abdomen is 7-jointed and 5.6 mm. broad, a little less than the upper surface of the carapace; the penultimate joint of the abdomen, which is finely punctate and pubescent, is 0.88 mm. long, measured in the middle line, whereas the antepenultimate

joint is 0.84 mm. long. The terminal joint is triangular, 0.8 mm. long and 1.4 mm. broad, almost twice as broad as long and barely shorter than the preceding; its posterior margin is arcuate, convex, the tip rounded.

The chelipeds (Pl. 31. fig. 5) are equal, rather feeble and small; they are 6 mm. long, almost as long as the upper surface of the carapace is broad. The arm is triangular, 2 mm. long, unarmed; its upper border is strongly curved and carries about in the middle *a tuft of long setæ* that are half as long as the merus. Stimpson describes the merus as "superne prominentia mediana setigera instructus," but I see no prominence at all. Carpus rounded internally. The chela, which is somewhat compressed and the fingers of which are slightly curved inward, is 3 mm. long, once and a half as long as the merus. The fingers, which are distinctly longer than the upper border of the palm, barely exceed the length of the lower border; the palm is 1.1 mm. high, so that the chelæ are nearly three times as long as broad. The fingers regularly taper to the pointed acute tips; they are of equal size, equally broad at their base, and they leave a small interspace between them that gradually narrows towards the tips; the cutting-edges are rather sharp, that of the immobile finger carries 6 or 7 very low obtuse teeth, nearly of equal size and extending along the two proximal thirds; the dactylus carries near the base two truncate, somewhat larger teeth, the first of which is little larger than the other, and beyond them the cutting-edge runs somewhat uneven, the distal third excepted. The upper border of the palm is a little hairy and seems to be slightly granular, but it cannot be described as sharp, as was done by Stimpson; his words "superne acuta" are apparently applicable to the dactylus. The outer surface of the palm and of the fingers is smooth, but a ridge proceeds along the lower border from the carpal articulation to the tip of the index, and the palmar portion of this ridge is granulated.

As regards their shape and their relative length, the ambulatory legs much agree with those of *Tritodynamia japonica*, Ortm. Those of the antepenultimate or third pair (fig. 6) are the longest of all, measuring 11.5 mm., *i. e.* once and a half the greatest width of the carapace; the legs of the fourth pair are 11 mm. long, barely shorter than the preceding; then follow those of the second pair, that are *much shorter*, measuring 8.5 mm.; whereas the legs of the fifth pair, 6 mm. long, are the shortest and smallest of all, reaching but little beyond the merus of the penultimate pair. The meri of the third legs are *moderately enlarged*, as they are almost three times as long as broad; the two following joints are nearly equally long, and the dactyli are *barely shorter* than the propodites. The straight dactyli are depressed and taper, about from the middle, to the pointed extremity; their outer surface is longitudinally grooved in the middle, the lateral margins are ridged, and one observes on either side of the ridges a fringe of stiff outstanding setæ. The lower margin of the outer surface of the merus is coarsely granulated, the arcuate upper border more finely and the borders of the two following joints are also partly granular. The legs of the penultimate pair much resemble those of the third, but the carpo- and propodites are a little broader in proportion to their length; the dactyli are as long as the propodi, but those of the second pair are a little longer than the propodi, measured in the middle. The dactyli of the small legs of the fifth pair, which are also a little longer than the propodites, are slightly recurved, and they

are furnished on their lower surface with a row of setæ, of which the first are little shorter than these joints, whereas the following regularly decrease in length towards the tips; the outer surface of the meri of these legs is distinctly granulated near the upper and lower borders. The upper surface of the ambulatory legs is covered, the dactyli excepted, *with the same dark brown tomentum* that one observes also on the side-walls of the carapace and near the lateral margins of the upper surface; the lateral margins of these legs are furnished with somewhat longer setæ.

Eggs numerous, globular, small.

The upper surface of the carapace has a very pale ochraceous colour.

On the legs of the fifth pair several pedunculated Infusoriæ were attached.

The genus *Tritodynamia*, Ortm., is apparently most closely related; its chief difference is probably presented by the external maxillipeds, the merus-joint of which is longer than broad and not shorter than the ischium, and furthermore by the insertion of the terminal joint on the inner border of the penultimate. The latter character was observed by Nobili in a new species referred by him to *Tritodynamia*; but it is still unknown whether this character occurs also in the typical species, *Trit. japonica*, because the outer footjaws of Ortmann's single specimen were much damaged. Probably, therefore, the genus *Tritodynamia* ought to be referred to the subfamily *Asthenognathinæ* (confer Alcock, in Journ. Asiat. Soc. Bengal, vol. lxxix. part II. 1900, p. 294).

*Geographical Distribution.*—East coast of Nippon, 38° N. lat., on a sandy bottom (*Stimpson*).

### TRIGONOPLAX, H. M.-Edw.

#### TRIGONOPLAX UNGUIFORMIS (de Haan).

*Ocypode (Elamena) unguiformis*, de Haan, Fauna Japonica, Crust. 1839, p. 75, tab. 29. fig. 1, ♂ ♀, and tab. H.

*Elamena (Trigonoplax) unguiformis*, Alcock, in Journ. Asiat. Soc. Bengal, vol. lxxix. pt. II. 1900, p. 387.

One male, collected in deep water, Inland Sea of Japan.

H. Milne-Edwards, in Annales Sciences Nat. 3<sup>e</sup> série, Zool. t. xx. 1853, p. 224, describes this species as having the carapace "arrondie en arriere et très-déprimée." These words are not quite exact, but liable to be misunderstood. The carapace, measured from the rather obtuse tip of the triangular front to the middle of the concave posterior margin of the carapace appears to be 7.4 mm. long; the greatest breadth above the insertion of the third pair of legs measures 9.4 mm. The undivided, smooth, and glabrous upper surface cannot be said to be "très-déprimée"; in a lateral view of the carapace the middle part of the upper surface corresponding to the cardiac area appears, indeed, to slope slightly downwards towards the front and more rapidly towards the posterior and the slightly carinate antero-lateral margins. The postero-lateral margins and the concave posterior border are distinctly lamellar.

The legs of the second and third pairs are five times as long as the length of the carapace without the front; the upper border of the meri terminates in a small tooth.

The legs are yellowish, the carapace orange-coloured.

*Geographical Distribution*.—Japan (*de Haan*); Bay of Tokyo, Katsiyama, Kagoshima, Japan (*Ortmann*); Gulf of Martaban (*Henderson*); Andamans (*Alcock*).

### LEUCOSIA, Fabr.

#### LEUCOSIA RHOMBOIDALIS, de Haan. (Pl. 31. fig. 7.)

*Leucosia rhomboidalis*, de Haan, Fauna Japonica, Crust. 1841, p. 134, pl. 33. fig. 5; Alcock, in Journ. Asiat. Soc. Bengal, vol. lxxv. pt. II. 1896, p. 234.

One adult male from the Inland Sea of Japan, caught in deep water.

The carapace is 16 mm. long and 13.75 mm. broad; its upper surface is lead- or slate-coloured, without the dark red spots described by Alcock. The abdomen (Pl. 31. fig. 7) does not exactly agree with the figure in the 'Fauna Japonica'; the penultimate segment narrows more distinctly distally and its lateral margins are very slightly arched, not at all concave; the antepenultimate joint is distinctly constricted not far from its posterior margin, as in *Leuc. maculata*, Stimps., which is regarded by Alcock as identical with this species. The edge of the pterygostomial region that forms the anterior boundary of the thoracic sinus is quite straight.

### MYRA, Leach.

#### MYRA FUGAX (Fabr.).

*Myra fugax* (Fabr.), Alcock, in Journ. Asiat. Soc. Bengal, vol. lxxv. pt. II. 1896, p. 202.

One young male from the Inland Sea of Japan, deep water.

The carapace of this specimen, which agrees with the form described by Miers in 1879 under the name of *Myra dubia*, and apparently also with that described by Hilgendorf as *Myra coalita*, is 13.5 mm. long exclusive of the median spine, and 15 mm. when it is included; the carapace is 12.4 mm. broad. The upper surface, which is strongly convex transversely, agrees in its general shape with the figure of *Myra carinata* in Bell's Monograph, but the acute median spine is much shorter, being only *once and a half* as long as the lateral ones. The median granulated ridge is quite distinct, as also the raised cluster of granules on the well-defined intestinal region; punctiform granules are scattered on the upper surface, except quite anteriorly. The front and the adjacent parts of the flattened subhepatic regions are pubescent. Immediately behind the notch three or four beads of the lateral border are dentiform, and one observes another just above the last pair of legs. The chelipeds are 25 or 26 mm. long, not quite twice as long as the cephalothorax.

There is still a very young male specimen, without definite locality, that no doubt belongs also to this species; it is, in my opinion, that form which has been described by Dr. Alcock as a distinct species, *Myra pentacantha* (Alcock, *l. c.* p. 204). Measured in the middle line, the carapace appears to be 6.4 mm. long the median spine included, and 5.5 mm. without it; it is 5.1 mm. broad. The carapace is less strongly convex; not only is the intestinal region distinctly defined, but the branchio-cardiac grooves are also

discernible. The median acute spine on the intestinal region is twice as long as the lateral ones. The carapace is marbled with red on either side of the median ridge, on each side of the front, and on the hepatic regions.

### ARCANIA, Leach.

#### ARCANIA HEPTACANTHA (de Haan). (Pl. 31. figs. 8-10.)

*Iphis heptacantha*, de Haan, in Herklots, 'Symbolæ carcinologicæ: Études sur la Classe des Crustacés,' Leyde, 1861, p. 27.

Two males and two sterile females of somewhat larger size, from the Inland Sea of Japan, deep water.

Through the kindness of the Direction of the Leyden Museum I was enabled to compare these specimens with the single type of *Iphis heptacantha*, de Haan, a description of which seems not to have appeared. This type specimen, the locality of which is unknown, is an adult female of larger size than the Japanese specimens; legs and foot-jaws are unfortunately wanting. The Japanese specimens no doubt belong to this species.

The cephalothorax of de Haan's type specimen is *a little broader* in proportion to its length; but this may be explained by its larger size (compare the measurements). Alcock's description of *Arc. septemspinosa* (Fabr.), Leach (in Journ. Asiat. Soc. Bengal, vol. lxxv. pt. II. no. 2, 1896, p. 265), is applicable to de Haan's type of *Arc. heptacantha* except as regards the length of the spines and perhaps also the following. The cardiac and intestinal regions are also separated on each side by *a moderately deep groove* from the branchial regions, which, according to Alcock's description, does not seem to be the case in *Arc. septemspinosa*. In *Arc. heptacantha* the surface of the carapace is finely granular; on the gastric, cardiac, and intestinal regions the granules are a little larger than on the branchial; from each of the two spines with which the latter are armed a somewhat irregular row of granules runs forward and inward on their surface; these granules have the same size as those of the gastric region, but between these rows the granulation is finer than on the median regions. The concavity just behind the crease or pucker that separates the hepatic from the branchial regions and the upper surface of the front are smooth. The lateral spines, that are somewhat directed backward and slightly curved upward, measure in de Haan's type specimen 6 mm., *i. e.* almost *one-third* the breadth of the carapace without the spines; the median spine on the transversely and longitudinally convex intestinal region, which is a little directed upward, is the shortest of the seven spines, measuring 1.75 mm., *not quite one-third* the length of the lateral spines. The four other spines, which have nearly the same size, are 2.4 mm. long, so that they appear a little larger than the spine on the intestinal region, measuring a little more than *one-third the lateral spines*. Exclusive of the spines, the cephalothorax, which is strongly convex transversely and as much longitudinally, appears in the Leyden type a little broader than long, in the largest of the Japanese specimens (a sterile female) nearly as long as broad. In the latter specimen the lateral spines are 3.25 mm. long, about *one-fifth* the width of the carapace without the spines, so that they are

comparatively shorter than in de Haan's adult female; the median spine on the intestinal region is just as long as the two spines on the posterior border, viz. 1.3 mm., measuring a little more than one-third the lateral spines, but the posterior two on the branchial region are, in this specimen, the shortest of all, measuring 0.9 mm. The posterior branchial spines are a little farther, viz. 7.3 mm., distant from the tips of the lateral spines than from that (5.75 mm.) of the median spine. The front and the depression between it and the gastric region are tomentose; the spines are also granular. In the Leyden type the front is a little less prominent and its lateral margins run somewhat more obliquely than in this female; but in the other specimens the obliquity is nearly the same. The chelipeds are equal, 37 mm. long, more than twice the length of the carapace (posterior spine included); they agree with the quoted description of *Arc. septemspinosa* and with the fig. 4, pl. 25, in Cuvier's 'Atlas du Règne Animal.' The slender fingers are one-fourth longer than the tapering hand, but carpus and palm appear also finely granulated under a lens. The meropodites of the ambulatory legs are finely granular, but the following joints seem to be smooth.

In the other female the five posterior spines are of equal length, but the two males agree with the larger female. In these specimens the whole upper surface of the carapace is slightly pubescent.

The abdomen of the male (Pl. 31, fig. 9) consists of five pieces; the penultimate segment is once and a half as long as broad and once and a half as long as the terminal piece.

*Measurements in millimetres.*

	1.	2.	3.	4.	5.
	♀.	♀.	♀.	♂.	♂.
Breadth of the carapace, the lateral spines included .....	33	21	18.4	16.5	13.75
Length of the carapace, the posterior spine included.....	21.75	16.75	15	13	11.25
Breadth of the carapace, exclusive of the lateral spines...	21.5	15.5	13.4	11.5	10
Length of the carapace, exclusive of the posterior spine .	20.5	15.75	14.5	12	10.5

No. 1. Leyden type of *Iphis heptacantha*, de Haan; Nos. 2-5. Inland Sea of Japan.

Whether this species differs from *Arc. septemspinosa* (Fabr.), Leach, by other characters than the shorter spines, is difficult to say, because I was unable to compare it with specimens of the latter. I will, however, observe that at the end of his quoted description of *Arc. septemspinosa*, Dr. Alcock adds:—"Of ninety-two specimens in the Indian Museum the lateral spines are found to vary a good deal in length: they are usually, in adults, about as long as the arm, and sometimes a good deal longer; but in the young they are usually much shorter than the arm."

Perhaps *Arc. heptacantha* is related to *Arc. septemspinosa* (Fabr.), var. *gracilis*, Hend., from the Gulf of Martaban, but it is difficult to decide, because his description is too short (Henderson, in Trans. Linn. Soc., ser. 2, Zool. vol. v. 1893, p. 403).

*Arc. quinquespinosa*, W.-Mason (Ill. Zool. 'Investigator,' Crust. pl. 24. fig. 6), is certainly a different species.

## ARCANIA GLOBATA, Stimpson. (Pl. 31. figs. 11-13.)

*Arcania globata*, Stimpson, in Proc. Acad. Nat. Sciences Philadelphia, 1858, p. 160.

*Arcania globata*, Miers, in Proc. Zool. Soc. 1879, p. 44.

*Arcania globata*, Ortmann, in Zool. Jahrb., Syst. vi. 1892, p. 577.

One young male, collected at a depth of 8 fathoms in the Inland Sea of Japan; bottom sandy. It is said to be here very rare.

Measured in the middle line, this specimen appears to be 8 mm. long, whereas the carapace is 7.25 mm. broad without the spines, and 9 mm. when they are included. Without the front the cephalothorax appears semiglobular, for the outline is circular and it is strongly convex transversely and also much longitudinally. The front, which is characteristic, is prominent, extending a little beyond the eye-peduncles. Its upper surface, which is a little convex longitudinally, is slightly furrowed in the median line, makes a very obtuse angle with the upper surface of the carapace, and appears to be situated at a much lower level than the latter, in a lateral view or when the carapace is looked at from in front. The breadth of the front is nearly *one-fourth* that of the carapace (the spines included) and it is a little broader than long; the slightly arcuate, lateral margins terminate each in a small subacute tooth, and the anterior border of the front between these two teeth is *nearly straight, very slightly concave*. The upper surface is rather thickly beset with slender, subacute spines; these spines, which are smooth and almost of equal length, appear to be very slightly curved forward in a lateral view of the carapace. A few similar spines, though much smaller, stand at the base of the front. The spines on the upper surface of the carapace are about 80 to 90 in number. Under a strong magnifying-glass the upper surface appears to be covered between the spines with small pointed spinules, especially anteriorly. A much stouter though barely longer spine stands on the middle of the well-defined intestinal region; this spine is granular and also slightly curved forward. Round the margin of the carapace are *ten conical larger and acute spines* that are all *granulated* and more or less curved upward; they are as *stout* as the already described stouter spine on the intestinal region. Of the five spines on each side, the third or middle one is placed just in the middle of the lateral margin and somewhat curved forward; the fourth spine has the same size as the third, and it is as far distant from the third as from the spine on the intestinal region. A fifth spine, a little shorter than the third and the fourth, is placed on the outer angle of the narrow posterior border of the carapace; this spine, which is directed backward and slightly outward, is also as far distant from the fourth spine as the fourth from the third. The second spine, which is a little smaller than the third, stands somewhat nearer to the latter than to the first; the distance between the first spine and the second is just two-thirds of that between the third and the fourth. The first to fourth spines and also the spine on the intestinal region are all placed at some, nearly equal, distance from the lower border of the carapace, *i. e.* from the base of the legs, but the fifth spine stands just near the base of the last leg. One observes, moreover, two smaller spinules on the posterior margin between the two spines of the fifth pair.

Eye-peduncles a little shorter than the front; the cornea, which is shining and dark

brown, carries anteriorly a small conical tooth or tubercle. Both the outer and the inner angle of the lower margin of the orbits are produced into an acute slender spine that reaches not as far forward as the eye-peduncles; the outer wall of the orbits carries on its free border a small spine, which is preceded on its outer surface by a somewhat larger one. The outer wall is separated on each side by a furrow from the front and from the pointed spine at the outer orbital angle; the latter spine carries a small acute tooth on its outer margin (Pl. 31, figs. 10 & 11).

The lateral margins of the buccal frame are considerably thickened anteriorly at the level of the merus-joint of the outer footjaws and terminate in a forwardly-directed spine that reaches as far forward as the spine at the internal angle of the orbits. The outer footjaws are granulated, like the lower surface of the carapace. The merus-joint, measured along the inner border, appears to be 1 mm. long, the ischium-joint 1.6 mm.; the former is thus more than half as long as the latter.

The 5-jointed, strongly granulated abdomen resembles that of *Arc. 11-spinosa*, de Haan; the same rather coarse granulation exists on the sternum. The chelipeds, 13 mm. long, are little more than once and a half as long as the carapace. The merus-joint, which is a little stouter than that of *Arc. 11-spinosa*, de Haan, is covered above with rounded, circular granules, mostly large, though with some smaller observable among them on the distal half; on the anterior border they are of a more conical shape and the posterior border carries *four strong, nearly equidistant, and subequal, subacute spines*, which are not described by the quoted authors, unless by Stimpson with the words "granulis plerumque subspiniformibus." Similar circular bead-like granules as on the upper surface also occur on the lower. Carpus and hand are closely beset with granules, which are, however, much smaller than those of the arm; the slender fingers, which shut close together and are almost once and a half as long as the upper border of the palm, are deeply furrowed longitudinally; they show a fine granulation under a strong magnifying-glass, they are a little hairy distally, and their prehensile edges are beset with numerous small teeth, a few of which are distinctly larger on the distal half of the fingers.

The ambulatory legs, smooth to the naked eye, are indeed covered with a close minute granulation, visible only by means of a strong magnifying-glass; the anterior border of the meropodites is *spinulose*, being beset with 5-9 small, spiniform, acute teeth, and the slender, slightly arcuate terminal joints are about as long as the propodites.

This pretty little crab has the front and a median band on the upper surface of the carapace *white*, the median band being half as broad as the front; adjacent to the band the upper surface is *orange*, but this colour gradually becomes paler laterally. The spines are also of a pale orange-colour, but those that stand on the band are white. The lower surface is uncoloured, but the sternum is marked anteriorly, on each side of the abdominal groove, *with a triangular orange-coloured fleck*, between that groove and the base of the chelipeds. The latter are pale reddish above; the proximal extremity of the merus is white, like the tips of the fingers. The ambulatory legs are uncoloured, but carpus and merus are partly reddish.

*Arcania 11-spinosa* is at once distinguished by the different shape of the front, by the carpus and chelæ being apparently smooth, and, no doubt, by other characters as well.

*Geographical Distribution.*—Chinese Sea, lat. 23°, depth 16–25 fathoms, bottom sandy or muddy (*Stimpson*); Corea Channel, lat. 34° 8' N., long. 126° 24' E., at a depth of 24 fathoms (*Miers*); Maizuru, Japan (*Ortmann*).

### GALATHEA, Fabr.

#### GALATHEA ACANTHOMERA, Stimpson. (Pl. 31. figs. 14, 15.)

*Galathea acanthomera*, Stimpson, in Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 252.

*Galathea orientalis*, Ortmann, in Spengel, Zool. Jahrb., Syst. vi. 1892, p. 252, tab. 11. fig. 10 (*nec* Stimpson).

One male from the Inland Sea of Japan.

Through the kindness of Prof. Döderlein, of Strassburg, some specimens of Ortmann's *Galathea orientalis* from Kadsiyama, Japan, are lying before me, and though they show a few slight differences, especially as regards the rostral teeth, they belong no doubt to the same species as our specimen from the Inland Sea. As will appear from the following description, this species ought to be referred to *Gal. acanthomera*, Stimpson, and not to *Gal. orientalis* of the same author.

The carapace of our male is 7.2 mm. long and 5 mm. broad. The rostrum measured from the tip to a transverse line uniting the bases of the first, *i. e.* the posterior teeth, appears to be 2.7 mm. long and 1.5 mm. broad at its base; in a male from Kadsiyama of the same size the rostrum is 2.55 mm. long, but just as broad as the other. The length of the rostrum and its relative breadth are thus somewhat variable. The lateral teeth of the rostrum are all acuminate and pointed. The first or basal tooth is, in the male from Kadsiyama, directed straight forward and measures just one-third of the second, which is slightly turned inward, its outer margin being a little curved; the third tooth, one-third longer than the second and therefore the longest of all, and also the fourth, which is just as long as the second, are directed straight forward; the terminal spine, finally, measures two-fifths the whole length of the rostrum, is once and a half as long as the fourth lateral tooth, and its lateral margins carry a few, six or seven, microscopical teeth and some setæ. In another specimen the third and the fourth lateral teeth are nearly of equal length and the fourth is slightly turned outward. In an adult female from Kadsiyama the second tooth is also directed straight forward and its outer margin straight, not curved inward.

In the male from the Inland Sea the first tooth measures a little more than one-third the length of the second and is turned slightly outward; the second tooth projects straight forward and its outer margin is straight; the third is once and a half as long as the second, which is almost as long as the fourth, the third and the fourth being both directed straight forward. Length and shape of the rostral teeth are thus somewhat variable. Immediately posterior to a transverse line uniting the base of the incisions between the first and second lateral teeth, one observes, in the middle, *two spines* near together; these spines are, in the male from the Inland Sea, a little shorter than the basal teeth of the rostrum, they are twice as far distant from one another as they are long and a little farther distant from the basal teeth than from each other.

The upper surface of the rostrum is somewhat hairy in the middle, short setæ being arranged in curved, parallel rows on each side and near the middle line; a longer seta is inserted at the base of the fourth lateral tooth, in the middle, another nearly in the middle of the rostrum on either side of the median line.

The lateral borders of the carapace are armed with *nine* teeth, or rather spines. The first spine is, in the male from the Inland Sea, a little larger than the first lateral tooth of the rostrum and directed obliquely outward; it stands at the outer angle of the orbits. The second spine, a little less turned outward, is placed somewhat nearer to the first than to the cervical groove; one observes, between the second and this groove, the two following spines, viz. the third, somewhat smaller than the second, placed on the upper surface quite near the cervical groove and a little remote from the lateral margin, and the fourth, which is as large as the second, just below the lateral margin. Behind the cervical groove the lateral margin carries five other spines, which are equidistant and of equal size, as long as the second, except the last which is somewhat shorter. From each of the two spines, on the boundary between rostrum and gastric region, a ciliated ridge runs laterally towards the base of the second spine of the lateral margin of the carapace; posterior to the two spines one observes *seven ciliated ridges*, all reaching the lateral margins, except the second, which terminates at the cervical groove. Between the third and the fourth runs a short transverse ridge immediately in front of the cervical groove; between the fourth and the fifth a ridge proceeds, parallel with them, from the lateral border until at some distance from the middle line; between the fifth and sixth two similar shorter ridges run from the lateral border inward, of which the posterior, which terminates at the ninth spine of the lateral margin, is almost twice as long as the other. Between the sixth ridge and the seventh a similar stria proceeds from the lateral border; this stria is a little shorter than the posterior of the two between the fifth ridge and the sixth. A ciliated stria runs from the fifth lateral spine inward along the cervical groove, another shorter one from the sixth lateral spine. All these ridges are ciliated; the cilia are *long*, viz. 0.3–0.35 mm. The upper surface of the carapace, of the rostrum, and of the abdomen is thickly and coarsely punctate; the anterior borders of the segments of the abdomen are ciliate and carry, moreover, a few rather long setæ, which occur also in very small number on the lateral parts of the upper surface of the carapace.

The antepenultimate joint of the antennal peduncle is bispinose, carrying a strong spine above and a similar one on the lower border; the penultimate joint is armed above with a single, somewhat smaller spine.

The external maxillipeds (Pl. 31. fig. 14), partly described already by Dr. Ortmann, show the following characters:—Measured along its outer margin, the ischium appears a little longer than the merus; in the male from the Inland Sea the ischium is 1.5 mm. long, the merus, however, 1.2 mm. The outer margin of the ischium terminates distally in a sharp tooth, which is slightly turned inward; the inner margin ends in a conical, stouter though shorter tooth. The two acuminate teeth on the inner margin of the merus are larger than those of the outer border; the anterior spine on the outer border is somewhat curved inward and stands at the distal end, the other nearly in the middle of the border. The outer margin of the carpus is armed, in the male from the Inland Sea, with three sharp

spines, preceded by a very small, acute tooth; these spines are a little smaller than those of the outer border of the merus, and decrease a little in length from the posterior to the anterior. In the male from Kadsiyama the outer border of the carpus carries two spines, which conform to Ortmann's description, and they are also preceded by a very small acute tooth. The slender peduncle of the exopodite reaches a little beyond the merus.

In the male from the Inland Sea the chelipeds are a little unequal, one being 20 mm. long, the other 18 mm.; they agree with Ortmann's fig. 10. The dactylus of the larger chela carries a moderately strong, subacute tooth at one-third of its length from the articulation, and between this tooth and the tip are seen 25 small obtuse or subacute teeth; the immobile finger has only small teeth, no stronger ones, as also the fingers of the smaller leg.

The three following legs are also characteristic. The meropodites of the second pair (Pl. 31. fig. 15) are five times as long as broad, and their upper margin is armed, along its whole length, with 11-12 strong sharp teeth nearly of the same size; the lower margin is also a little denticulate, and terminates, at the distal end, in a sharp spine which slightly projects beyond the rounded extremity of this joint. The outer margin of the carpus is armed with 5-6 sharp spines, nearly of the same size as those of the merus; the spine at the far end is a little larger than the preceding. The propodites, one-fourth shorter than the meropodites and about six times as long as broad, carry, on the proximal half of their upper border, three or four spines, which are a little smaller than those of the merus, and their lower margin is beset with six movable spines, which have nearly the same size as those of the upper margin. The terminal joints, little more than half as long as the propodites, end in a curved claw, while their lower border carries six movable spines, which gradually increase in length from the first to the sixth. The upper border of the meropodites is furnished with setæ, which are partly plumose or ciliate; at the base of each spine, on the posterior surface, is a long hair and one or two shorter hairs near it. The posterior surface of the meropodites shows transverse rows of short setæ and near the lower margin longer hairs. The following joints are also setose. The legs of the third and fourth pairs agree with those described, but the spines on the upper border of the meri are, in the legs of the fourth pair, comparatively smaller.

The male from the Inland Sea is of a pale yellowish red, the rostrum is whitish, like the lateral teeth of the carapace; the ciliated ridges on the carapace and the segments of the abdomen are marked with small red spots. The mero- and propodites of the second to fourth legs are adorned each with two wine-red rings.

*Gal. orientalis*, Stimps., from Hong Kong is, no doubt, a different species. The carapace is described as "brevissime pubescens," whereas in *Gal. acanthomera* the cilia are long. The lateral margins of the carapace carry six teeth, in *Gal. acanthomera* nine; the first lateral tooth of the rostrum of *Gal. orientalis* is minute, the chelipeds "crassiusculi," the chela depressed, the dactylus bidentate, all characters not observed in *Gal. acanthomera*. The upper border of the meropodites is described as "confertim spinulata, spinulis minutis æqualibus," that of *Gal. acanthomera*, however, as "spinulis robustis ad 11 armato."

*Geographical Distribution.*—Bonin Islands (*Stimpson*); Japan, Kadsiyama, Sagami Bay, Maizuru, Tanagava, Kagoshima (*Ortmann*).

## CRANGON, Fabr.

## CRANGON CONSOBRINUS, de Man. (Pl. 31. figs. 16-19.)

*Crangon consobrinus*, de Man, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. 1906, p. 401.

*Crangon affinis*, Ortmann, in Spengel, Zool. Jahrb., Syst. v. 1890, p. 531.

One adult egg-laden female from the Inland Sea of Japan, caught in deep water.

This species is closely allied to *Crangon alaskensis*, Lockington, from Mutiny Bay, Alaska\*, but as it is perhaps different, I think it well to publish a somewhat detailed description.

Measured in the middle line, this specimen appears to be 48 mm. long, from tip of rostrum to the end of the telson; the carapace, inclusive of the rostrum, measures  $11\frac{2}{3}$  mm., i. e. *one-fourth* of the whole length, without the rostrum it is 10 mm. long.

The rostrum is distinctly *shorter* than the eye-peduncles when they are directed straight forward, and reaches only to the corneæ; it is rather narrow, spatulate, the sides nearly parallel for a portion of their length, though the rostrum is very slightly narrowed behind the middle; the edges are somewhat upturned and the sides curve anteriorly to the rather acute tip. The carapace is pubescent on each side, but glabrous posteriorly and in the middle of the dorsal surface, but the short hairs are here perhaps partially worn off. The single median gastric spine, which is of usual size and slightly directed upward, is situated at one-fourth the length of the carapace from the tip of the rostrum, the distance between both tips being 3 mm. On each side is the hepatic spine, which has the same size as the gastric, and the three spines are situated in a transverse line. In its general shape the abdomen resembles that of *Crangon vulgaris*: it is three times as long as the carapace (rostrum included). The first, the second, and the third segments are rounded above; the third, however, shows a slight depression on each side of the median line just behind the middle. The fourth segment presents *a trace of carination along a very short space on the posterior half*; the faint and obtuse carina does not, however, reach either to the middle of the segment or to its posterior margin. *The fifth segment is distinctly carinate*; the rather obtuse carina arises about at one-sixth the length of this segment from its anterior extremity and terminates quite near the posterior margin. The sixth segment, which is 7 mm. long, resembles that of *Crangon vulgaris*, but its upper border has *a shallow median groove*; as in *Crangon vulgaris*, the sixth segment is sulcate beneath, the furrow is rather shallow, and, as in that species, there is a sharp tooth at the posterior end between the bases of the uropods. The telson is 10 mm. long, almost once and a half as long as the sixth segment and just as long as the carapace (rostrum excluded); the slender and gradually tapering telson, which is *faintly* grooved above, terminates in a sharp tooth, on each side of which three movable spinules are inserted; the second is the longest of all, twice as long as the others, and extends, like the third, a little beyond the extremity of the telson. The inner caudal swimmerets are just as long as the telson, the outer are very little shorter.

The eye-peduncles (Pl. 31. fig. 16) resemble those of *Crangon vulgaris*. The antennular peduncles reach just beyond the middle of the distance between the orbital margin of the

\* Rathbun, 'Decapod Crustaceans of the North-west Coast of North America,' 1904, p. 114.

carapace and the tip of the antennal scales; the process on the outer side of the base is rather narrow and does not quite reach to the distal end of the first joint, hardly exceeding the eye-peduncles when they are turned straight forward. The gradually tapering, inner flagellum, which surpasses somewhat the antennal scales, is a little longer than the peduncle, measured from the orbital margin of the carapace; the outer flagellum reaches to the end of the blade.

The external antennæ are just as long as the body. The scale (Pl. 31. fig. 18), measured along its straight outer margin, appears to be *four-fifths* the length of the carapace, exclusive of the rostrum; it resembles that of *Crangon alaskensis*, but it is only *three times as long as broad*; the end of the blade is rounded, not produced at the antero-internal angle, and much broader than the spine at this level; the spine extends almost as much beyond the blade as the end of the latter is broad. The antennal peduncle extends as far forward as the penultimate joint of the external maxillipeds, which just reach to the end of the blade.

The first pair of feet (fig. 19) are somewhat shorter than the antennal scales, reaching a little beyond the antennal peduncles. The chelæ, which are 5.6 mm. long and 1.5 mm. broad at the base of the spinous pollex, are *a little slenderer* than those of *Cr. alaskensis*, for they are *almost four times as long as broad*; the obliquity of the terminal margin is in both species the same.

The legs of the fifth pair reach as far forward as those of the first.

There is a slender spine on the sternum between the third pair of legs.

The single typical specimen of Ortmann's *Crangon affinis* from Maizuru, Japan, which is lying before me (Ortmann, *l. c.*), seems to belong to this species; the rostrum is, however, a little longer and the process on the outer side of the base of the antennular peduncle reaches almost to the end of the first joint. Ortmann's specimen carries a Bopyrid on the left side of the carapace.

*Crangon affinis*, de Haan, is certainly different. In this species, indeed, the external maxillipeds are longer than the antennal scales, and the latter are *just as long as the carapace*, the rostrum excluded. Nothing is said about the carination of the fifth abdominal segment. Unfortunately de Haan's types do not now exist in the Leyden Museum.

*Crangon propinquus*, Stimpson, differs by the third and the fourth segments being carinate, not the fifth. According to Miss Rathbun\*, the rostrum of this species should exceed the eyes.

#### CRANGON CASSIOPE, de Man. (Pl. 32. figs. 20-25.)

*Crangon cassiope*, de Man, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. 1906, p. 402.

Two egg-laden females from the Inland Sea of Japan, captured in deep water, common on mud.

In its outer appearance *Crangon cassiope* much resembles the typical species of this genus, viz. *Crangon vulgaris*, but it is at once distinguished by the sixth segment of the abdomen, which is *convex, not sulcate, beneath*. This species appears therefore also

\* Rathbun, in Proc. U.S. Nat. Mus. xxvi. 1902, p. 42.

related to *Crangon alba*, Holmes, and *Crangon holmesi*, Rathb., from the North-west coast of North America. From the former it differs, however, at first sight by the blade of the antennal scale which agrees with that of *Crangon vulgaris*; from the latter also by the antennal scale, which measures only two-thirds the length of the carapace, exclusive of the rostrum, while the blade appears, moreover, broader at the extremity than that of *Crangon holmesi*.

The two specimens are nearly of the same size: they are 46.5 mm. and 44 mm. long from tip of rostrum to the end of the telson. In the larger specimen the carapace is 12.5 mm. long, rostrum included, and 11 mm. without it; in the other it is 11.75 mm. long, rostrum included, and 10.5 mm. without it, so that the carapace, rostrum included, is a little longer than one-third the abdomen.

Viewed from above this species *closely resembles Crangon vulgaris*, but the numerous small, dark spots with which carapace and abdomen of the common shrimp are mottled are almost wanting in *Crangon cassiope*. *Small violet spots* are, however, seen on the peduncle and inner flagellum of the inner antennæ, on the antennal scales, on the hepatic region of the carapace between the pterygostomian and hepatic spines, near the posterior margin of the carapace, on the telson and on the uropods.

Even on close inspection the carapace shows no differences from that of *Crangon vulgaris*. The narrow, triangular rostrum is as short in proportion to the eye-peduncles as in that species, the gastric and the two hepatic spines agree also in both. The abdomen, viewed from above, also closely agrees with that of *Crangon vulgaris*; all the seven segments are rounded above, but *neither the sixth nor the seventh shows any tendency to become flattened or grooved*, as is sometimes the case in *Crangon vulgaris*. In the common shrimp the ventral surface of the sixth segment is marked by a moderately deep groove, which usually begins near the anterior margin and more or less gradually widens posteriorly; on the posterior end is a sharp spine, which is directed backward. In *Crangon cassiope*, however, the ventral surface appears *in the middle of the segment rounded and convex*, but the posterior fourth is *slightly concave*, and there is also a short, transverse, though quite shallow pit or depression at one-third of the segment from its anterior margin; instead of a sharp spine one sees in *Crangon cassiope*, at the posterior end, a subacute conical tubercle. On each side of the middle line the ventral surface is punctate; one observes numerous large puncta and between them many others that are quite minute. The two pairs of antennæ *closely resemble* those of *Crangon vulgaris*. The antennal scales (Pl. 32. fig. 20) measure along their outer margin two-thirds the length of the carapace without the rostrum, and they are two and half times as long as broad; the end of the blade (fig. 21) is slightly rounded, makes a distinct angle with the inner margin, and is four times as broad as the adjacent part of the spine, which reaches considerably beyond it. The antennal scales closely resemble those of *Crangon vulgaris* and the outer antennæ are just as long as the body. As regards the inner antennæ, I wish only to observe that the stylocerite is a little shorter than the first joint of the peduncle, and that these antennæ otherwise fully agree with those of the common European shrimp.

The external maxillipeds, which reach to the end of the antennal scales, do not fully

agree with those of a female of *Crangon vulgaris* from this country. Thus the joints of the endopodite are *broader* in proportion to their length. The terminal joint appears in an egg-bearing female of *Crangon vulgaris* of the same size six times, but in the female of *Crangon cassiope* five times as long as broad; the penultimate segment of *Crangon vulgaris* is a little more than four times, that of *Crangon cassiope* a little more than three times as long as broad; the antepenultimate joint, finally, is, in the common shrimp, about four times, but in *Crangon cassiope* three times as long as broad.

The first pair of feet (Pl. 32. fig. 23), which reach nearly to the end of the antennal scales, are *stouter* than those of *vulgaris*; the length of the chelæ is only *two and one-third* times the width measured from the inner base of the immovable spine, in *Crangon vulgaris*, however, *three times*. The obliquity of the anterior margin is in both species the same.

The second legs are also a little less slender than those of the common shrimp. The legs of the fourth pair reach with their dactyli beyond the tip of the antennal peduncles, those of the fifth (fig. 24) are but little shorter; these legs differ especially from those of *Crangon vulgaris* by comparatively *shorter* dactyli (fig. 25) and somewhat *slenderer* propodites. For example, the propodites of the fifth pair in an egg-laden female of *Crangon vulgaris* of the same size as the specimens of *Crangon cassiope* are seven times, but in *cassiope* eight times as long as broad; the dactyli are in *Crangon cassiope* *half as long* as the propodites, but in *Crangon vulgaris* they measure *three-fourths* the length of these joints, appearing thus comparatively *once and a half* as long as in our new species.

The globular eggs are small, diameter 0.45 mm.

### SCLEROCRANGON, G. O. Sars:

#### SCLEROCRANGON ANGUSTICAUDA (de Haan).

*Crangon angusticauda*, de Haan, Fauna Japonica, Crust. 1849, p. 183, tab. 45. fig. 15; Stimpson, in Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 25.

*Sclerocrangon angusticauda*, Ortmann, in Spengel, Zool. Jahrb., Syst. v. 1890, p. 533, and in Proc. Acad. Nat. Sci. Philad. 1895, p. 179.

One egg-laden female from the Inland Sea of Japan.

Length 32 mm. from tip of rostrum to the end of the telson; the carapace, 8.75 mm. long, the rostrum included, measures little more than one-fourth the whole length. Viewed from above, the rostrum, which is as long as broad at its base, appears a little shorter than the eyes; its slightly upturned lateral margins, which in a lateral view of the rostrum appear a little arcuate, curving at first upward and then very slightly downward, converge forward, so that the rostrum appears triangular, with rather obtuse tip. De Haan, however, describes the rostrum as "apice acutum."

The obtuse, flattened, median carinæ of the third to fifth abdominal somites are bounded on each side by a hairy, longitudinal furrow, into which issues the transverse furrow described by de Haan. The sixth segment carries above two obtuse carinæ, which converge backward and are even united for a short distance posteriorly; between the two

carinæ it appears faintly furrowed, and the two carinæ are also bounded externally by a hairy groove.

The external maxillipeds reach with half their terminal joint beyond the antennal scales.

*Geographical Distribution.*—Japan (*de Haan*); Simoda and Hakodadi (*Stimpson*); Kadsiyama (*Ortmann*).

#### LEANDER (Desm.), Stimpson.

##### LEANDER PAUCIDENS (de Haan).

*Palemon paucidens*, de Haan, Fauna Japon., Crust. 1849, p. 170, tab. 45. fig. 11.

*Leander paucidens*, Stimpson, in Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 40.

*Palemon paucidens*, Rathbun, in Proc. U.S. National Museum, xxvi. 1902, p. 51.

*Leander paucidens*, Doflein, Ostasiatische Dekapoden, 1902, p. 640.

Ten specimens, among which are two adult, egg-laden females, from Hakone Lake, Japan, caught in July 1896, 2400 feet above sea.

The two egg-bearing females are respectively 54 and 55 mm. long, the other specimens are all smaller but one. The eggs are not very numerous, *large*, 1.8–2 mm. long and 1.4–1.5 mm. broad.

In five specimens the tip of the rostrum is injured, in the rest it is bifid at extremity; in one the rostrum is broken, two carry five teeth on the upper margin besides the apical tooth, the rest only four; usually the second tooth stands immediately before the frontal border of the carapace, rarely just above it. In two specimens the lower border is armed with three teeth, in six with two, and in one specimen there is only one tooth. In some specimens the rostrum is just as long as the scales, in others it overreaches them a little; in the larger specimens it is slightly upturned at extremity, in the rest it is straight.

In the larger, ova-bearing female, which is 55 mm. long, the external maxillipeds reach a little beyond the antennal peduncle; the legs of the first pair extend to the end of the scales and those of the second reach with their chelæ beyond them, the carpus extending to the end of the scales. The carpus of the second pair is once and a half as long as the chela.

*Geographical Distribution.*—Japan (*de Haan*): near the town of Simoda, in fresh water of a river, not far from the sea (*Stimpson*): Aomori, Rikuoku; Matsushima, Rikuzen; Misaki, Sagami; Lake Biwa, Matsubara, Omi (abundant); Kawatana; Kurume; Nagasaki, Hizen (*Rathbun*): Korea, Fusan; Gensan, brackish streams flowing into the sea (*Rathbun*): Nemuro, Yesso (*Doflein*): Iterup, Kurilen, August (*Doflein*).

##### LEANDER LONGIPES, Ortmann. (Pl. 32. figs. 26–30.)

*Leander longipes*, Ortmann, in Spengel, Zool. Jahrb., Syst. v. 1890, p. 519, Taf. 37. fig. 13.

*Palemon ortmanni*, Rathbun, in Proc. U.S. National Museum, xxvi. 1902, p. 53 footnote.

*Leander longirostris*, de Man, in Notes from the Leyden Museum, iii. 1881, p. 141 (nec *Palemon longirostris*, H. M.-Edw., Hist. Nat. Crust. ii. p. 394 = *styliferus*, H. M.-Edw., *ibidem*, Errata, vol. iii. p. 638, 1840).

One adult egg-laden female from the Inland Sea of Japan. Rare.

As usual, Dr. Ortmann has not indicated the length that this species attains: the present female is 58 mm. long from tip of rostrum to the end of the telson. The carapace is just half as long, viz. 29 mm., the rostrum included, and 11 mm. without it. The slender, elongate rostrum, which reaches with somewhat less than half its length beyond the antennal scales, is strongly recurved and about once and a half as long as the carapace. Different from *Leander pacificus*, Stimps., *L. serratus*, Penn., *L. treillianus*, Risso, and other species, the rostrum is *hardly broadened* at the level of the first tooth of the lower margin, so that it appears stiliform and not emarginate at base. As in Ortmann's typical male specimen from the Sagami Bay, the third tooth is placed immediately before the anterior margin of the carapace, the first two teeth standing upon it; the third tooth is followed by four other teeth, the first six are equidistant, but the seventh, which is placed just on the middle of the upturned part of the rostrum, is a little farther from the sixth than the sixth from the fifth. The seventh tooth is a little smaller than the preceding. As in Ortmann's specimen, there are three apical teeth, which are smaller than the preceding; the first apical tooth, *i. e.* the eighth of the whole series, is as far distant from the second as the third apical tooth from the tip. The first apical tooth is a little farther from the seventh tooth than the seventh from the sixth. The first tooth stands immediately before the middle of the carapace, and the fifth is situated above the distal end of the basal joint of the antennular peduncle. As in the typical male, the lower margin carries eight nearly equidistant teeth, of the same size as those of the upper border; the first is situated just below the fifth, the eighth just below the eighth of the upper margin, *i. e.* the first of the three apical teeth.

As was rightly observed by me in 1881 (*l. c.*), the branchiostegal spine, which is a little remote from the margin of the carapace, is distinctly *smaller* than the antennal. The abdominal segments are rounded. The telson (Pl. 32. fig. 26), once and a half as long as the sixth segment, gradually tapers backward and ends in a sharp tooth; of the lateral spinules the outer, 0.34 mm. long, are a little shorter than the median tooth, but the elongate slender inner spinules are *four times as long* and reach far beyond the latter (fig. 27). There are two pairs of spinules on the upper surface as usual.

The short flagellum, as long as the antennular peduncle, is united *for one-fourth* its length with the outer; 10 or 11 joints are grown together.

The external maxillipeds reach with their terminal joint beyond the antennal peduncle.

The legs of the first pair are as long as the scales; the carpus is almost twice as long as the chela, and the fingers are a little longer than the palm.

The legs of the second pair are unequal, the much longer right leg (fig. 28) reaches as far forward as the rostrum, the other only to the end of the antennal scales. The carpus of the right leg, 5.7 mm. long, is almost as long as the merus (6 mm.); the carpus, 0.5 mm. thick at the proximal end, is 0.92 mm. broad at the distal extremity, here thus twice as thick. The chela, 8.35 mm. long, is almost *once and a half* as long as the carpus, and also longer than the merus. The palm, a little shorter than the fingers, is distinctly *broader* than the distal end of the carpus, and its upper surface is about

three times as long as broad, the palm being 4.1 mm. long and 1.3 mm. broad in the middle. The slender fingers, which shut close together, are 4.25 mm. long; the dactylus carries two, small, equal, obtuse teeth near one another (Pl. 32. figs. 29, 30), the anterior of which is situated at one-fifth the length of the finger from the articulation; just opposite the middle between both teeth the immobile finger carries one single, somewhat smaller, subacute tooth; the finger-tips are strongly curved inward.

The three following legs are very slender: those of the third pair reach with their dactyli beyond the scales, those of the fifth even with one-third of their propodites. The propodites of the fifth pair, e. g., are 8.4 mm. long and 0.32 mm. broad in the middle, twenty-five times as long as broad; they thicken somewhat at the distal end and are beset with a few spines on their distal half. The slender, tapering dactyli of the fifth pair measure little more than one-fourth of the propodites, viz. 2.36 mm.

The very numerous eggs are small, 0.6–0.7 mm. long and 0.45–0.5 mm. broad.

Two specimens, collected near Amoy, China, were (*l. c.*) wrongly referred by me in 1881 to *Leander longirostris* (Milne-Edwards, Hist. Nat. Crust. ii. p. 394): as is proved by the examination of one of them, now lying before me through the kindness of the Direction of the Leyden Museum, they belong in fact to *L. longipes*, Ortm. In 1881 the words of Milne-Edwards's description, "surmonté à sa base d'une crête sexdentée," were misunderstood or overlooked by me. As has been shown by Miss Rathbun, *l. c.* pp. 50 & 51, the species described by Milne-Edwards, *l. c.* p. 394, under the name of *longirostris* should henceforth bear that of *styliferus*, M.-Edw.

In my opinion, however, Miss Rathbun was wrong when creating for *L. longipes*, Ortm., the name *ortmanni*, because this species belongs to the genus *Leander*; de Haan's *longipes*, however, to the genus *Palæmon*. In that case the species mentioned by the learned carcinologist of Washington under the name of *Pal. japonicus* (Ortm.) should also be changed, because a "*Bithynis*" *japonica* has been described by de Haan.

*Geographical Distribution*.—Japan, Sagami Bay (*Ortmann*).

### SPIRONTOCARIS, Sp. Bate.

#### SPIRONTOCARIS RECTIROSTRIS (Stimpson). (Pl. 32. figs. 31–34.)

*Hæppolyte rectirostris*, Stimpson, in Proc. Acad. Nat. Sciences Philadelphia, 1860, p. 33.

*Spirontocaris rectirostris*, de Man, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. 1906, p. 403.

One male and one egg-laden female from the Inland Sea of Japan.

The female, which agrees pretty well with Stimpson's diagnosis, was captured in deep water; as the above were the only specimens caught, it is probably a rare species. Alive, the female was of a Prussian blue, the eggs were orange. The female is 35.5 mm. long from tip of rostrum to end of telson and has a stout shape; the carapace, rostrum included, measures nearly a third the whole length. The rostrum, which arises with an obtuse crest at one-third the length of the carapace from its posterior border, reaches to the end of the antennular peduncle; the free portion, which measures a little more than half the length of the carapace, projects straight forward. The upper margin carries six teeth, three of which are on the carapace, and the first of these stands just before its

middle; the first four are equidistant, the fifth is almost once and a half as long as the fourth, and the sixth is as long as the fifth; the tip of the sixth tooth is three times as far from that of the fifth as from the extremity of the rostrum. The rostrum is a little dilated distally, just below the sixth tooth, and carries here *two* teeth, which are smaller than the first teeth of the upper border; the first is situated just below the middle of the sixth tooth, the second just below its tip, and the tip of the second is a little farther from the extremity of the rostrum than from the tip of the first tooth. According to Stimpson, the lower margin should be armed with *four* teeth. Posterior to the first tooth the lower margin appears slightly concave. Antennal spine short; pterygostomian spinule very small, but distinct.

Abdomen rounded above, geniculate at the third segment, which is slightly produced posteriorly into an obtuse lobe; on either side of the middle the tergum of the third segment carries a faintly impressed, longitudinal line, which runs from the posterior border to a little beyond the middle. The pleura of the fourth segment, which is a little longer than the fifth, ends in a small sharp spinule; the sixth segment, *once and a half as long as the fifth and almost twice as long as broad in the middle*, terminates, as also the fifth, in a sharp tooth at the postero-lateral angles. The tapering telson, which is one-third longer than the sixth segment, is armed on its flattened, upper surface with four pairs of spinules and terminates in a small, sharp tooth; of the two spines on each side the inner are twice as long as the outer, which slightly reach beyond the median tooth. The basal joint of the uropods, which are a little longer than the telson, terminates in a sharp tooth at its postero-external angle.

The eye-peduncles, which carry a distinct ocellus close to the corneæ, reach with the latter beyond the lateral margin of the carapace.

The internal antennæ are little longer than the carapace and extend with half the inner flagellum beyond the antennal scales. Their peduncle is as long as the rostrum and reaches the middle of the antennal scales; the first joint is somewhat longer than the eye-peduncles when they are directed forward, and carries one or two spinules at the distal border of its upper surface; the large and broad stylocerite is acuminate and reaches beyond the middle of the second joint; the second joint, not quite half as long as the first and as broad as long, is armed, at the antero-external angle, with a strong spine, which is directed forward and outward; the terminal joint, finally, is half as long as the second and has a sharp tooth or spine at the distal end of its upper border. The upper flagellum is considerably thickened along three-fourths its length and the filiform terminal part extends beyond the scales. The basal joint of the antennal peduncle carries a slender spine on the distal border of its lower surface; the *straight* outer margin of the scale (Pl. 32. fig. 32), which measures one-seventh the whole length of the body, and is two and a half times as long as broad, terminates in a sharp spine, which reaches a little beyond the rounded or truncate extremity of the laminar portion. The antennal peduncle is as long as that of the inner antennæ, and the flagellum is somewhat shorter than the body.

The external maxillipeds, which are devoid of an exopodite, project with one-third their terminal joint beyond the antennal scales.

The legs of the first pair, which barely reach to the end of the scales, can hardly be described as "graciles," as they were by Stimpson. The merus, 3.1 mm. long, is nearly three times as long as broad and carries on its lower border proximally six or seven small, movable spinules and some plain setæ; the latter are also observed on the lower border of the ischium. The carpus, half as long as the chela, is somewhat excavated distally. The chela is little longer than the merus, and the fingers, which shut close together, measure one-third its whole length. Unfortunately, the right leg of the second pair is wanting, the left reaches to the end of the scales. The carpus, which was not described by Stimpson, is 3 mm. long, and seems to be composed of six joints; the first is a little longer than each of the following and the fifth is the shortest. The chela measures little more than one-third the carpus, and the fingers are half as long as the palm.

The legs of the third pair reach to the end of the scales, the following are a little shorter. The meropodites of the third and fourth pairs (the fifth pair are wanting) carry on their outer surface four or five movable spines, whereas their lower margin, like that of the ischium, is furnished with tufts of setæ.

The three posterior legs are marked with blue rings.

The oblong eggs are very numerous and small, 0.6-0.65 mm. long, 0.4-0.45 mm. broad.

If the other specimen be really the male of *Spiront. rectirostris*, the sexual differences are considerable: Stimpson apparently observed only the female, though he does not mention it. This specimen is 34.5 mm. long from tip of rostrum to the end of the telson, presenting the same size as the female, but the abdomen is less deep and appears therefore *slenderer*. The carapace is 12.5 mm. long, a little longer in proportion to the whole length than in the female. The rostrum, which just reaches beyond the distal end of the antennular peduncles for about 0.75 mm., projecting straight forward, arises more anteriorly than in the female, viz., at one-third the length of the carapace from its frontal border; the upper margin is armed with six teeth, which are of equal size and equidistant, and only two of them are placed upon the carapace. The upper margin appears between the most anterior tooth and the extremity of the rostrum *somewhat convex*, different from the female. As in the latter, the rostrum is dilated and just below the foremost tooth and the lower edge carries here also two teeth, which are much smaller than those of the upper margin; the second of these is as far distant from the tip of the rostrum as from the first. The antennal spine and the pterygostomian spinule agree with those of the female.

The third segment of the abdomen resembles that of the female, but the two impressed lines on the tergum are wanting. The fifth segment appears a little shorter in proportion to the fourth than in the female, the fourth being once and a half as long as the fifth; the sixth segment appears therefore twice as long as the fifth, but it is only once and a half as long as broad. The postero-lateral angles of the fourth, fifth, and sixth segments terminate in a sharp spinule. The telson, almost once and a half as long as the sixth segment, agrees with that of the female, but the four pairs of spinules reach farther backward, so that the most posterior pair is farther from the

penultimate than from the posterior border, whereas in the female the contrary is the case.

The internal antennæ agree with those of the female, and the distal border of the first joint of the peduncle carries a sharp spine near the outer angle, which has the same size as the spine with which the second joint is armed, and the thickened portion of the outer flagellum reaches to the end of the antennal scales. The antennal scales (Pl. 31. fig. 34) are *more elongate* than those of the female; they are 6 mm. long, nearly one-sixth the whole length and a little more than three times as long as broad; the flagellum is as long as the body.

The most prominent difference from the female is exhibited by the external maxillipeds, which are *much longer*. These appendages, 25.5 mm. long, are *twice* as long as the carapace, rostrum included, and *their last two joints* extend beyond the antennal scales; the terminal joint, *just as long as the other joints together*, viz. 12.75 mm., is *much slenderer* than in the female and terminates in one single, brown-coloured, sharp point.

The legs of the first pair resemble those of the female, but they are *much larger*, half their chelæ extending beyond the antennal scales. The lower margin of the merus carries proximally eight small spines, similar to those of the female.

The legs of the second pair extend one-third of their carpus beyond the antennal scales. The merus is not articulate, the carpus is 7-articulate; the third joint is nearly as long as the first and the second taken together, and longer than the others; the sixth is the shortest, the fourth little longer than the fifth; the first, the second, the fifth, and the seventh are nearly the same length. The chela is a little shorter than the last three joints taken together, and the fingers are somewhat shorter than the palm.

The other legs agree with those of the female: the third extend a little beyond the scales; the merus of the third pair carries only three movable spinules on the distal half of its outer surface, that of the fourth only two, that of the fifth only one, near the carpal articulation.

The difference in colour is quite remarkable, for, when caught, the male is *scarlet*.

*Geographical Distribution*.—Hakodadi, in deep water (*Stimpson*).

#### SPIRONTOCARIS PROPUGNATRIX, de Man. (Pl. 32. figs. 35-41.)

*Spirontocaris propugnatrix*, de Man, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. 1906, p. 404.

One specimen from the Inland Sea of Japan, caught at a depth of 6 fathoms; bottom sand, weeds, here and there stones. It was captured together with the specimens of *Spirontocaris pandaloides*, *Stimpson*.

Apparently a new species, distinguished by the *elongate* rostrum and its characteristic toothing. Measured from the tip of the rostrum to the end of the telson, this specimen, which has a *slender* shape, appears to be 33.2 mm. long; the carapace, rostrum included, is 15.2 mm. long, little shorter than the abdomen; without the rostrum, the carapace measures one-seventh the whole length. The rostrum, which is *a little more than twice* (namely  $2\frac{1}{3}$  times) as long as the remainder of the carapace, arises *at one-third* the

length of the carapace from its anterior border; it is *stiliform*, *very little dilated* at the level of the first tooth of the lower margin (Pl. 32. fig. 37), and tapers gradually to the acuminate tip. The upper margin, which is somewhat arched above the eyes, whereas the anterior half is *gently ascending*, is armed with 7 rather low teeth, *two* of which are on the carapace; these teeth, which reach *to the middle* of the free portion, grow gradually somewhat longer, so that the two anterior, which are of equal length, are longer than the preceding. The lower margin is armed with 10 teeth, of which the first is small and situated below the fifth of the upper margin; these ten teeth increase also in length from the first to the last, and reach *to the tip of the rostrum* (fig. 36). *Two-fifths* of the rostrum extend beyond the antennal scales.

Antennal spine small; supraorbital and pterygostomial spines *wanting*.

The abdomen is moderately geniculated, the upper border of the deflexed part making an angle of  $45^\circ$  with the remainder. The third segment is slightly produced into an obtuse lobe posteriorly. The fourth and fifth segments are of *subequal* length; the postero-lateral angle of the fourth is *obtuse*, but that of the fifth terminates in a sharp tooth. The sixth segment (fig. 39), almost twice as long as the fifth, is *twice as long as broad*, and its postero-lateral angle is sharp. The slender telson, almost *one-fourth longer* than the preceding segment, tapers gradually, so that the posterior margin measures but one-fourth its breadth proximally; the posterior margin (fig. 40) ends in the middle in a sharp tooth, and of the two spinules on either side the outer are twice as long as the inner. The upper surface carries four pairs of spinules; the anterior pair are as far from the base of the telson as the posterior pair from the posterior border. The uropods are barely longer than the telson.

There is a distinct ocellus near the cornea, and the rather slender eye-peduncles project their whole terminal joint beyond the carapace when they are directed transversely outward.

The peduncles of the internal antennæ, measuring little more than one-fourth the length of the rostrum, reach not quite to the middle of the antennal scales; the acuminate stylocerite reaches to the distal end of the first joint. The second and third joints are together half as long as the first; the second, which is once and a half as long as thick and twice as long as the third, is armed at its antero-external angle with a strong spine; the thickened outer flagellum reaches to the distal third of the scales, whereas the thin inner flagellum reaches slightly beyond them.

As in other species, there is a spine on the distal border of the lower surface of the basal joint of the outer antennæ. The scales are narrow, elongate, their outer margins straight; the membranous portion (fig. 41), which extends considerably beyond the strong spine, is obliquely truncate. The antennal peduncle reaches as far forward as that of the inner antennæ, the flagellum measures two-thirds the length of the body.

The external maxillipeds are very short, barely reaching to the end of the antennal peduncles; they seem to be devoid of an exopodite and an epipodite.

The legs of the first pair, still shorter, project with their fingers, which are half as long as the palm, beyond the basal joint of the antennal peduncle. The legs of the second pair extend with their chelæ beyond the antennal peduncle. The carpus, once and a half

as long as the merus, is 7-articulate; the joints measure 0.32 mm., 0.22 mm., 0.54 mm., 0.36 mm., 0.3 mm., 0.22 mm., and 0.46 mm.; the second and sixth the shortest, the third the longest. The chela, 0.88 mm. long, is almost as long as the last three carpal joints together, and the fingers measure two-fifths the whole length of the chela.

The following legs are slender. Those of the third pair project nearly with half the propodites beyond the antennal peduncles; the meropodites, eleven times as long as broad, carry on their outer surface a longitudinal row of 8 stout, movable spines, of which the last is inserted near the carpal articulation; the lower margin of the propodites is furnished with 9 movable spinules, which are smaller and thinner than those of the merus; the dactylus carries 6 spines on its lower margin, the last is stouter than the terminal claw, so that the dactylus appears to terminate in two claws. The following legs are gradually shorter; the meropodites of the fourth carry 7, those of the fifth 3 spines.

The nearest allies of *Spiront. propugnatrix* are *Spiront. stylus* (Stimpson), *Spiront. gracilis* (Stimpson), and *Spiront. amabilis*, Lenz (confer Rathbun, 'Decapod Crustaceans of the North-west Coast of North America,' 1904).

SPIRONTOCARIS ALCIMEDE, de Man. (Pl. 32. figs. 42-46.)

*Spirontocaris alcimede*, de Man, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. 1906, p. 404.

Twelve specimens from the Inland Sea of Japan.

Closely related to *Spiront. gracilis* (Stimpson), and *Spiront. flexa*, Rathbun, from the North-west coast of North America, but apparently different.

The largest specimen is 34 mm. long from the tip of the rostrum to the end of the telson; the abdomen, which is *strongly geniculated at a right angle at the third segment*, is almost once and a half as long as the carapace (rostrum included). The slender rostrum, the free part of which is *once and a half* as long as the remainder of the carapace, arises with an obtuse crest *at one-third* of the length of the cephalothorax from its anterior border; it projects at first horizontally forward, but is gently ascending from the anterior tooth of the upper margin and the acuminate extremity just reaches beyond the antennal scales. The upper margin, which is slightly arched above the eyes, is armed with 5, rarely 4, pointed teeth, of which *two always* stand on the carapace; these teeth grow usually a little longer from the first to the anterior, so that they cannot be said to be equidistant. The anterior tooth is situated in the middle of the free part or immediately behind it, so that *the terminal half of the upper margin or somewhat more appears devoid of teeth*; rarely the foremost tooth is situated in front of the middle, in which case the terminal part, devoid of teeth, appears somewhat shorter than the remainder. In front of the foremost tooth the upper limb is very narrow and cannot be followed to the tip. The lower limb (Pl. 32. fig. 43) is *shallow*, convex, as in *Spiront. unalaskensis*, Rathbun, and *Spiront. tridens*, Rathbun, the width of the rostrum at the base of the lower margin being only  $\frac{1}{3}-\frac{1}{2}$  of its whole length. The lower limb, which gradually diminishes anteriorly, is armed with 6, 7, or 8, rarely 9, teeth, which are smaller than those of the upper border, grow usually longer distally and reach

to the tip. The toothling-formulæ of these specimens are the following:— $\frac{2}{7}$  two specimens;  $\frac{2}{5}$  four specimens;  $\frac{2}{7}$  two specimens;  $\frac{2}{5}$  three specimens;  $\frac{2}{9}$  one specimen.

According to the woodcuts in Miss Rathbun's excellent work, the lower limb of the rostrum appears in *Spiront. gracilis*, Stimpson, and *Spiront. flexa*, Rathbun, narrow along its whole length, hardly broader at its base than distally.

There is no supraorbital spine, the outer angle of the orbital margin terminates in a rounded tooth or lobe, and the antennal spine is of moderate length. In most specimens the antero-lateral angle of the carapace is rounded; in two specimens only (Pl. 32. fig. 42) a minute pterygostomian spinule occurs on one side of the body, whereas on the other side the carapace is rounded. The third segment of the strongly geniculated abdomen is produced posteriorly to a somewhat compressed hump or hunch, which is bent at a right, though rounded angle. The lateral sides of the third segment are somewhat punctate, near the posterior border, like the others, but also below the upper margin. The fourth segment, distinctly longer than the fifth, is rounded at the postero-lateral angle, but the fifth ends in a sharp tooth; the sixth segment, which is twice as long or almost twice as long as the fifth, is twice or barely twice as long as broad; its postero-lateral angle terminates in a sharp tooth. The telson, which is but little longer than the sixth segment and somewhat shorter than the uropods, terminates in a sharp tooth, and of the two spinules on either side of it the outer is half as long as the inner. The upper surface (fig. 44) carries 4, more rarely 5, pairs of spinules; in seven specimens there are 4 pairs, in two 5, in two 4 spinules are observed on one side, 5 on the other, and in the last individual the telson has 3 spinules on one side and 4 on the other.

The eye-peduncles, which carry a distinct ocellus close to the cornea, measure a little more than one-fourth the length of the carapace (rostrum excluded). The antennular peduncle (fig. 45) attains to one-third of the antennal scale; the acuminate stylocerite reaches to the distal end of the first joint, but never beyond it; the second joint, much shorter than the first, has a spine at its antero-external angle, and the third, half as long as the second, carries also a spine at the distal end of its upper border; the thickened portion of the outer flagellum reaches, in all the specimens, somewhat beyond the middle of the antennal scale. Antennal scale a little longer than the carapace (rostrum excluded), slender, six times as long as broad, hardly narrowing distally; the outer margin is a little concave, and the distal spine is not nearly so advanced as the membranous portion; there is a slender spine at the distal end of the basal joint at the lower side; the peduncle reaches to the middle of the second joint of the antennular peduncle, and the flagellum is little longer than the body.

The external maxillipeds, though produced a little beyond the antennal peduncle, attain only to one-third of the antennal scale; they are devoid of an exopodite, the upper margin of the antepenultimate joint terminates in a small acute tooth, and the terminal joint carries 7 or 8 brown-coloured teeth at the distal end.

The legs of the first pair extend their fingers beyond the basal joint of the outer antennæ, those of the second reach to the middle of the antennal scales. The joints of

the carpus present in a specimen 32 mm. long the following dimensions, from the first to the last:—0.42 mm., 0.29 mm., 0.73 mm., 0.42 mm., 0.3 mm., 0.26 mm., and 0.52 mm.; the chela is 0.9 mm. long, and the palm is nearly once and a half as long as the fingers. The sixth joint of the carpus, just half as long as the last, is the *shortest*, the third, which is as long as the first and the second together, the *longest*, as in *Spiront. propugnatrix*, and the chela is almost as long as the last three joints taken together.

The third pair reach to the middle of the antennal scale, the following are a little shorter. The meropodites of the third legs, which are ten times as long as broad, carry a row of six spines on their outer surface, of which the last is inserted near the distal end of the lower margin; the lower margin of the propodites is armed with 14 or 15 pairs of spinules, those of the distal half increasing somewhat in length. The dactyli, which measure one-third the length of the propodites, terminate in two claws, of which the posterior is stouter than the other, and, between the former and the articulation, the posterior margin is armed with six movable spines, which slightly increase in length distally. The following legs are a little shorter; the meri of the fourth pair are armed with four, those of the fifth with three spines.

External maxillipeds and thoracic legs seem to be devoid of epipods.

*Spiront. amabilis*, Lenz, of Bare Island (Spengel's Zool. Jahrb., Syst. xiv. 1901, p. 432, pl. 32. figs. 2a & 3), a typical specimen of which was kindly sent me by the Direction of the "Städtisches Museum" at Bremen, differs as follows:—As in *Spiront. alcimede*, the outer angle of the orbital margin ends in a rounded tooth or lobe; in the figure in Lenz's paper it appears erroneously as sharp, and in both species there is, just below this angle, a sharp antennal spine, at the level of the upper border of the basal joint of the outer antennæ. *Spiront. amabilis* carries, however, below this spine, another also sharp tooth, apparently the pterygostomian spine, but this is altogether wanting in *Spiront. alcimede*. The third segment of the abdomen of *Spiront. amabilis* is less strongly curved, the posterior deflexed part is much shorter in proportion to the anterior than in our new species, and not compressed; the sixth has a slenderer shape, being almost three times as long (5 mm.) as broad anteriorly (1.9 mm.), and, according to the figure, the telson should carry six pairs of spinules (in the type specimen the telson is wanting). The carpus of the second legs is 7-jointed, in the figure it appears erroneously 6-jointed; it agrees with that of *Spiront. alcimede*, but the chela is as long as the last four joints taken together. There are, however, still more differences in the tothing of the rostrum, &c. (Concerning this locality, see Note A on page 454.)

#### SPIRONTOCARIS PANDALOIDES (Stimpson). (Pl. 32. figs. 47, 48.)

*Hippolyte pandaloides*, Stimpson, in Proc. Acad. Nat. Sciences Philadelphia, 1860, p. 34.

Seven specimens from the Inland Sea of Japan, captured at a depth of six fathoms, bottom sand and weeds, here and there stones. These prawns are, when alive, brilliant emerald-green, and conform to Stimpson's "color viridis."

The slender fusiform body is moderately geniculated at the third segment of the abdomen, the upper border of the posterior deflexed part making an angle of nearly 45°

with the anterior. Six specimens are of subequal size, their length from the tip of the rostrum to the end of the telson varying between 50 and 56 mm.; the seventh is younger, 38.5 mm. long: the first six specimens are thus a little longer than was indicated by Stimpson, viz. 44 mm. The *slender, stiliform* rostrum is horizontal and straight, or the distal half is slightly turned upward; the free portion of the rostrum is *once and a half* as long as the upper border of the carapace, rarely a little shorter, and *one-fourth or one-fifth* of it extends beyond the antennal scales. The upper margin, which arises with an obtuse carina a little before the middle of the carapace, carries in four adult specimens, in which the rostrum is normally developed, 7, 8, or 9 teeth. These teeth, which are rather small and *two* of which are always (also in the other specimens) situated on the carapace, reach either almost to the middle of the free part or a little beyond it, so that in one specimen the terminal part, which is devoid of teeth, appears a little longer than the rest, whereas in the others the terminal third or a little more appears unarmed. Two or more distal teeth are longer than the preceding; in one specimen they gradually increase in length, but in the others this is not the case, and the longer distal teeth are of equal or unequal length. This species is apparently variable as regards the number and the shape of these teeth. The lower margin is armed, in these four specimens, with 8, 10, or 12 teeth, that reach to the tip; they are partly larger than the teeth of the upper border, and grow also, more or less regularly, longer towards the tip. The basal part of the lower margin, posterior to the first tooth, is nearly straight. In these four specimens the tothing-formulæ are therefore:  $\frac{3}{7}, \frac{3}{8}, \frac{3}{8}$ , and  $\frac{3}{12}$ ; in two others, in which the rostrum is apparently not well developed, reaching not or barely beyond the antennal scales, the formulæ are:  $\frac{3}{7}$  and  $\frac{3}{9}$ ; in the young specimen, finally, it is  $\frac{3}{9}$ . Stimpson mentions  $\frac{10-12}{10}$  as the tothing-formula, but in not one of our specimens do ten or twelve teeth occur on the upper border. Neither the upper nor the lower margin of the rostrum is ciliated.

Carapace and abdomen are smooth, though finely punctate. Antennal tooth slender, reaching to the middle of the basal joint of the outer antennæ; antero-lateral angle rounded, *devoid* of a pterygostomian spinule. Abdomen rounded, the third segment moderately produced backward in an obtuse lobe. The pleuræ of the third segment are rounded posteriorly, those of the fourth are obtuse, but the fifth are produced, at the postero-lateral angle, in a sharp spine. Measured along its upper border, the sixth segment appears almost twice as long as the fifth, resembling that of *Spirontocaris stylus* (Stimps.) (*cf.* Rathbun, 'Decapod Crustaceans of the North-west Coast of North America,' 1904, p. 84). The sixth segment, the lower surface of which is rounded, and the postero-lateral angles of which terminate in a sharp tooth, is just twice as long as broad in the middle. The telson, which is a little longer than the sixth segment and a little more than four times as long as broad at its base, tapers rather strongly; its rounded upper surface, armed, according to Stimpson, with 6 pairs of spinules, carries in the six adult specimens 5 pairs, though in one of them there are 6 spinules on the left and 5 on the right side; the telson of the young individual has but 4 pairs. The telson

terminates in a sharp tooth and carries two spinules on either side, of which the inner are twice as long as the outer.

The eye-peduncles, which present a distinct ocellus near the cornea, project almost entirely beyond the antero-lateral angle of the carapace, when directed transversely outward, and reach to the distal fifth of the first joint of the antennular peduncle.

The inner antennæ barely reach with their thin filiform, inner flagellum beyond the end of the antennal scales. The first joint of the peduncle, which is not quite half as long as the antennal scales, is three times as long as the second; the pointed stylocerite, the outer margin of which is straight, extends barely beyond the distal end of the first joint. The second joint, the outer border of which terminates distally in a small sharp tooth or spine, appears once and a half as long as broad when viewed from above, and twice as long as the third joint, which has also a small sharp tooth at the distal end. The shorter outer flagellum is considerably thickened along two-thirds of its length and beset with olfactory setæ.

The basal joint of the peduncle of the outer antennæ carries a small spine at the distal border of its lower surface. The blade of the scale, which is five times as long as broad, and the outer margin of which is straight, exceeds the small spine considerably by its rounded antero-internal angle. The peduncle reaches nearly to the distal end of the second joint of that of the inner antennæ, and the flagellum is about as long as the abdomen.

The mandibles are typical, and consist of a strong molar-process, an incisor-process, and a palp. The molar-process carries at the distal end a subacute conical tooth and another that is more obtuse; the distal end is yellow-coloured and thickly covered with short setulæ or bristles. The incisor-process, almost as long as the molar-process, but much narrower, tooth-like, narrows somewhat towards the distal extremity, which is divided into four acute teeth, the outer one of which is a little larger than the three others, which are of equal size; both processes are not connected and make a right angle with one another. The palp that originates at the base of the incisor-process is two-jointed; the terminal joint, as long as the other, is 0.45 mm. long, spathulate; its margins are fringed with pubescent setæ, a few of which occur also on the basal joint.

The external maxillipeds are short, reaching only to the distal end of the antennal peduncle, and are devoid of an exopodite; the antepenultimate joint is deeply hollowed out along the proximal half of its lower surface, and the penultimate is half as long as the terminal joint, which is armed with six sharp teeth at the distal end.

The legs of the first pair are very short, reaching only to the distal end of the basal joint of the antennal peduncle. The carpus, which slightly thickens distally, is a little shorter than the merus and than the chela; the fingers are about half as long as the palm; the dactylus terminates in two dark-brown claws, the fixed finger in one. The second legs (Pl. 32. fig. 48) barely reach beyond the antennal peduncle. The seven joints of the carpus, which is 4.24 mm. long, not yet twice as long as the merus, are, from the proximal to the distal end, respectively 0.65 mm., 0.38 mm., 1.02 mm., 0.7 mm., 0.5 mm., 0.34 mm., and 0.65 mm. long; the chela is 1.22 mm. long, the fingers 0.52 mm. These numbers show that the first and the seventh joints are equally long, that the

second and sixth are subequal, that the third is the longest and the sixth the shortest. The chela is almost twice as long as the last joint of the carpus, and the fingers are a little shorter than the palm.

The legs of the third pair reach to the end of the antennal peduncle, those of the fifth little beyond the anterior border of the carapace. The merus of the third legs is armed on its outer surface near the lower margin with 7 spines, that of the fourth with 6, that of the last pair with 3.

*Geographical Distribution.*—Hakodadi, Japan (*Stimpson*).

### LATREUTES, Stimpson.

#### LATREUTES PLANIROSTRIS (de Haan).

*Cyclorhynchus planirostris*, de Haan, Fauna Japonica, Crust. 1849, p. 175, tab. 45. fig. 7.

*Rhynchocyclus planirostris*, Miers, in Proc. Zool. Soc. 1879, p. 55.

*Latreutes planirostris*, Ortmann, in Spengel, Zool. Jahrb., Syst. v. 1890, p. 505, Taf. 37. figs. 4 *d-l*, 4 *n*.

*Platybema planirostre*, Rathbun, in Proc. U.S. Nat. Mus. vol. xxvi. 1902, p. 46.

One egg-bearing female from the Inland Sea of Japan; rare.

This specimen fully agrees with the ova-bearing females described by Miss Rathbun (*l. c.*). It is 28 mm. long from the tip of the rostrum to the end of the telson. The sixth abdominal segment is not quite twice as long as the fifth, and the telson is about once and a half as long as the latter. The carpus of the legs of the first pair is not carinate above. The legs of the second pair extend with their chela beyond the distal end of the antennal peduncles; the first joint is slightly longer than the third and both together are almost as long as the second; the chela, which is a little less broad than the distal extremity of the carpus, is little shorter than the second joint, and the fingers are distinctly shorter than the palm.

*Geographical Distribution.*—Japan (*de Haan*); Hakodate and North Coast of Nippon, 10–20 fathoms (*Stimpson*); Cape Sima, Nippon, 18 fathoms (*Miers*); Bay of Tokyo and Kagoshima, Japan (*Ortmann*); Hakodate, Hokkaido (*Rathbun*).

#### LATREUTES ACICULARIS, Ortmann.

*Latreutes acicularis*, Ortmann, in Spengel, Zool. Jahrb., Syst. v. 1890, p. 506, Taf. 37. figs. 6, 6 *d-k*, 6 *n*.

*Latreutes acicularis*, Doflein, Ostasiatische Dekapoden, 1902, p. 638.

One ova-bearing female from the Inland Sea of Japan; deep water.

This specimen is 31 mm. long from the acute tip of the rostrum to the end of the telson, the carapace (rostrum included) being just half as long. The rostrum, which is one-third longer than the carapace, is unarmed above, except a minute spinule on the carapace, just behind the frontal border; it exceeds the antennal scales by one-third of its length. That part of the rostrum which is situated above the lateral carinæ is low and barely diminishes in height towards the tip; its upper margin is straight. The lower part of the rostrum is proximally about three times as high as the upper and gradually narrows towards the tip; it is armed near the latter with three sharp teeth.

Antennal tooth small. Along the distal end of the lower border of the carapace seven slender spines are observed, which diminish a little in length backward, and the foremost

of them is placed at the pterygostomian angle. The tapering telson terminates in a long slender tooth, which makes distinct angles with the posterior margin, and this margin is little broader than the tooth is long; of the two movable spines on either side the inner is three times as long as the outer and extends much beyond the median tooth. The rounded, upper surface of the telson carries two pairs of small spinules, the anterior pair somewhat nearer to the proximal than to the distal extremity.

External maxillipeds short, barely reaching beyond the insertion of the antennal peduncles. Fingers of the first pair of legs shorter than the palm, the latter a little thicker than the carpus. The first joint of the carpus of the second legs is about once and a half as long as the third, and both are a little longer than the second, which is twice as long as the third; the chela is just as long as the first and the third carpal joints taken together, the fingers being a little longer than the palm. The three other legs are slender and a little setose. The meropodites are armed with a sharp tooth near the distal end of their lower margin; the propodites carry six or seven movable spinules along the lower edge, which gradually grow longer and stronger towards the distal end; the slender dactyli, measuring a little more than one-third of the propodites, terminate in two strong claws, which are preceded on their lower margin by six movable spinules that diminish in length towards the articulation. So the meropodites of the fifth pair are 1.4 mm. long and six times as long as broad; the carpopodites are a little more than half as long as the meropodites, the propodites as long as the meropodites, but nine times as long as broad in the middle; the dactyli, finally, are 0.56 mm. long, measuring a little more than one-third of the propodites.

The ova are numerous, small, 0.5 mm. long, and once and a half as long as broad.

*Geographical Distribution.*—Japan, Kadsiyama (*Ortmann*); Hakodate, Yokohama (*Doflein*).

#### LATREUTES LAMINIROSTRIS, *Ortmann*.

*Latreutes laminirostris*, *Ortmann*, in *Spengel, Zool. Jahrb., Syst. v. 1890, p. 506.*

One egg-laden female from the Inland Sea of Japan; deep water.

As usual, *Dr. Ortmann* has not mentioned, in the work referred to, the length attained by this remarkable species: the present female is 53 mm. long from the tip of the rostrum to the end of the telson. The rostrum (14 mm.) is one-fourth longer than the carapace (11 mm.). The tapering central axis of the rostrum runs at first straight forward, then slightly upward, whereas the pointed tip is again curved downward. That part of the rostrum which is situated above the central axis, and which is much lower than the inferior part, is slightly arched and carries six small acute equal teeth, four equidistant on the middle and two midway between them and the tip. *Ortmann's* typical specimen, also a female, was armed with nine teeth above. The lower edge carries seven much smaller teeth nearly of the same length, of which the first is situated midway between the distal end of the antennular peduncle and the first tooth of the upper edge; the inferior edge regularly curves, posteriorly, upward toward the central axis. The small spine on the carapace, which is a little larger than the upper teeth of the rostrum, is placed once and a half as far from the posterior border of the carapace as from the first tooth of the upper edge.

The short eye-peduncles do not quite reach the extremity of the first joint of the antennular peduncle; there is a sharp, forwardly directed spine on the upper side of this extremity. Six sharp teeth or spinules occur at the pterygostomial angle of the carapace, and there is a small antennal spine just below the orbits.

The sixth segment of the abdomen is almost twice as long as the fifth, but a little shorter than the tapering telson, which is 7 mm. long; the postero-lateral angles are acute. The telson, which is rounded above, carries two pairs of minute spinules, which were overlooked by Ortmann; the anterior pair a little nearer to the proximal than to the distal extremity, the posterior a little nearer to the latter than to the anterior pair. The tip of the telson is not truncate ("abgestutzt"), as is said in the original description, but it ends in a sharp tooth, on either side of which are inserted, as usual, two movable spines, of which the outer is just as long as the median tooth, the inner twice as long. The lateral swimmerets are a little shorter than the telson.

The short external maxillipeds reach as far forward as the eye-peduncles. The second joint of the carpus of the second legs is twice as long as the first, the third appears a little shorter than the first; the chela is nearly as long as the second joint, the fingers slightly shorter than the palm.

Eggs very numerous, small.

This specimen is of a pale greenish colour, the gastric region more yellowish brown.

*Geographical Distribution.*—Japan, Tanagava (Ortmann).

### HIPPOLYSMATA, Stimpson.

#### HIPPOLYSMATA VITTATA, Stimpson. (Pl. 33. figs. 49, 50.)

*Hippolysmata vittata*, Stimpson, in Proc. Acad. Nat. Sciences Philadelphia, 1860, p. 26.

*Hippolysmata vittata*, var. *subtilis*, Thallwitz, Decapoden-Studien, 1891, p. 22.

*Nauticarisc unirecedens*, Spence Bate, Report on the 'Challenger' Macrura, 1888, p. 608, pl. 110. fig. 1.

Nec *Hippolysmata vittata*, var., de Man, in Archiv f. Naturg. 53 Jahrg. 1888, p. 494.

Two egg-bearing females and one young specimen from the Inland Sea of Japan.

Dr. W. T. Calman, of the British Museum, was so kind as to examine for me the single typical specimen (♀) of *Nauticarisc unirecedens*, Sp. Bate, from Hong Kong, and concluded that this species ought to be considered *identical* with *Hippolysmata vittata*, Stimps., from the same locality; this was also my supposition. "The type specimen of *Nauticarisc unirecedens*," so wrote Dr. Calman to me, "is a little larger than is stated by Spence Bate. I think it would measure about 29 mm. in length, but I cannot attempt to straighten it for fear of damage. The postero-lateral angle of the fifth abdominal segment is distinctly more produced and more acute than in the original figure. The sixth segment is longer than the fifth (about 26:20). The flagella of the antennules are wanting, and I cannot even find any fragments of them in the bottle. There are no arthrobranchiæ on the peræopods, but there are epipods on all except the last pair. I have compared the specimen with Stimpson's description of *Hippolysmata vittata*, and I think it very likely, as you suggest, that it is the same species. At all events, I cannot find any character which distinctly contradicts this supposition."

The two egg-bearing females are respectively 33 mm. and 32 mm. long from the tip of the rostrum to the end of the telson, the carapace of the former being 12 mm. long, of the other 11.5 mm. ; the young specimen is 22.5 mm. long, the carapace 8 mm. The carapace, rostrum included, measures little more than one-third of the whole length. The rostrum of the two larger specimens reaches to the distal end of the second joint of the antennular peduncle, that of the youngest individual little beyond the middle of that joint. In the largest specimen the tothing-formula of the rostrum, which closely resembles fig. 1 of plate 110 of the 'Challenger' Report, is  $\frac{7}{4}$ ; the first tooth, twice as far distant from the second as the second from the third, is little larger than the second, but the difference is not so great as on that figure. The distance of the first tooth from the frontal border is *a little more than one-third* the length of the carapace (rostrum excluded); two teeth are on the cephalothorax, the third is placed above the frontal margin. The foremost tooth is as far distant from the penultimate as from the pointed tip, which is situated on a somewhat lower level than the upper border of the carapace. The four teeth of the lower margin occur on its distal half and are considerably smaller than the upper ones; the first is situated just below the middle of the penultimate tooth of the upper border, the foremost tooth midway between the tip and the foremost one of the upper margin. In the other ova-bearing specimen the tothing-formula is  $\frac{8}{4}$ , just as in the 'Challenger' specimen of *Nauticarid unirecedens*, and three teeth are on the carapace, the fourth immediately before the frontal border; the foremost tooth is once and a half as far distant from the tip as from the penultimate tooth. Of the four small teeth of the lower margin, the first is situated just below the base of the foremost tooth of the upper margin, the two anterior in front of it. Except the first, the teeth of the upper border are equidistant, like those of the lower margin.

The rostrum of the youngest specimen shows the formula  $\frac{6}{4}$ ; two teeth are on the carapace, the third above the frontal border; the foremost tooth of the upper margin is a little farther from the tip than from the penultimate; of the four very small teeth of the lower margin, the first and the second are situated below the foremost tooth of the upper margin, the third and the fourth in front of it. In this youngest individual the tip of the rostrum is situated at the same level as the upper surface of the carapace. The slender antennal tooth reaches the cornea of the eye-peduncles; the pterygostomial spinule is small and sharp, though distinct in the three specimens.

The abdomen is rounded and smooth. The postero-lateral angle of the fifth segment terminates in a sharp point, much sharper than it appears in the quoted figure 1 of the 'Challenger' Report. The sixth segment is *once and a half* as long as the fifth; in Spence Bate's figure it appears shorter than the fifth, but, as is shown above, this figure is inaccurate. The postero-lateral angle of the sixth segment is acute, but not movable. The telson, which is not quite twice as long as the sixth segment, tapers posteriorly to the obtuse posterior border, which is in the middle acute and which, fringed, like the lateral margins, with ciliated setæ, carries on either side two movable spinules, of which the inner are much longer than the outer. The somewhat flattened upper surface carries

two pairs of spinules. The uropods are little longer than the telson and carry no movable spine at base.

The stout eye-peduncles reach a little beyond the middle of the first joint of the antennular peduncle. The internal antennæ are, in the largest specimen, 38 mm. long, *a little longer than the body*; the peduncle agrees with Spence Bate's description and figure of *Nautic. unirecedens*; the sharp-pointed basal spine or stylocerite reaches barely beyond the eye-peduncles; the second joint is half as long as the first and twice as long as broad, the third half as long as the second. The two flagella, however, which are *just as long as the body*, do not agree with the figure in the 'Challenger' Report, nothing is said about them in the text, and, as is shown above, they are lost in the type specimen in the British Museum. I suppose, however, that they have been wrongly figured in the Report. These flagella are of equal length, *filiform*, but the outer one is slightly thickened at its base for a short distance (4.5 mm.), which is a little shorter than the peduncle, and this thickened part is beset with olfactory setæ.

The outer antennæ are as long as the inner; the basal joint of the peduncle, which reaches midway between the tip of the eye-peduncles and the distal end of the first joint of the antennular peduncle, carries a small spine at its outer angle; the flagella, 36 mm. long in the adult females, are a little longer than the body. The antennal scales barely narrow distally, and the small spine which terminates the slightly concave outer margin reaches barely beyond the truncate tip.

The pediform external maxillipeds project with half their terminal joint beyond the antennal scales; the exopodite reaches a little beyond the middle of the antepenultimate joint.

The legs of the first pair extend to the extremity of the antennal scales. The carpus is, in the adult, a little shorter than the chelæ, but slightly longer than the palm, that is once and a half as long as the fingers; the latter gape a little along their proximal half. The elongate, filiform legs of the second pair project with their small chela and the last joint of their carpus beyond the distal extremity of the basal thickened part of the outer antennular flagella. The carpus is composed of 22 joints; the penultimate joint is 0.3 mm. long, those in the middle are slightly longer, viz. 0.36 mm., and the last joint is twice as long as the penultimate. The chela, 1.22 mm. long, is twice as long as the last joint of the carpus, and the palm is a little longer than the fingers.

The three other legs apparently agree with those of the 'Challenger' specimen of *Nautic. unirecedens*. The meri carry on their outer surface a few movable spinules, those of the third pair, *e. g.*, five; the propodites carry similar spinules along their posterior margin in two rows, those of the third legs seven pairs; the dactyli, finally, measure, in the legs of the third pair, one-fourth of the propodites and are armed with six spines along their posterior margin, which gradually increase in length, the last being the terminal claw.

The eggs are very numerous, ovate, 0.6 mm. long and 0.4 mm. broad.

I am indebted to Prof. Heller, of Dresden, for having been enabled to examine the single type specimen of Thallwitz's variety *subtilis* from Cebu: it proved to differ from our specimens only *by its smaller size*.

One of the five specimens described (Archiv f. Naturg. liii. p. 494) by me in 1888 as a variety *amboinensis*, and which were collected by Dr. Brock at Amboina, is lying before me. It proves now to be a *different* species from *Hipp. vittata*, Stimps., and it may henceforth bear the name of *Hippolysmata amboinensis*. The whole animal has a *slenderer* appearance. The rostrum, the free part of which is almost as long as the carapace, has a *much slenderer* form than that of *Hipp. vittata*, and the first tooth of the upper margin is situated *at one-fourth* the length of the carapace from its frontal border. The sixth segment of the abdomen is *more elongate, almost twice as long as the fifth, and barely shorter than the telson*. The peduncles of the inner antennæ and the antennal scales are *more elongate, slenderer*, and the stylocerite is shorter than the eyes, rudimentary. The legs are also *slenderer*. A more detailed description will be published hereafter.

The following remarks about the single type specimen of *Merhippolyte orientalis*, Sp. Bate, captured by the 'Challenger' Expedition at a depth of 800 fathoms off New Guinea, will, I think, be welcome. Dr. Calman wrote me about it as follows:—"With regard to *Merhippolyte orientalis*, I am sorry that I cannot give you many details. The type specimen is in such an extremely bad state that no one except Mr. Spence Bate would have thought for a moment of describing it as a new species! I attempted to make a sketch of the rostrum etc., but I thought it was not worth the trouble. The eye-peduncles are *shorter* than the first segment of the antennular peduncle, probably not more than two-thirds of its length, though on account of the membranous consistency of all the parts it is difficult to form an idea of the exact proportions. There is a well-marked pterygostomial spinule on the carapace. The mandible has an incisor-process and a three-segmented palp. There are apparently arthrobranchiæ on the peræopods. All the peræopods are wanting. I doubt very much whether it would ever be possible to recognize the species again."

According to Calman's latest paper on the Hippolytidæ (Ann. Mag. Nat. Hist. ser. 7, vol. xvii. January 1906, p. 30), this species seems to be indeed a *Merhippolyte*.

Another species, which was described by me in 1892 and in 1902 under the name of *Merhippolyte orientalis* (in Max Weber's 'Decapoden des Indischen Archipels,' p. 407, and in Abhandl. Senckenb. naturforsch. Gesellschaft, Bd. xxv. p. 849), is certainly different from that deep-sea species of the 'Challenger' Expedition; it is also different from *Hippolysmata vittata* and *Hippolysmata amboinensis*, and may henceforth bear the name of *Hippolysmata kükenhali*, with some doubt as regards the genus, because the mandible was not examined by me.

*Geographical Distribution of Hippolysmata vittata, Stimps.*—Hongkong (*Stimpson* and *Spence Bate*); Cebu (*Thallwitz*); Pulau Bidan, Penang (*Lanchester*).

## ALPHEUS, Fabr.

## ALPHEUS BREVIROSTRIS (Olivier). (Pl. 33. figs. 51, 52.)

*Palaemon brevirostris*, Olivier, in Encyclop. Méthod. t. viii. 1789, p. 664, pl. 319. fig. 4.

*Alpheus brevirostris*, Milne-Edwards, Hist. Nat. Crust. ii. 1837, p. 350.

*Alpheus rapax*, de Haan, Fauna Japonica, Crust. 1849, p. 177, tab. 45. fig. 2.

*Alpheus rapax*, de Man, in Max Weber's Zool. Ergebnisse, 1892, ii. p. 404.

Two egg-bearing females from the Inland Sea of Japan, deep water.

Before describing these two specimens, I wish to make some synonymical remarks about the species of the "*brevirostris*" section of this genus, to which section the two females doubtless belong.

In his great work 'Les Alpheidæ : Morphologie externe et interne etc.,' Ann. Sc. Nat., Zool. 8<sup>e</sup> sér. t. ix. 1899, p. 14, Prof. Coutière writes:—"Il convient d'identifier *A. malabaricus*, de Haan, avec *A. rapax*, Fabricius (?), Spence Bate." In my opinion this identification is erroneous, and de Haan's *A. malabaricus* ought to be regarded as a proper species that henceforth may bear the name of *brevicristatus*, under which name this species has been figured by the author of the 'Fauna Japonica.' Before me are lying a typical specimen of *A. malabaricus*, de Haan, and another of *A. rapax*, de Haan, both from de Haan's typical collection in the Leyden Museum, both specimens in a dry state. Through the kindness of Prof. Döderlein, of Strassburg, I received also four specimens of an *Alpheus* from the Bay of Tokyo, described by Dr. Ortman under the name of *A. malabaricus* (in Zool. Jahrb., Syst. v. 1890, p. 481), and two, also from that Bay, of Ortman's *A. rapax* (l. c. p. 481). The examination of these specimens proved that Ortman's *A. malabaricus* is really the same species as that which was described by de Haan under this name and figured under the name of *A. brevicristatus*; and furthermore that this species is no doubt *different* from Spence Bate's *A. rapax* (Report on the 'Challenger' Macrura, p. 552, pl. 99. fig. 1). The rostrum of *A. malabaricus* passes backward into a carina which is subacute and strongly compressed between the eyes, but which soon broadens behind the corneæ and becoming obtuse and rounded passes into the surface of the gastric region; its shape is therefore characteristic. The second joint of the antennular peduncle of Spence Bate's *A. rapax* is described as three times as long as the first, but in his fig. 1 c it appears little more than twice as long; the peduncle resembles therefore that of de Haan's *malabaricus*. In de Haan's *A. malabaricus* the antennal scale barely extends beyond the antennular peduncle, whereas in the fig. 1 c of the 'Challenger' Report it reaches much beyond it. The telson of *A. brevicristatus* appears broader in proportion to its length, and the spinules of the posterior pair are situated closer together than those of the anterior, whereas this is not the case in fig. 1 z.

Not only the chelipeds, but also the four other legs, present a *slenderer shape* than those of *A. brevicristatus*. In both chelipeds the upper border of the merus is *obtuse* and *quite unarmed*, but in Spence Bate's *A. rapax* the upper margin ends in a sharp tooth. In the latter species the upper margin of the larger chela carries *no trace* of the transverse

furrow near the articulation of the dactylus characteristic of *Alpheus brevicristatus*, and the carinæ on the outer surface of the palm are neither described nor figured in the 'Challenger' Report. The dactylus of the smaller chela of *A. brevicristatus* has a slenderer form. These two species are therefore certainly different.

It is on the authority of Coutière, who has compared the type of *A. brevirostris*, Oliv., with the Leyden type of de Haan's *A. rapax*, that these two species are considered also now by me as identical, though I may observe that in de Haan's *A. rapax* the upper border of the larger chela presents *no trace* at all of the transverse groove near the articulation of the dactylus which is characteristic of *A. brevirostris* (*vide* Coutière, *l. c.* p. 230, fig. 281, and in Bull. Soc. Entom. France, 1898, p. 250, fig. 1), and that the antennal scale reaches barely or not beyond the antennular peduncle. In my opinion it would be preferable to consider *A. rapax* of Fabricius as *identical* with *A. brevirostris*, Oliv., for Fabricius's description is fully applicable to the latter. The two specimens, apparently both males, of *A. rapax*, received from the Museum of Strassburg, seem at first sight to belong to two different species. The larger specimen, which is 65 mm. long from the tip of the rostrum to the end of the telson, fully agrees with the Leyden type of *A. rapax*, de Haan, and ought thus to be referred to *A. brevirostris*, Oliv. The other specimen, however, 55 mm. long, belongs perhaps to that species which has been described and figured by Spence Bate under the name of *A. rapax* (*l. c.* p. 552, pl. 99, fig. 1). It fully agrees with it, except the antennal scale, which, though a little longer than the peduncles of the outer and inner antennæ, has a less slender shape, being proximally broader in proportion to its length, whereas the terminal spine barely reaches beyond the tip of the scale. As regards the shape of the antennal scale and the peduncles of both pairs of antennæ, this specimen agrees with that of *A. brevirostris*, except that in the latter the antennal peduncle extends a little beyond the tip of the scale. The rostral carina, acute and strongly compressed between the eyes, does not reach so far backward as in the other older specimen, but fades away soon behind the eyes. All the legs are *a little slenderer* than in the specimen of *A. brevirostris*. Both the larger and the smaller chela *closely resemble* those of Spence Bate's *A. rapax*. The larger chela is 29 mm. long and 8.75 mm. broad, the palm being 17.5 mm. long, the fingers 11.5 mm.; the smaller chela is 28 mm. long, the fingers three times as long as the palm, and the greatest breadth of the chela, about in the middle, is almost one-fourth of its length. The fact that the fingers are longer in proportion to the length of the palm than in the 'Challenger' species may be explained by the larger size of our specimen. Ortmann referred both specimens to *A. rapax*, de Haan = *brevirostris*, Oliv. (*teste* Coutière); perhaps he will eventually prove to be right, if the length of the fingers of the smaller chela of *A. brevirostris* is shown to be so very variable.

The two egg-laden females from the Inland Sea of Japan are of equal size, adult, 55 mm. long from the tip of the rostrum to the end of the telson. The rostrum reaches in one female almost to the distal end of the first joint of the antennular peduncle, in the other only to the middle of this joint; it passes into a carina, which between the eyes is sharp, strongly compressed; the upper edge, between the eyes slightly concave, runs obliquely upward and, reaching the upper surface of the carapace, becomes obtuse, even

a little flattened, and gradually fades away about on the middle of the cephalothorax. The surface of the latter is punctate, the puncta being larger posteriorly.

The telson, 7.5 mm. long and 4 mm. broad at its base, resembles that of the 'Challenger' *rapax*, but the spinules of the posterior pair stand closer together. The lateral swimmerets extend a little beyond it. The second joint of the antennular peduncle is in one specimen twice, in the other almost twice, as long as the first and almost three times as long as the third; the flattened stylocerite ends in a sharp spinule which reaches to the extremity of the first joint of the peduncle. The antennal scale, slightly longer than the antennular peduncle, has the same form as in the adult male from Strassburg; it has a much stouter shape than that of Spence Bate's *rapax*-specimen, the scale being 7 mm. long and 2.75 mm. broad proximally; the terminal spine barely reaches beyond the tip of the scale and its outer margin is slightly concave. The antennal peduncles, reaching only to the middle of the third joint of the inner antennæ, are shorter than the scales, whereas in the adult male from the Strassburg Museum they reach a little beyond them. The external maxillipeds reach to the end of the antennal scales.

In one specimen the larger cheliped is placed on the right side, in the other on the left. The larger cheliped resembles that of the 'Challenger' specimen of *A. rapax* (*l. c.* pl. 99, fig. 1 *k*). The upper border of the merus terminates in a sharp tooth, the rather sharp infero-internal edge is beset with very small teeth and ends in a much stronger pointed tooth. The chela is in one specimen 20 mm. long and 5.5 mm. broad, the fingers being 7.4 mm. long. The larger chela of the other female is 17 mm. long, 5.4 mm. broad, the fingers 7.25 mm. long. The outer and the inner surfaces of the larger chela are finely granulated, except the distal half of the fingers which is smooth; the outer surface of the fixed finger is slightly concave, that of the palm presents no trace of carinæ; the two carinæ on the upper border are distinct, the inner, fringed with long hairs and continued to the carpal articulation, more than the outer, which fades away nearly on the middle of the palm. The lower edge of the chela is also fringed with hairs internally, from the carpal articulation to the tip of the immobile finger, and the hairs along the upper border are continued to the tip of the dactylus.

The smaller cheliped (Pl. 33, figs. 51, 52) also much resembles that of the 'Challenger' *rapax*-specimen, but the immobile finger is distinctly broader at its base than the dactylus, whereas in fig. 1 of pl. 99 the dactylus appears broader than the immobile finger. The merus, as slender as on that figure, is armed with the same teeth as that of the larger cheliped. The chela is strongly compressed. In the larger female it is 17.25 mm. long, the palm 6.25 mm. long and 3.5 mm. broad; in the other specimen these numbers are 14.5 mm., 5.5 mm., and 3.7 mm. The fingers gape a little and are compressed, especially the immobile, which at its flattened base is *distinctly broader* than the dactylus, whereas both taper towards the pointed, crossing tips; their inner edges are hairy. The upper and lower borders of the chela of the dactylus are fringed with long hairs on their inner side.

The four following legs closely resemble those of the older specimen, 65 mm. long, of Ortmann's *A. rapax* from the Bay of Tokyo, mentioned above. The second joint of the carpus of the second legs is 4 mm. long, *a little longer* than the first (3.5 mm.). The

meri of the third pair are 10·25 mm. long and 1·9 mm. broad,  $5\frac{1}{2}$  times as long as broad; those of the fourth pair are 7·5 mm. long and 1·75 mm. broad; those of the fifth are 6·75 mm. long and 1 mm. broad.

The ova are very numerous and small, 0·6–0·62 mm. long and somewhat less broad.

The red upper surface of the body is marked with symmetrically arranged spots and striæ of a white colour, but the fourth segment of the abdomen is adorned on either side with a *dark red-brown spot*, which is quite characteristic. The red inner surface of the larger chela with a few large white flecks near the upper and lower borders; similar flecks occur also on the inner surface of the palm of the smaller chela, and its fingers are almost entirely white.

The ova-bearing female from the river near Pare-Pare, Celebes (de Man, in Weber, Zool. Ergebn. 1892, ii. p. 404), was also examined by me, and seemed to belong to the same species as the two females from the Inland Sea of Japan. Its size is a little smaller, the upper surface of the telson is a little more rounded, and, in consequence of its smaller size, the rostral crest is not continued so far backward; but otherwise there are no differences.

#### ALPHEUS JAPONICUS, Miers. (Pl. 33. fig. 53.)

*Alpheus japonicus*, Miers, in Proc. Zool. Soc. 1879, p. 53.

*Alpheus japonicus*, Ortmann, in Spengel, Zool. Jahrb., Syst. v. 1890, p. 476, Taf. 36. fig. 14.

*Alpheus longimanus*, Spence Bate, Report on the 'Challenger' Macrura, 1888, p. 551, pl. 98. fig. 4.

Two males from the Inland Sea of Japan and one egg-bearing female without definite locality, but no doubt also from the Inland Sea. This Prawn is common in 8–15 fathoms.

The two male specimens are 45 mm. long; the female 40 mm. from the tip of the rostrum to the end of the telson.

The sharp-pointed rostrum is little shorter than the visible part of the first joint of the antennular peduncle and extends horizontally forward. The second joint of the antennular peduncle is about once and a half as long as the visible part of the first, and the third is shorter than the first; the flattened and broad stylocerite ends distally in a sharp spinule, which reaches almost to the distal end of the first joint of the antennular peduncle. The small spinule on the basal joint of the antennal peduncle is placed on the distal edge of its lower surface, and is therefore not visible from above. The antennal scale, the outer margin of which is slightly concave, is as long as the peduncle of the inner antennæ and a little shorter than that of the outer. The telson, the lateral margins of which are slightly prominent in the middle, carries two pairs of spinules.

The external maxillipeds are a little shorter than the antennal peduncles; according to Spence Bate, they should extend to a little beyond them.

In both male specimens the left cheliped is the larger. The infero-internal margin of the merus is fringed with hair and terminates in a sharp tooth; the infero-external margin is very finely denticulate, and its upper border ends also in a sharp tooth. The larger chela, which is *a little more than three times as long as broad*, agrees with the quoted descriptions and figures; the fingers are little more than half as long as the palm.

The merus of the other cheliped agrees with the described one, but there is no tooth at the far end of the upper border and that of the infra-internal border is also rudimentary. The wrist is a little longer than that of the left cheliped.

This species now proves to belong to those of the "*edwardsi*"-section, in which the dactylus of the smaller cheliped presents the "*Balæniceps*"-form in the male, whereas that of the female is simple. Miers makes no mention of this character, but only two specimens were at his disposal, probably females. Spence Bate was able to examine both males and females; but the difference was nevertheless overlooked by him, and his fig. 4 *k'* represents apparently the smaller cheliped of a female. In both males the smaller chela (Pl. 33. fig. 53) is a little longer than the larger, and in both the fingers are somewhat shorter than the palm. The straight upper margin of the palm, which distinctly narrows distally, terminates in an acute lobe a short distance behind the articulation of the fingers, but the lower margin has no constriction at all; the longitudinal depressions on the inner and on the outer side of the palm are distinct. Just as on the larger chela, a sharp spine occurs on either side of the articulation of the dactylus. The dactylus has the well-known "*Balæniceps*"-form: two crests, which are beset with stiff setæ and which arise from the middle of the finger, run, on its outer and inner side, forward and upward, and unite at a short distance behind the tip; looked at from above the dactylus appears here somewhat broadened, whereas it is narrowest in the middle. The fingers shut close together, and their hooked tips cross one another.

The larger cheliped of the female is wanting; the smaller agrees with the figure 4 *k'* in the 'Challenger' Report. The upper border of the merus is unarmed, but there is a sharp tooth or spine at the distal end of the infero-internal margin. The fingers are distinctly somewhat longer than the palm, and the slender tapering dactylus is *simple*, without hairy carinæ. Both the upper and the lower border of the palm are *entire*, without a constriction or lobe behind the articulation of the fingers. The inner surface of the larger chela is finely granulated; the granules are wanting on the triangular depression, on the middle of the palm, and at the base of the immobile finger, except in the middle; the dactylus is smooth, except at its base. The granulation on the outer surface is less distinct.

The carpus of the second pair of legs is 5-articulate; the first joint is almost as long as the three following taken together, the fifth is once and a half as long as the two preceding, which are equal and the shortest of all. The fingers are a little longer than the palm. The other legs are slender, smooth, unarmed.

Eggs very numerous and small.

The upper surface of the body and of the peduncles of the internal antennæ, as also the inner surface of the chelipeds, are reddish.

Coutière ("*Les Alpheidæ*," in *Ann. Sc. Nat., Zool.* 8<sup>e</sup> sér. ix. 1899, p. 35) is inclined to regard this species also as a variety of *A. edwardsii*, but I am not of that opinion.

This Prawn is named the Clawcracker, because it makes a loud cracking noise with its claws which can be heard under water; if the noise is made while the animal is being handled it is instinctively dropped, owing to the slight shock received. The exertion is so great that the end of the big claw is frequently cast off.

*Measurements in millimetres.*

Length of the body from the tip of the rostrum to the end of the telson . . . . .	♂.	♂.	♀.
	46	46	40
Length of the carapace . . . . .	15	15	13
Length of the larger chela . . . . .	28.5	31	...
Greatest breadth of the palm of the larger chela . . . . .	8	9	...
Length of the fingers . . . . .	10	10	...
Length of the smaller chela . . . . .	34	35	16.5
Greatest breadth of the palm . . . . .	3.75	4.25	2
Length of the fingers . . . . .	16	15.5	9.5

*Geographical Distribution.*—Lat. 34° 6' N., long. 136° 15' E., at 11 fathoms; lat. 35° 7' N., long. 136° 55' E., at 3 fathoms (*Miers*); off Yokorka, Japan, in from 5 to 20 fathoms, and off Kobé, Japan, depth 8 to 50 fathoms (*Spence Bate*); Bay of Tokyo and Tanagava, Japan (*Ortmann*).

## PENÆUS, Fabricius.

## PENÆUS (METAPENÆUS) LAMELLATUS, de Haan.

*Penæus lamellatus*, de Haan, Fauna Japonica, Crust. 1849, p. 193, tab. 46. figs. 4 & 5.

*Penæus lamellatus*, Miers, in Proc. Zool. Soc. 1878, p. 308.

*Penæus lamellatus*, Kishinouye, in Journ. Fish. Bureau, Tokyo, vol. viii. no. 1, 1900, p. 25, pl. 6. fig. 1.

*Parapenæus lamellatus*, Rathbun, in Proc. U.S. Nat. Museum, xxvi. 1902, p. 38.

One adult female from the Inland Sea of Japan.

This beautiful specimen is 75 mm. long from tip of rostrum to the end of the telson. The upper margin of the rostrum, which, extending just beyond the eyes, reaches as far forward as the first joint of the antennular peduncle and as the setose scale or prosartema, carries nine teeth; of these the first is placed immediately before the middle of the carapace and the fifth above the frontal margin; the second is almost as far from the fifth as from the first. When this female is compared with a typical male from the Leyden Museum, lying before me, the lower margin of the rostrum appears to run, in the Leyden type, a little more oblique than in the female, and this is also the case with the teeth of the upper margin, especially with the first and the second, so that these teeth are in the male a little more erect. I cannot decide whether this is a sexual, a local, or an individual difference.

The upper margins of the first three teeth of the rostrum and of the carina on the third to sixth segments of the abdomen are marbled with blue and yellow, and the hairs with which the appendages of the body, excepting the eye-peduncles and the upper antennæ, are furnished are of a beautiful red colour.

The external maxillipeds, which reach to the tip of the antennal scales, are provided with an exopodite that reaches almost to the middle of the carpopodite. The peræopods are also all furnished with a well-developed exopodite; the exopodites of the fifth pair

reach just beyond the ischium, whereas those of the first reach nearly to the distal end of the merus.

*Geographical Distribution.*—West coast of the island of Yezo, near Cape Sooga, lat. 45° N. (*de Haan*); Hizen, Nagasaki (*Rathbun*).

PENÆUS (METAPENÆUS) AKAYEBI, Rathbun. (Pl. 33. fig. 54.)

*Penæus velutinus*, Spence Bate, 'Challenger' Macrura, 1888, p. 253 (part.), nec *Pen. velutinus*, Dana.

*Penæus velutinus*, Kishinouye, in Journ. Fish. Bureau, Tokyo, viii. no. 1, 1900, p. 26, pl. 6. fig. 2; pl. 7. figs. 11, 11 a, 11 b.

*Parapenæus akayebi*, Rathbun, in Proc. U.S. Nat. Museum, xxvi. 1902, p. 39.

? *Metapenæus stridulans*, W.-Mason, Alcock, in Ann. & Mag. Nat. Hist. ser. 7, xvi. 1905, p. 526.

One male and one female from the Inland Sea of Japan, caught in deep water.

According to the label, this species, which is very common, has curious pea-green eyes, the body covered with red mottled spots.

The male is 57 mm. long from tip of rostrum to the end of the telson; the carapace with the rostrum is 17.5 mm. long, without the rostrum 10 mm.; the sixth segment of the abdomen, measured on median line, appears to be 8.75 mm. long, 4.6 mm. broad anteriorly, 3.7 mm. broad posteriorly. The rostrum, which reaches to the end of the second joint of the antennular peduncle, is horizontal and 1+6-toothed; the gastric tooth is situated at the anterior fourth of the carapace, as in Kishinouye's figure; according to Miss Rathbun, it should be situated in adult individuals "a little in front of the anterior third"; the foremost tooth is a little farther from the tip than from the penultimate. The telson, which is little longer than the sixth segment, is armed with one immovable spiniform tooth, which is preceded by three movable spines.

The short flagella of the inner antennæ are little more than twice as long as the terminal joint of their peduncle; they are of equal length, but the upper is much stouter than the gradually tapering lower flagellum, and they reach entirely beyond the antennal scales.

The external maxillipeds extend almost to the tip of the rostrum; their exopodite reaches to the middle of the merus.

All the thoracic legs carry an exopodite.

The female is 60 mm. long; the carapace, rostrum included, 19.5 mm., without it 11 mm.; the sixth segment of the abdomen is, measured on median line, 9.5 mm. long, 5 mm. broad anteriorly, 4 mm. posteriorly; the telson, 9.75 mm. long, has its lateral margins armed as in the male. The very slightly ascending rostrum, which reaches to the end of the second joint of the antennular peduncle, is 1+7-toothed; the three or four anterior teeth decrease a little in size, and the anterior tooth is a little farther from the tip than from the penultimate, whereas the gastric tooth is situated at the anterior fourth as in the male.

The external maxillipeds and the thoracic legs agree with those of the male; those of the fifth pair carry also an exopodite.

Both in the male and in the female the carapace carries a pair of stridulating-organs, first mentioned by Dr. Alcock in his description of *Metapenæus stridulans* (Ann. & Mag.

Nat. Hist. ser. 7, xvi. 1905, p. 526). Each organ consists of a smooth, quite glabrous band, which, arising from the posterior end of the branchiostegite, curves forward, slightly narrowing distally; this band carries 18–20 smooth transverse ridges that run parallel with one another; they are broadest in the middle of the organ and gradually narrow towards both extremities.

Alcock suggests that *Penæus akayebi*, Rathb., may prove to be identical with *Metapenæus stridulans*, W.-Mason, from the east coast of Bengal. I hesitate, however, to identify them, because they belong to a section of this subgenus the species of which are very closely related and chiefly distinguishable by such slight differences as the shape of the sixth pleonic segment and the proportion of its length to that of the carapace. Though Alcock's description of *Metap. stridulans* agrees very well with these specimens, these characters are not spoken of. I suppose even that *Pen. akayebi* is a different species, for the stridulating-organ of *Metap. stridulans* is usually composed of 5, occasionally of as many as 12, transverse ridges, whereas 18–20 are observed in *Pen. akayebi*. Moreover, the closely related *Pen. (Metapenæus) acclivis*, Rathb., is also furnished with these remarkable organs, and the description of *Metap. stridulans* agrees very well with this species.

In *Metap. stridulans* the "second abdominal tergum is medially carinated in less than its posterior half," and this carina is sulcate; in *Pen. akayebi* this carina is hardly grooved, and runs *in the middle* of the tergum.

*Geographical Distribution.*—Inland Sea, Bay of Ise, Japan (*Kishinouye*): Wakanoura, Kii; Onomichi, Bingo; Kawatana; Hizen, Nagasaki; Mogi, near Nagasaki, Japan (*Rathbun*).

PENÆUS (METAPENÆUS) ACCLIVIS, Rathbun. (Pl. 33. fig. 55.)

*Parapenæus acclivis*, Rathbun, in Proc. U.S. Nat. Museum, xxvi. 1902, p. 41, figs. 12–14.

One female from the Inland Sea of Japan, captured at a depth between 5 and 20 fathoms or more.

This specimen is 80 mm. long from tip of rostrum to the extremity of the telson. Measured on median line, the carapace appears to be 26.5 mm. long, the rostrum included, and 16 mm. without it; the sixth segment of the abdomen is 11.3 mm. long just *seven-tenths* as long as the carapace; the greatest width of this segment anteriorly is 7.25 mm., whereas it is 5.5 mm. broad posteriorly. The telson is 14.5 mm. long, just twice as long as the greatest width of the sixth segment anteriorly; the telson, which gradually tapers to the acuminate tip, is armed with one pair of immovable spines, which are preceded by three pairs of strong movable ones; the immovable spine on either side is barely longer than the anterior movable one, and the two following grow gradually longer, so that the third is three times as long as the anterior spine and slightly extends beyond the immovable. The outer swimmerets hardly reach beyond the extremity of the telson, the inner not at all.

When the peduncles of the inner antennæ are placed immediately below the rostrum, the latter appears to reach a little beyond the end of the second antennular segment,

but in the usual horizontal position of the peduncle it does not appear to extend to the extremity of the second joint. As regards its usual shape, the rostrum *exactly agrees* with Miss Rathbun's figure, but there are only *six* teeth on the free part; the gastric tooth is situated at the anterior fourth of the carapace. The six teeth of the free part are equidistant and of equal size except the anterior, which appears distinctly smaller than the preceding; this anterior tooth is once and a half as far from the penultimate as from the tip of the rostrum.

The stylocerite of the inner antennæ reaches to the end of the first joint, which carries a spine at the far end of its outer border; the short flagella, which extend beyond the antennal scales, are nearly twice as long as the terminal joint of the antennular peduncles; they are subequal in length, but the upper is a little shorter. The basal joint of the antennal peduncle has no spine at the outer angle or on the distal border of the lower surface; the outer margin of the scale is very slightly arcuate proximally, and the distal spine reaches as far forward as the laminar portion.

The last two joints of the external maxillipeds extend beyond the antennal peduncle, reaching almost to the tip of the rostrum; their exopodite reaches to the end of the merus-joint. The outer footjaws, as also the legs of the first and of the second pair, are unispinose at base, but the legs of the first pair carry, moreover, a spine at the distal end of the lower margin of their ischium. The legs of the third pair attain the tip of the antennal scales, those of the fifth extend with little more than their dactylopodites beyond the antennal peduncles, while the legs of the fourth pair are but little shorter. The terminal joints of the fifth legs are little more than half as long as their propodites.

The thelycum does not fully agree with the figure of the original paper; it is therefore figured afresh (Pl. 33. fig. 55).

The stridulating-organ of this species much resembles that of *Pen. (Metap.) akayebi* Rathb., but there are only 13 or 14 ridges, which gradually narrow, like the organ itself, towards the anterior end.

*Geographical Distribution.*—Mogi, near Nagasaki (*Rathbun*).

#### PENÆUS (PARAPENEOPSIS) TENELLUS, Sp. Bate.

*Penæus tenellus*, Spence Bate, Report on the 'Challenger' Macrura, 1888, p. 270.

*Penæus tenellus*, Kishinouye, in Journ. Fish. Burcau, Tokyo, viii. no. 1, 1900, p. 22, pl. 6. fig. 3, pl. 7. fig. 8 A & B.

*Penæus crucifer*, Ortmann, in Zool. Jahrb., Syst. v. 1890, p. 451, Taf. 36. fig. 5 a, b.

One female from the Inland Sea of Japan, captured at a depth between 5 and 20 fathoms or more.

This specimen is not yet full-grown, being 52 mm. long from the tip of the rostrum to the end of the telson, whereas, according to Kishinouye, the female attains a length of 75 mm. The body is described, both by Spence Bate and Kishinouye, as being smooth and naked; in the present female, however, the carapace is *very finely scabrous*, being covered rather closely *with minute spinules* which are only 0.03-0.05 mm. long; still smaller spinules occur also on the telson and perhaps here and there on the other segments of the abdomen.

This species is characterized by all the rostral teeth standing upon the free part of the rostrum, there being none on the carapace. Of the eight teeth, the first, which is situated upon the anterior border of the carapace, appears a little smaller than the two following; these are also larger than the rest, which slightly decrease in size distally; the anterior tooth is about once and a half as far distant from the tip of the rostrum as from the penultimate.

A longitudinal fissure proceeds from the anterior border of the carapace, immediately above the antennal spine, backward, and extends along two-thirds of the length of the carapace; it was first described by Kishinouye. There is also a third transverse suture at the level of the third pair of legs. Stridulating-organs wanting.

The rather obtuse carina of the fourth segment of the abdomen arises at one-seventh of its length from the anterior extremity. The telson is not "about half the length of the lateral plates of the rhipidura," but measures about two-thirds their length, the basal joints included. The furrow on the upper surface reaches little beyond the middle of the telson.

The stylocerite of the inner antennæ reaches not quite so far forward as the antennal peduncle, which extends to the middle of the cornæ; the antennular peduncle is 9 mm. long, the flagella 7.2 mm. The basal joint of the antennal peduncle carries a spine at the outer angle; the spine at the distal end of the very slightly arcuate outer margin of the scale reaches not quite to the rounded extremity of the laminar portion. The flagellum is almost twice as long as the body.

The external maxillipeds, which project with their terminal joint beyond the antennal peduncles, reach to the middle of the scales.

The legs of the third pair extend to the distal extremity of the antennal peduncles and are unarmed at base, and those of the fifth reach just beyond the rostrum, to the terminal third part of the scales. (See additional Note B on page 454.)

*Geographical Distribution.*—Bay of Kobe, Japan (*Spence Bate*); Inland Sea of Japan and along the lower half of this Empire (*Kishinouye*); Maizuru, Japan (*Ortmann*).

PENÆUS (TRACHYPENÆUS) CURVIROSTRIS, Stimpson. (Pl. 33. figs. 56–58.)

*Penæus curvirostris*, Stimpson, in Proc. Acad. Nat. Sciences Philadelphia, 1860, p. 44.

*Penæus curvirostris*, Ortmann, in Spengel, Zool. Jahrb., Syst. v. 1890, p. 451, Taf. 36. fig. 4 a, b.

*Penæus curvirostris*, Kishinouye, in Journ. Fish. Bureau, Tokyo, vol. viii. no. 1, 1900, p. 23, pl. 6. fig. 4.

*Parapenæus curvirostris*, Rathbun, in Proc. U.S. Nat. Mus. xxvi. 1902, p. 38.

*Trachypenæus curvirostris*, Alcock, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvi. 1905, p. 523.

*Penæus anchoralis*, Spence Bate, 'Challenger' Macrura, 1888, p. 258, pl. 35. fig. 1 (partim?).

Two females from the Inland Sea of Japan, caught in deep water.

They are nearly equally long, one measuring 80 mm., the other 78 mm. from the tip of the rostrum to the end of the telson. In both specimens carapace and abdomen are tomentose and scabrous with short adjacent setæ and microscopical spinules; the setæ are 0.15–0.16 mm. long, the spinules 0.03–0.04 mm. The lower margin of the rostrum, which reaches to the distal end of the second joint of the antennular peduncle, is distinctly curved in its ascent upwards and fringed with long cilia. In the female, which is 80 mm. long, the upper margin is 1+7-toothed; the gastric or first tooth, which is

situated still a little farther from the second than the second from the fourth, is a little smaller than the second; the first and the second are placed upon the carapace, the third reaches for the greater part of its length beyond the anterior margin of the carapace; the second, third, and fourth teeth are a little larger than the following, which decrease in size, and the anterior tooth is a little farther from the pointed tip of the rostrum than from the penultimate. In the other specimen the formula is 1+8; the second tooth is very little farther from the fifth than from the first or gastric tooth, and the latter is also somewhat smaller than the second; the following teeth are, as in the other specimen, equidistant, the two or three foremost are a little smaller than the preceding, and the anterior tooth is twice as far from the penultimate as from the acuminate tip, which is directed horizontally forward; two teeth are on the carapace, the third is situated above the anterior border. The lateral carinæ of the rostrum do not reach beyond the anterior border of the carapace. The postrostral ridge is distinct, and extends until quite near the posterior margin of the carapace. The sulcus gastro-frontalis (Stimpson) is indistinct in both specimens, as are also the cardiaco-branchial grooves; the antennal and the gastro-hepatic sulci are well developed, and the antero-lateral part of the cervical groove, situated just below the hepatic spine and beginning, at some distance from the anterior border of the carapace, at the posterior end of the antennal carina, is rather deep but short, being hardly once and a half as long as its distance from the anterior border. The outer angle of the orbital margin is produced into a sharp though small tooth; antennal and hepatic spines well developed, the former a little the larger. Pterygostomial angle angular, though not produced into a tooth or spine. Stridulating-organs wanting.

Characteristic of this species (Pl. 33. fig. 57) is a fissure about in the middle of the lower margin of the first segment of the abdomen, distinctly visible in Spence Bate's fig. 1 of *Penæus anchoralis*, which is identical with *Pen. curvirostris*. In both specimens the second segment of the abdomen carries a short median carina as far from the anterior as from the posterior margin of this segment; the carina of the third segment reaches from the posterior margin to the anterior fourth part, the carinæ of the fourth and fifth terminate in a narrow cleft at the posterior extremity, but the carina of the third segment does not; the carina of the sixth segment, which is little longer than broad, is, in the specimen 78 mm. long, posteriorly more strongly curved backward than in the other. The telson, which is very little longer than the sixth segment, but one-third shorter than the outer swimmerets, terminates (fig. 58) in an acuminate pointed tip; it is deeply grooved in the middle of the upper surface, and the lateral margins carry *four movable, very small spinules*; the foremost or first spinule is inserted at little more than one-third, the posterior or fourth at one-seventh the length of the telson from the posterior extremity, the second is inserted just midway between the first and the fourth, and the third immediately in front of the fourth; the fourth is twice as large as the third, and the two anterior are a little larger than the third. Stimpson describes the telson as similar to that of de Haan's *Pen. monoceros*, where it is armed with three minute spinules, and Kishinouye describes it likewise: Ortmann (Spengel, Zool. Jahrb., Syst. v. 1890, p. 447) was therefore apparently wrong when denying their existence altogether;

Spence Bate is also inaccurate, for ('Challenger' *Macrura*, 1888, p. 259) he says "that one small spinule is visible on close inspection," whereas (p. 261) he describes three spinules.

The antennular flagella are of equal length and only *one-third* shorter than their peduncle, *i. e.*, the distance between its distal extremity and the anterior border of the carapace; the spine at the far end of the outer margin of the first joint of the peduncle is slightly directed outward.

There is only a minute spinule on the distal border of the lower surface of the basal joint of the outer antennæ. The peduncle reaches as far forward as the stylocerite of the inner antennæ, *i. e.* to the middle of the cornæ, and the flagellum is a little more than twice as long as the body. The outer margin of the antennal scales, which reach as far forward as the antennular peduncles, appears very slightly arched; the spine at the distal end extends as far forward as the laminar portion, which in the specimen 78 mm. long narrows a little more distally than in the other, an individual difference of course.

The external maxillipeds, of which the terminal joint extends beyond the antennal peduncles, reaching almost to the middle of the scales, are described by Stimpson as "nudi" on their outer surface; in our two specimens they are, however, distinctly hairy; the exopodite reaches to the distal end of the merus-joint of the endopodite.

The legs of the first and of the second pair are unispinose at base, their second joint being armed with a spine; the third legs, which reach to the tip of the antennal scales, are *unarmed*. The slender legs of the fifth pair reach to the tip of the eyes or slightly beyond them; their dactyli are little more than half as long as the propodites.

Both specimens seem to have copulated. The thelycum (Pl. 33. fig. 56) agrees with Ortmann's and Kishinouye's figures, in the female 78 mm. long: the amorphous gum-like substance with which it is covered resembles Kishinouye's figure 10 *c*; but in the other it has a remarkable shape, appearing as *a narrow, asymmetric, shield-like body*, somewhat pointed at the distal end and divided by a transverse suture in the middle; it is of a whitish colour, whereas the lateral margins are of a pale violet (fig. 56).

Carapace and abdomen marked with innumerable small dots or points of a dark, perhaps bluish, colour; they are quite well visible in Spence Bate's figure 1 of *Pen. anchoralis*.

*Penæus anchoralis*, Sp. Bate, was founded upon specimens from the Arafura Sea and from Yokohama; those from the latter locality are no doubt identical with *Pen. curvirostris*, Stimps., those from the Arafura Sea certainly belonged to *Pen. granulatus*, Hasw., but it is difficult to say whether Haswell's species, though most closely related to *Pen. curvirostris*, is indeed identical with it or not. The second segment of the abdomen of *Pen. granulatus* seems to be destitute of the small crest near the centre of the upper border which is characteristic of *curvirostris*; the apex of the telson is acute, but not developed into a spine as in the Japanese species, and finally the lateral margins should be armed in *Pen. granulatus* only with a single, weak spine. The last named difference explains perhaps the fact that Spence Bate describes at one place the existence of one, but at another page that of three spinules on the lateral margins of the telson.

Dr. Alcock's suggestion that *Pen. affinis* (de Haan) = *Pen. barbatus*, de Haan, should

also be identical with *Penæus curvirostris* is, no doubt, erroneous. The carapace of *Pen. barbatus* is rounded and devoid of a postrostral ridge; the anterior margin carries a spine below the basal joint of the outer antennæ, which does not occur in *Pen. curvirostris*; and in *Pen. barbatus* there is a faint ridge posterior to the hepatic spine, no trace of which exists in *Pen. curvirostris*.

The external maxillipeds of de Haan's species reach to the tip of the antennal scales and the third legs are also unispinose.

*Pen. monoceros* of de Haan = *Pen. ensis*, de Haan, appears, on the contrary, most closely related to *Pen. curvirostris*. The rostrum reaches, however, to the end of the antennal scales, and from the hepatic spine a ridge goes backward to the posterior margin of the carapace. The outer flagellum of the internal antennæ is not longer than the eye-peduncles. The third legs are also unispinose at base; and the second somite of the abdomen seems to be devoid of a rudimentary crest on the upper border.

*Pen. monoceros*, Fabr., is also a different species (*vide* de Man, in Max Weber's Zool. Ergebnisse, 1892, t. ii. p. 513, pl. 29. fig. 54).

*Geographical Distribution*.—Simoda (*Stimpson*): Yokohama ('*Challenger*'): Arafura Sea (*Spence Bate*): Kochi, Bays of Tokyo and Sagami (*Ortmann*): Hakodate, Hokkaido; Aomori, Rikuoku; Hizen, Nagasaki (*Rathbun*): Pacific Coast of Japan from the Bay of Awomori to Kagoshima (*Kishinouye*).

## Stomatopoda.

### CHLORIDELLA, Miers\*.

#### CHLORIDELLA AFFINIS (Berthold).

*Squilla affinis*, Berthold, 'Reptilien aus Neu-Grenada und Crustaceen aus China,' Göttingen, 1846, p. 26, tab. 3. figs. 1, 2; Bigelow, in Proc. U.S. Nat. Museum, xvii. 1894, p. 538 (ubi synonym.).

*Chloridella affinis*, Rathbun, in Proc. U.S. Nat. Museum, xxvi. 1902, p. 55.

One specimen from the Inland Sea of Japan.

In this specimen, which is 45 mm. long from the tip of the rostrum to the end of the telson, the oblique corneal axis of the eyes is 3.2 mm. long, *i. e.* 0.07 of the length of the body; according to Bigelow it is comparatively a little shorter in adult individuals, measuring here only 0.05 of the length of the body.

The antero-lateral spines of the carapace reach just beyond the suture between the latter and the rostrum, whereas in adult specimens they are shorter than it. The median carina of the carapace is bifurcated for  $\frac{1}{6}$  of its length. The rostrum carries on its anterior half a feeble median ridge. The telson carries between the marginal spines, on each side of the middle line, one lateral, nine intermediate, and four submedian denticles. The submedian spines of the telson are probably provided with movable tips, which in that case should be a juvenile character.

\* This species and the following are provisionally placed in the genus *Chloridella*, Miers, but it appears to me probable that it will prove necessary to create a new name for the genus including those species that were referred by Bigelow to *Squilla*, J. C. Fabr.

## CHLORIDELLA FASCIATA (de Haan).

*Squilla fasciata*, de Haan, Fauna Japonica, Crust. 1849, p. 224, tab. 51. fig. 4.

*Chloridella fasciata*, Rathbun, in Proc. U.S. Nat. Museum, xxvi. 1902, p. 54 (ubi synonym.).

Two specimens from the Inland Sea of Japan.

This species seems to be rare, for neither Miers in 1880 nor Bigelow in 1894, when describing this species, had specimens of it at their disposal, whereas only two were collected by the 'Challenger' Expedition, also in the Inland Sea of Japan.

The present specimens are respectively 51 mm. and 40 mm. long from the tip of the rostrum to the end of the telson, about as long as those that were described by Brooks; de Haan's single type specimen was 5 centim. long. The eyes are described by Brooks as "nearly cylindrical"; in our specimen, 40 mm. long, the peduncle and still more the corneal axis are distinctly somewhat compressed, and the latter, which is directed somewhat obliquely as in *Chlor. affinis*, Berthold, measures 0.045 of the length of the body.

The spiniform teeth at the antero-lateral angles of the carapace are directed a little outward and reach almost as far forward as the suture between carapace and rostrum.

The tooth on the middle of the outer margin of the inner spine of the basal prolongation of the uropods is obtuse, though not rounded, and the inner border is armed with twelve or thirteen sharp teeth, which slightly increase in length distally; the 'Challenger' specimens presented here only seven or eight teeth. The terminal paddle of the exopodite measures two-thirds the length of the first joint, the outer margin of which is furnished with eight movable spines, which increase in size and in length distally. According to Brooks, the paddle measured in the 'Challenger' specimens half the length of the proximal joint. The length of the telson, measured in the middle line, is three-fourths its greatest width. The median crest, which ends posteriorly in a sharp tooth, carries a small notch at one-fourth of its length from the base. Between the marginal spines are observed on each side one lateral, eight intermediate, and four or five submedian denticles, which are all very sharp. There are, in the smaller specimen, on the left side five, on the right four submedian denticles. According to the label, this species presents a red colour above; in the larger specimen the carapace and abdominal terga are mottled with minute dark points.

*Geographical Distribution*.—Japan (*de Haan*); Inland Sea of Japan, depth 15 fathoms, bottom blue mud (*Brooks*).

## B.—LAKE AT YUNNAN-FU, CHINA.

## POTAMON, Savigny.

## PARAPOTAMON, nov. subgen.

A new subgenus *Parapotamon* is proposed for those Potamonidæ that present the general characters of *Parathelphusa*, but in which the fingers of both chelipeds are spoon-shaped, excavated at the tips. In the typical species of *Parathelphusa*, *Parath. tridentata*, H. M.-Edw., and *Parath. sinensis*, H. M.-Edw., the fingers are distally acute-pointed, and the other species of this subgenus seem to agree with them as regards this character. In the remarkable new species of River-Crab from Yunnan, however, that

was described last year by Dr. Calman as *Parath. spinescens*, both fingers of both chelipeds are spoon-shaped: though in old males the fingers of the larger cheliped become obtuse, gradually losing their spoon-like shape, as may be observed in some species of *Leptodius*. *Pot. spinescens* becomes therefore the type of the new subgenus *Parapotamon*.

POTAMON (PARAPOTAMON) SPINESCENS, Calman.

*Parathelphusa spinescens*, Calman, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvi. 1905, p. 156.

Four males and one female without eggs from the Yunnan-Fu Lake, China.

In the youngest male and in the female of the same size the antero-lateral margins are armed on each side with five spiniform teeth; in the male, however, the last tooth on the left side is rudimentary and a smaller granule is situated just before it. In the male the right cheliped is somewhat larger than the left. The right chela, which is 24 mm. long, is almost just as long as the length of the cephalothorax in the middle line; the fingers are a little shorter than the palm and barely longer than the palm is high. Though the dactylus is nearly straight, there is, however, a small hiatus between both fingers; both fingers carry fine punctuations, which are partly arranged in longitudinal rows. In Calman's somewhat larger male the dactylus was "slightly arched and very obscurely furrowed." The outer surface of the palm is *quite smooth*, finely punctate. The fingers of the left chela are just as long as the palm. The anterior border, articulating with the chela of the upper surface of the carpus, carries a few small denticulations; otherwise the upper surface is smooth, punctate. In the female the right chela is very slightly larger than the left; the fingers are a little shorter than the palm and a little longer than the latter is high. Fingers and palm of the left cheliped are equally long. The fingers of both chelipeds are, in this male and in the female, *spoon-shaped*; the margins of the spoon-shaped tips of the fingers are white. The three other males are of much larger size; in the largest the cephalothorax is 54 mm. broad, the antero-lateral margin of the right side is armed with five teeth, that of the left with seven, the last being rudimentary; the first and second are grown together at the base, as are also the third and fourth. (See Note C on page 454.)

*Measurements in millimetres.*

	1.	2.	3.
	♂.	♂.	♀.
Greatest breadth of the cephalothorax at the level of the penultimate antero-lateral teeth . . . . .	54	34.5	34
Length of the cephalothorax in the middle line, without the abdomen . . . . .	38	25	24
Distance between the external orbital angles . . . . .	32	21.5	21
Breadth of the frontal border . . . . .	14.5	10	10
Length of the larger (right) chela . . . . .	54	24	20

Nos. 1 and 2 the largest and the youngest males, No. 3 the female.

Both specimens were collected, together with the types described by Dr. Calman, in the lake at Yunnan-Fu.

## POTAMON (PARATHELPHUSA) ENDYMION, de Man. (Pl. 33. figs. 59-63.)

*Potamon (Parathelphusa) endymion*, de Man, in Zoologischer Anzeiger, xxx. 1906, p. 35.

Two egg-laden females from the lake at Yunnan-Fu, China, that were collected together with specimens of *Potamon (Parapotamon) spinescens* (Calman).

This species is related to *Pot. spinescens*, Calman, and *Pot. (Parathelphusa) lanzi*, Doflein, but is of smaller size.

Carapace three-fourths as long as broad, just as in *Pot. spinescens*, when the lateral spines are included; the carapace presents its greatest width at about one-third of its length from the frontal margin. The upper surface, flattened on its posterior half, curves anteriorly towards the rather steeply deflexed front; it is also flattened transversely, but the anterior branchial regions are *somewhat swollen*, more than in *Potamon spinescens*, and they slope steeply down to the antero-lateral border, which is not the case in Calman's species. The two lateral furrows of the H-like figure on the middle of the carapace are shallow, though distinct, but the transverse median part is hardly discernible. On the outer side of each lateral furrow a transverse impression is observed, bounding the inner part of the anterior branchial region posteriorly. The posterior branchial regions are also somewhat inflated and separated by shallow impressions from the anterior. The branchio-cardiac impressions are shallow, like those between the intestinal and branchial areas. The distance between the external orbital angles is little more than half the greatest width of the carapace (the spines included), the proportion being in the larger specimen as 5:9, but in the other female that distance is comparatively larger. As in *Pot. (Parapotamon) spinescens*, the post-frontal crest is only represented by the two barely prominent, epigastric lobes; the mesogastric furrow between them is, however, somewhat deeper, and, instead of being rugose, these lobes are distinctly *granular*, each being beset with ten or twelve rounded granules. An oblique, shallow, though interrupted furrow or impression defines the gastric region laterally; on each side of it is another impression, of which the outer one, on the branchial region, is larger than the other. The gastric and epibranchial regions slope anteriorly down, so that the upper surface is somewhat concave behind the orbits. The gastric region is *granular anteriorly*, the granules being similar to those of the epigastric lobes; the swollen, anterior branchial lobes are also *granular anteriorly* and *near the antero-lateral border*, but the granules near the latter are somewhat larger. In the younger female they are less distinct. The rest of the upper surface is smooth, very finely punctate.

The front (Pl. 33. fig. 60) resembles that of *Potamon spinescens*, but its upper surface is distinctly *granular*; the granules are, however, smaller than those of the epigastric lobes; in the larger specimen the anterior border is *half as broad* as the distance between the external orbital angles. The finely granulated frontal margin is notched in the middle line, nearly as in *Potamon spinescens*, and the external angles are rounded; it makes right angles with the lateral margins, so that the latter run at first parallel and then curve outward. The upper orbital margin is also granular in the middle and externally, but in the younger specimen it is still smooth, like the frontal border. The external orbital

angles are not sharp and reach almost as far forward as the front. The antero-lateral margin is not shorter than the postero-lateral. The slightly convex outer edge of the flattened, extraorbital tooth is beset with three or four subacute granules, but its upper surface is smooth. The granules of the extraorbital tooth are followed, in the larger female, by six or seven spiniform, sharp teeth, of which the last is much smaller than the rest, which are subequal and nearly of the same size; in the other specimen there are eight spines on the left and seven on the right side, those of the left being a little more unequal. These teeth or spines are smooth and glabrous. The lateral spines of *Pot. (Parapotamon) spinescens* are more acuminate and there are only five or six on each side. The rounded postero-lateral margins are smooth, converge *less strongly backward* than those of *Pot. spinescens*, and run almost parallel. The posterior margin of the carapace is *just half as broad* as the latter is long and appears thus comparatively broader than in *Pot. spinescens*; it is also much *more concave* than in that species.

The orbits are, in the larger specimen, *a little more than half as broad* as the frontal border; as they have exactly the same measurements in both females, they appear in the younger specimen comparatively larger. They are differently formed than in *Pot. spinescens*. The orbits are *more regularly oval*, their outer margin being *more regularly curved* (Pl. 33. fig. 60); the lower margin is more distinctly crenulate than the upper, and, as in *Pot. (Parapotamon) spinescens*, the inner angle is not produced at all, but there is an internal suborbital lobe, inserted between the inner angle and the basal joint of the outer antennæ. In *Pot. spinescens* this lobe is semi-elliptical, obtuse, its outer surface is concave, and it reaches beyond the middle of the orbital hiatus; in *Pot. endymion* the lobe is subacute and *considerably smaller*, its length being only *one-third* of the width of the orbital hiatus. The basal joint of the outer antennæ has also a different form in the two species; in *Pot. spinescens* it is just as long as broad, it does not reach the front, and its outer surface is slightly convex; in this new species, however, the basal joint is longer than broad, its outer surface is quite flat, and it narrows distinctly towards the front, which it attains (fig. 61).

The subhepatic and subbranchial regions are smooth, but the pterygostomian area is somewhat granular on its outer half.

The epistome, which is smooth, is *a little longer* in proportion to its breadth than in *Pot. spinescens*. In that species the granulated posterior margin is not prominent in the middle, but the granulated ridge, which extends from the middle backward into the buccal cavity, is very prominent. In *Pot. endymion* we observe just the contrary, the granulated posterior margin of the epistome forms a prominent tooth in the middle line, but the ridge into the buccal cavity is hardly distinguishable.

The external maxillipeds (fig. 62) are characteristic. The longitudinal groove on the ischium, which in *Pot. spinescens* is well-marked, is wanting, or, at the utmost, a faint trace of it is discernible; this joint is punctate, the puncta are a little larger and more crowded near the inner border. The merus-joint, which in *Pot. spinescens* is once and a half as broad as long, appears in *Pot. endymion* *hardly broader than long*; in the larger female it is 2 mm. long, but only 2.4 mm. broad; it is quadrangular, the straight inner border and the equally long antero-internal being much shorter than the

oblique outer border, which is nearly straight, though curving a little at each extremity; anteriorly the merus-joint is obtuse. On this joint the puncta are larger near the inner border. The finely punctate exognath reaches barely as far forward as the inner border of the ischium, but in *Pot. spinescens* it extends almost to the middle of the merus.

The finely, though rather densely, punctate terminal joint of the oval abdomen is regularly rounded, its posterior border is just twice as broad as this joint is long; the penultimate joint is almost exactly as long as the terminal, the preceding grow gradually shorter; the punctuations are very fine and rare.

In both females the right cheliped is somewhat larger than the left. The upper margin of the merus carries a subterminal spine, which is preceded by a smaller one, and several sharp granules; the lower margin carries also four or five, subacute, spiniform teeth and there are a few granules on the anterior border. The lower surface of the merus is *unarmed*, presenting no tooth or spine near the carpal articulation. Just as in *Pot. (Parapotamon) spinescens* and *Pot. (Parathelphusa) lanzi*, Dofl., the carpus is armed internally with *two* unequal, pointed spines, of which the upper is the larger; its upper surface is somewhat *granulated*, the granules being larger on the inner side. The length of the larger chela is two-thirds of the greatest width of the carapace; the palm is a little longer than the fingers and a little longer than its height at the articulation of the latter. The rounded upper border of the palm and its outer surface are beset *with subacute granules*, which are rather small and not very numerous; the lower margin is smooth, as also the inner surface. Characteristic is the immobile finger (Pl. 33. fig. 63) of the larger cheliped. This finger is somewhat curved at its base, the prehensile edge is here *emarginate*, whereas the lower border *bulges somewhat out*; between the emargination and the subacute tip of the finger it carries eight or nine small, obtuse, somewhat unequal teeth. As the dactylus is nearly straight, there is proximally *a small interspace* between the fingers; the dactylus carries on the proximal half of its upper border six or seven obtuse granules, and it presents longitudinal rows of puncta, one of which runs on the middle of the upper border. The dactylus is provided with eleven or twelve obtuse teeth, which diminish in size towards the tip. The immobile finger is punctate and marked with a longitudinal furrow on its outer surface.

The fingers of the smaller chela are barely shorter than the palm, the immobile finger is not emarginate at its base and scarcely bulges out; each finger carries about a dozen low, obtuse or subacute teeth, which diminish in size towards the tip; the tips of the fingers are pointed.

The ambulatory legs are smooth, somewhat punctate. The upper margin of the merus is slightly denticulate and ends in a sharp, though small, subterminal tooth; these teeth are, however, on the last pair and in the younger specimen less distinct. The upper border of the following two joints is also finely denticulate internally; the lower border terminates, both at the outer and at the inner side, in a small sharp tooth and one or two smaller teeth occur on the middle of that border. The spinulose dactylopodites are, on all the legs, *distinctly longer* than the propodites. The ambulatory legs of the younger individual are a little pubescent on the upper border of the joints.

The eggs are *not numerous*, globular, *large*, their diameter being 1.75–1.8 mm.

*Pot. (Parathelphusa) endymion* may easily be distinguished from *Pot. (Parapotamon) spinescens*, Calman, by the shape of the carapace, by the granulations on the anterior regions and on the chelipeds, by the more numerous teeth on the antero-lateral border, by the shape of the orbits and of the epistome, by the characters of the outer footjaws, by the remarkable shape of the immobile finger, by the extremities of the fingers, which are not spoon-shaped, &c.

*Pot. (Parathelphusa) lanzi*, Dofl. (Pl. 33. figs. 64, 65), of which several typical specimens, both males and females, were kindly sent me for examination by Dr. Doflein, of Munich, is also a quite different species. The cephalothorax of this larger species is longer in proportion to its breadth, it is somewhat more arched both longitudinally and from side to side, the interregional furrows are deeper, the lateral parts of the postfrontal crest much more distinct, the lateral margins of the front more oblique, the antero-lateral teeth, the orbits, the epistome, the outer footjaws, all are different from *Pot. endymion*; the chelipeds, the chelæ, and the tapering fingers are slenderer, their pointed tips more acuminate, the immobile finger presents the usual form; the characters of the ambulatory legs finally are also different.

*Measurements in millimetres of the two specimens of Pot. endymion.*

	No. 1.	No. 2.
Greatest width of the carapace, the spines included . . . . .	22.5	20
Length of the carapace, in the middle line, the abdomen excluded . . . . .	17	15
Distance between the external orbital angles . . . . .	12.6	12.3
Breadth of the frontal margin . . . . .	6	5.5
Breadth of the posterior margin . . . . .	8.25	7.5
Breadth of the orbits . . . . .	3.25	3.25
Height of the orbits . . . . .	2.25	2.25
Length of the larger chela . . . . .	14.3	12
„ „ palm . . . . .	8.5	7
Height of the palm at the articulation of the fingers . . . . .	6.75	5.3

*Measurements in millimetres of four typical specimens of Potamon lanzi, Dofl., from the lower River Han, China, a few days from Hankow (Museum of Munich).*

	♂.	♂.	♀.	♀.
Greatest width of the carapace, spines included . . . . .	35.5	26	34.5	30
Length of the carapace in the middle line, without the abdomen . . . . .	29	22.3	29	24.5
Distance between the external orbital angles . . . . .	24	19.5	23.75	20.3
Breadth of the frontal margin . . . . .	10	8	10	8.5
„ „ posterior margin . . . . .	11	9	13.5	11.3
Breadth of the orbits . . . . .	6	5.5	6	5.5
Height of the orbits . . . . .	4	3.2	3.6	3.5
Length of the antepenultimate joint of the abdomen . . . . .	2.6	2.2	...	...
„ „ penultimate „ „ . . . . .	3.6	3	...	...

*Measurements of four typical specimens of P. lanzi (continued).*

	♂.	♂.	♀.	♀.
Breadth of the anterior margin of the penultimate joint . . . . .	6	4.6	...	...
" " posterior " " " . . . . .	7.75	6	...	...
Length of the terminal joint . . . . .	5	3.6	...	...
" " larger chela . . . . .	27.5	18.6	22.5	18
" " palm . . . . .	15.5	10	13	10
Height of the palm at the articulation of the fingers . . . . .	11.3	7	9.3	6.75

## C.—DARJEELING, BENGAL.

## PALÆMON (PARAPALÆMON?) HENDERSONI, de Man. (Pl. 33. figs. 66–68.)

*Palæmon (Parapalæmon?) hendersoni*, de Man, in Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. 1906, p. 405.

Three specimens from Darjeeling, fresh water, at a height of 2500 feet, collected by Mr. J. A. Gammie.

Apparently a new species, which I have the pleasure of dedicating to Prof. J. R. Henderson, of Madras, author of "A Contribution to Indian Carcinology," and other useful papers. This species is somewhat related to *Pal. altifrons*, Hend., from Delhi and Lahore, to *Pal. scabriculus*, Heller, from Ceylon, and *Pal. (Macrobrachium) latimanus*, v. Martens.

The largest specimen is 61 mm. long from the tip of the rostrum to the end of the telson; the carapace, rostrum included, is 25 mm. long, almost half the length of the whole body. The carapace is *scabriculate* on its anterior half, being closely covered with minute spinules; the branchial regions are smooth, finely punctate, but on the upper surface of the carapace the scabriculate area reaches nearly to the posterior border. The rostrum, which is *short*, reaching only to the middle of the penultimate joint of the antennular peduncle, arises from the anterior third of the carapace, and its free part is directed *obliquely downward*, so that the acute tip is situated *at a much lower level* than the surface of the carapace. The upper border (Pl. 33. fig. 66) is armed, in the two larger specimens, with seven rather small and low teeth, in the third with six. The first tooth, situated at one-fifth of the length of the carapace from the frontal border, is, in the two larger specimens, twice as far from the second as are the following, which reach to the tip; in the third specimen, however, the six teeth are equidistant. The first *three* teeth are situated on the cephalothorax. The nearly straight lower border carries, in the largest specimen, *one single tooth* not far from the tip and placed immediately below the foremost tooth of the upper border; in the smallest specimen there is also one tooth on the lower border, but it is situated between the foremost tooth of the upper margin and the tip. In the third specimen, which is 52 mm. long, the lower border carries *two* teeth, situated just behind and before the foremost tooth of the upper border. The formulæ of the three specimens are therefore:  $\frac{3+4}{1}$ ,  $\frac{3+4}{2}$ , and  $\frac{3+3}{1}$ . The free part of the rostrum is narrow, and that part which is situated above the lateral crest appears in the middle of the free part but little higher than that below it.

The antennal spine is *small* and reaches barely beyond the frontal border. The hepatic spine is *extremely small* and, in the two larger individuals, it is even wanting on the right

side; it is placed rather far below the other, for their tips are twice as far from one another as the hepatic spine from the frontal border of the carapace.

The telson, once and a half as long as the sixth segment and almost three times as long as broad at its base, ends in an acute tooth; the inner of the two spines on either side exceeds, as usual, the tip of the telson. Of the two pairs of spinules on the upper surface, the anterior stand a little behind the middle; the four spinules are, in the larger specimen, arranged in a quadrant, but in the others the posterior pair are situated a little closer to the anterior than the spinules of the anterior pair are distant from one another.

The eye-peduncles are small and reach barely beyond the middle of the first joint of the peduncle of the inner antennæ. The two outer flagella are united for a short distance, which is barely as long as the last joint of the peduncle.

The external maxillipeds reach as far forward as the peduncles of the inner antennæ.

The legs of the first pair extend, in the largest individual, with the distal fifth of their carpus beyond the tip of the antennal scales, but in the following somewhat smaller specimen by one-third of the carpus; those of the third specimen are lost. The carpus is as long as the merus and *one-third longer than the chela*, their proportion being as 4:3; the fingers are nearly as long as the palm.

Unfortunately only in the largest specimen one leg of the second pair is present, in the two others both are wanting. The remaining leg (Pl. 33. fig. 68) is the left and, as I conclude from the size of the coxæ, apparently the smaller. This leg is 48 mm. long, twice as long as the carapace, the rostrum included, but a little shorter than the whole body; one-fourth of the carpus extends beyond the antennal scales. The merus, 8.5 mm. long, when measured along its upper border, is cylindrical, but it is somewhat thickened distally; it is here 3.4 mm. thick, at the proximal end, however, 2 mm.; this joint reaches as far forward as the peduncles of the inner antennæ. The carpus, 6.5 mm. long, is *distinctly shorter* than the merus; it regularly thickens a little towards the distal end and, though generally cylindrical, appears very slightly compressed, as this joint is 3.6 mm. broad at the distal end of its upper surface, but 3.25 mm. at that of its lateral side. The chela is 22 mm. long, *three times as long as the carpus*, the palm is 10.25 mm. long, appearing *very slightly shorter* than the fingers. The upper surface of the palm is 3.7 mm. broad at the articulation of the fingers, 3.6 mm. in the middle, and still a little less broad at the proximal extremity, being therefore *barely broader* than the carpus; in a lateral view, however, palm and fingers appear to narrow regularly from the carpal articulation to the tips of the fingers, the palm being 3 mm. thick proximally and 2.3 mm. at the articulation of the dactylus. The palm appears therefore also *slightly compressed* in the proportion of 3:4. Viewed from above, the fingers do not appear to narrow towards their tips, which are strongly curved inward; they shut close together. The fingers are *somewhat tomentose*; the fixed finger carries a very small, conical tooth at the end of the cutting-edge, *i. e.*, at about one-third of its length from the articulation, and between this tooth and the articulation an elongate low prominence is observed which carries two or three small obtuse teeth. The cutting-edge of the dactylus terminates also in a small, conical tooth just behind the middle, and midway between this tooth and the articulation is a slightly larger, some-

what compressed, conical tooth. The ischium- and the merus-joints are closely beset with minute spinules, which are a little larger on the lower border; carpus and palm are also everywhere covered with similar minute spinules, but the larger spinules of the lower border of the merus are wanting. The fingers are devoid of spinules, except a few at their base.

The three following legs are *moderately slender*; those of the third pair reach to the distal end of the antennal scales, the fourth are a little shorter, and the fifth extend but little beyond the middle of the scales. The merus-joint of the third pair is somewhat spinulose and setose on its lower border; on the two following legs the spinules and setæ become gradually less numerous; the rest of the surface is nearly smooth. The carpo- and propodites are also nearly smooth, but the latter are spinulose on their lower border.

*Pal. altifrons*, Hend., differs by the more numerous teeth on the upper border of the rostrum, which has a different form, being vertically deep and having the apex placed in the same horizontal line as the surface of the carapace. The second legs are practically cylindrical, have a slenderer form, and the fingers are shorter than the palm.

*Pal. scabriculus*, Heller, is also distinguished by the more numerous teeth of the somewhat longer rostrum, six of which are placed on the carapace. The carpus of the second legs is not shorter than the merus, and the fingers are much longer than the palm.

*Pal. latimanus*, v. Mart., finally, of which a male 75 mm. long, from the Island of Halmahera, is lying before me, differs also by its vertically deeper and longer rostrum; the telson has a slenderer shape, and the characters of the second legs are different. The carpus, indeed, is much thinner at its base, its shape being thus quite different; the fingers are shorter than the palm, their cutting-edges shorter, their teeth much more numerous; the palm, finally, is distinctly broader than the carpus.

These three species show, however, no doubt, still other differences of less importance.

#### D.—THURSDAY ISLAND, TORRES STRAITS.

##### PENÆUS (PENÆUS) LATUSULCATUS, Kishinouye, var. ? (Pl. 33. fig. 69.)

*Penæus latusulcatus*, Kishinouye, in Journ. Fish Bureau, Tokyo, vol. viii. no. 1, 1900, p. 12, pl. 2. fig. 2, pl. 7. fig. 2 A.

One female, dredged in 5 fathoms, May 21st, at Thursday Island, Torres Straits.

This specimen agrees pretty well with Kishinouye's description of *Pen. latusulcatus* from Japan, except as regards the thelycum. This female is 87 mm. long from the tip of the rostrum to the end of the telson. The rostrum reaches to the middle of the third joint of the antennular peduncle and is armed above with ten teeth, below with one; the first tooth, which stands just before the middle of the carapace, is a little more than twice as far from the second as the second from the third, and the distance of the foremost tooth from the tip is but little shorter than that between the two first teeth. The distance (12.8 mm.) behind the posterior tooth is a little more than once and a half as long as that (7.75 mm.) from this tooth to the orbit. The first four teeth are on the upper surface of the carapace, and the fifth is situated just above the orbital

margin. The single tooth of the lower margin is situated immediately below the foremost tooth of the upper. The dorsal carina, which is distinctly grooved and which terminates abruptly at the distance of 1 mm. from the posterior margin, widens a little backward; the also quite distinct, lateral furrows are *much broader*, nearly twice than the median groove and reach as far backward as the latter.

The fifth and the sixth segments of the abdomen are carinate, the carina of the sixth terminating in an acute tooth; on the outer surface of these segments are observed, just below the middle, three short ridges which run parallel with one another, the lower margin of the sixth terminates in a small acute tooth. The telson, little longer than the sixth segment, is deeply grooved in the middle line, and the lateral margins carry on the posterior half three small movable spines; the middle spine is twice as far from the anterior as from the posterior, and the posterior is as far from the tip as from the anterior spine.

The external maxillipeds reach to the distal end of the first joint of the antennular peduncle. The legs of the first pair extend to the middle of the antepenultimate joint of the outer footjaws, those of the second pair to the distal end of the penultimate joint, those of the third pair finally reach by their fingers beyond the extremity of the external maxillipeds. The subequal legs of the fourth and fifth pairs reach to the distal end of the antennal peduncles. The basipodites of the legs of the first and second pairs are armed on their inner border with a slender spine, and the arched lower margin of the following joint terminates, in the first pair of legs, in a *very small* acute tooth (no spine).

The thelycum (Pl. 33. fig. 69) is composed of two lateral walls, the outer surface of which is flattened, triangular, and narrowing somewhat anteriorly; the inner margins of these plates are in contact along their posterior half, whereas they diverge along the anterior. The two lateral walls lean anteriorly on an arched transverse piece, situated between the coxæ of the fourth pair of legs posteriorly and bounding the cavity anteriorly; this transverse piece carries anteriorly a concave protuberance, barely as long as the transverse piece itself, and terminating anteriorly in a small subacute tooth.

The thelycum of the typical Japanese *Pen. latisulcatus* differs apparently by the lateral plates, which are in contact with each other nearly along their whole length, and the protuberance has also a different form. Perhaps this species may therefore eventually prove to be distinct, though I fully agree with the opinion of Lanchester (in Proc. Zool. Soc. 1901, vol. ii. p. 571), "that too little is known about the thelycum, and its possibly seasonal varieties within the same species, to justify the founding of a new variety on this character."

Probably one female from Thursday Island should be referred to *Pen. caniculatus*, Oliv., var. *australiensis*, Sp. Bate, but I hesitate to do so, as this variety is still insufficiently known.

## E.—COAST OFF BAHIA.

## PENÆUS (PENÆUS) BRASILIENSIS, Latr.

*Penæus brasiliensis*, Latreille, in Nouv. Dict. Hist. Nat. xxv. p. 256 (1817); Miers, in Proc. Zool. Soc. 1878, pp. 299, 306; von Martens, in Archiv f. Naturgeschichte, xxxviii. Jahrg. 1872, p. 140; Rathbun, in U.S. Fish Commission Bulletin for 1900, vol. ii. p. 100.

Five young specimens, dredged in a depth of  $2\frac{1}{3}$  fathoms off Bahia.

The largest specimen is 80 mm. long from the tip of the rostrum to the end of the telson, the smallest measures 65 mm. In all the basipodite of the first and second pairs of legs is armed with an acute spine, as also the ischium of the first pair; the third pair of legs is unarmed. In each specimen the lower margin of the rostrum is armed with *two* teeth; in three specimens the anterior of these teeth is placed just below the foremost tooth of the upper border, in the two others the posterior tooth is placed below it. In two specimens the upper border is armed with nine teeth, in one with ten, in two with eleven, and in all the first four teeth are placed upon the carapace.

According to Miss Rathbun, the carina on the fourth segment of the abdomen is very sharp in adult individuals which are 165 mm. long; in our younger specimens this carina is still only faintly developed. Otherwise these specimens agree with the descriptions in the references given above.

## SICYONIA, H. M.-Edw.

## SICYONIA SCULPTA, H. M.-Edw., var. ?

*Sicyonia sculpta*, H. Milne-Edwards, Hist. Nat. Crust. ii. p. 409; Heller, Die Crustaceen des südlichen Europa, 1863, p. 291; Spence Bate, Report on the 'Challenger' Macrura, p. 294, pl. 43. fig. 1.

Two females without eggs and one male were dredged off Bahia at a depth of  $2\frac{1}{3}$  fathoms.

*Sicyonia sculpta*, which inhabits the Mediterranean and Adriatic Seas, has also been captured off St. Vincent, Cape Verde Islands, by the 'Challenger' Expedition, and the 'Challenger' specimen seemed, according to the author of that Report, to agree with the Mediterranean species. When I now, however, compare the three specimens captured off Bahia with a specimen (♀) from Messina belonging to the Strassburg Museum (*vide* Ortmann, in Spengel, Zool. Jahrb., Syst. v. 1890, p. 453), I observe indubitable differences.

The two females are 40 mm. and 34 mm. long from the tip of the rostrum to the end of the telson, the younger male measures 32 mm. The specimen from Messina is 37 mm. long. The principal differences are the following:—The rostrum of the Mediterranean specimen projects almost horizontally forward, exactly as in the 'Challenger' female (Spence Bate, *l. c.* fig. 1), but the rostrum of the three American specimens is *more obliquely directed upward*, the straight lower margin, indeed, making an angle of about 30° with the upper border of the carapace. As regards the teeth on the latter and on the rostrum, the American specimens agree with that from Messina, but the third tooth

which stands at the base of the rostrum, is *much smaller* than the two preceding on the upper border of the carapace and than the corresponding tooth in the Mediterranean specimen. The straight upper border of the rostrum is armed with three teeth of equal size, of which the third or anterior, placed immediately behind the acute tip, is, in the larger female a little farther from the second than the second from the first, whereas in the two other specimens the second is a little farther from the first than from the third.

The straight lower margin of the rostrum ends in a sharp tooth, and, *exactly as in the specimen from Messina*, there are between this tooth and the tip, which is curved downward, nearer to the tip than to the tooth, *two* other pointed teeth which are also curved downward. According to Milne-Edwards the lower margin should carry only one tooth, according to Heller one or two, according to Spence Bate also one; Spence Bate is here, however, inaccurate, for he figures (*l. c.* fig. 1") two teeth below the tip. *In the specimen from Messina, as well as in those that were captured off Bahia, there are six teeth between the tip of the rostrum and the posterior margin of the carapace and three teeth below the tip.*

The abdomen agrees with that of the specimen from Messina, but the grooves, both the transverse and the oblique, are in the American specimens *much less deep and shallower*.

The third difference which I observe is presented by the first three pairs of legs, which in the specimens caught off Bahia are *a little slenderer*.

If the differences described are, indeed, constant, the American species should form a variety, for which the name *americana* is proposed.

#### SICYONIA CARINATA (Olivier).

*Sicyonia carinata* (Olivier), Spence Bate, Report on the 'Challenger' Macrura, p. 294, pl. 43. figs. 2, 3.

Three young specimens, dredged off Bahia,  $2\frac{1}{2}$  fathoms.

The largest specimen is 38 mm. long from tip of rostrum to the end of the telson.

These specimens fully agree, especially as regards the tothing of the rostrum, with the above cited figures of the 'Challenger' Report, the upper border of the rostrum carrying two teeth behind the acute tip and one immediately below it.

## EXPLANATION OF THE PLATES.

The specimens figured are from the Inland Sea of Japan, unless otherwise stated.

## PLATE 31.

- Fig 1. *Lambrus (Oncodolambrus) prædator*, de Man. × 3.  
 2. „ Cephalothorax viewed from in front, × 3.  
 3. „ Lower surface of the anterior part of the cephalothorax, × 10.  
 4. *Asthenognathus inæquipes*, Stimpson. Inferior view of the cervical region, × 17. (The oblique position of the figure is accidental.)  
 5. „ Left cheliped of the female, × 17 (the chela is turned a little backward, so that the full height of the palm is not visible).  
 6. „ Right leg of the antepenultimate pair, × 8½ (all the joints covered with a dark tomentum except the dactylus).  
 7. *Leucosia rhomboidalis*, de Haan. Abdomen of the male, × 3.  
 8. *Arcania heptacantha* (de Haan). Female, × 2.  
 9. „ Abdomen of a young male, × 3.  
 10. „ Cheliped of the female, × 2.  
 11. *Arcania globata*, Stimpson. × 3.  
 12. „ Front and anterior part of the cephalothorax viewed from above, × 10.  
 13. „ The same, lateral view, × 10.  
 14. *Galathea acanthomera*, Stimpson. External maxilliped of the right side of a male, × 17.  
 15. „ Leg of the second pair of the same, × 10.  
 16. *Crangon consobrinus*, de Man. Anterior part of carapace and eye-peduncles, × 8.  
 17. „ Tip of rostrum, × 50.  
 18. „ Antennal scale, without the setæ, × 8.  
 19. „ Chela, × 8.

## PLATE 32.

- Fig. 20. *Crangon cassiope*, de Man. Antennal scale without the setæ, × 5.  
 21. „ Extremity of the scale, without the setæ, × 25.  
 22. „ External maxilliped, × 5.  
 23. „ Chela, × 10.  
 24. „ Left leg of the fifth pair, × 5.  
 25. „ Dactylus of the same leg, × 10.  
 26. *Leander longipes*, Ortmann. Telson of the egg-bearing female, × 5.  
 27. „ Extremity of the telson, × 25.  
 28. „ Right leg of the second pair, × 4.  
 29. „ Tothing of the same leg, × 25.  
 30. „ Teeth, more magnified, × 50.  
 31. *Spirontocaris rectirostris* (Stimpson). Egg-bearing female, × 3.  
 32. „ Antennal scale, without the setæ, × 6.  
 33. „ Supposed male, × 3.  
 34. „ Antennal scale of the male, × 6, also without the setæ.  
 35. *Spirontocaris propugnatrix*, de Man. × 3.  
 36. „ Extremity of the rostrum, × 6.  
 37. „ Part of the rostrum, where the teeth of the lower margin begin, × 6.  
 38. „ Anterior part of the carapace, × 10.

- Fig. 39. *Spirontocaris propugnatrix*. Posterior half of abdomen,  $\times 6$ .  
 40. „ Extremity of telson,  $\times 50$ .  
 41. „ Extremity of left antennal scale,  $\times 10$ , without the setæ.  
 42. *Spirontocaris alcimede*, de Man.  $\times 3$ . One of the specimens in which a pterygostomian spinule occurs.  
 43. „ Rostrum of another specimen, which is  $\frac{2}{5}$  toothed,  $\times 6$ . (The rostrum of this figure should point upward.)  
 44. „ Posterior half of the abdomen of the same individual,  $\times 6$ .  
 45. „ Eye-peduncles and both pairs of antennæ of the same specimen,  $\times 6$ .  
 46. „ Leg of the second pair of the same specimen,  $\times 10$ .  
 47. *Spirontocaris pandaloides*, Stimpson. Cephalothorax, rostrum, and antennal scale of an adult specimen,  $\times 3$ .  
 48. „ Leg of the second pair of another individual,  $\times 10$ .

## PLATE 33.

- Fig. 49. *Hippolyasmata vittata*, Stimpson. Cephalothorax, antennulæ, and antennæ of an egg-bearing female,  $\times 3$ .  
 50. „ Terminal part of the abdomen of the same female,  $\times 3$ .  
 51 & 52. *Alpheus brevirostris* (Olivier). Chelæ of the smaller cheliped in the two egg-bearing females, viewed from the outer side,  $\times 3$ .  
 53. *Alpheus japonicus*, Miers. Chela and carpus of the smaller cheliped of one of the two males, viewed from the upper or inner side,  $\times 2$ .  
 54. *Penæus (Metapenæus) akayebi*, Rathbun. Stridulating-organ of the female, on the right side of the carapace,  $\times 17$ .  
 55. *Penæus (Metapenæus) acclivis*, Rathbun. Thelycum, viewed from outer side,  $\times 5$ .  
 56. *Penæus (Trachypenæus) curvirostris*, Stimpson. Thelycum,  $\times 5$ .  
 57. „ First segment of the abdomen, lateral view, presenting the fissure near the lower margin,  $\times 3$ .  
 58. „ Telson of the same female,  $\times 5$ .  
 59. *Potamon (Parathelphusa) endymion*, de Man. Egg-bearing female from the lake at Yunnan-Fu, China,  $\times 2$ .  
 60. „ Anterior part of the cephalothorax,  $\times 3$ .  
 61. „ Lower side of the anterior part of the cephalothorax,  $\times 3$ .  
 62. „ External maxillipeds of the same female,  $\times 3$ .  
 63. „ Right (larger) chela of the same female,  $\times 3$ .  
 64. *Potamon (Parathelphusa) lanzi*, Doflein, typical male specimen from the lower Han River, China (belonging to the Museum of Munich), external maxilliped,  $\times 3$ .  
 65. „ Larger (right) chela of the same male, outer side,  $\times 2$ .  
 66. *Palæmon (Parapalæmon?) hendersoni*, de Man, anterior part of the cephalothorax of the largest specimen from Darjeeling, in which an hepatic spine is wanting,  $\times 3$ .  
 67. „ Telson of the same specimen,  $\times 3$ .  
 68. „ Left leg of the second pair of the same specimen,  $\times 3$ .  
 69. *Penæus (Penæus) latisulcatus*, Kishinouye, var.? Thelycum, viewed from the outer side,  $\times 6$ .

## ADDITIONAL NOTES.

## A.

(Page 418.) According to Lenz's paper in Spengel's Zool. Jahrb., Syst. xiv. 1901, p. 429, Bare Island should be situated between Vancouver Island and the continent; afterwards, however, Prof. Lenz informed me that this very small island is situated close to the east coast of the northern island of New Zealand, between lat. 40° and Cape Kidnappers.

## B.

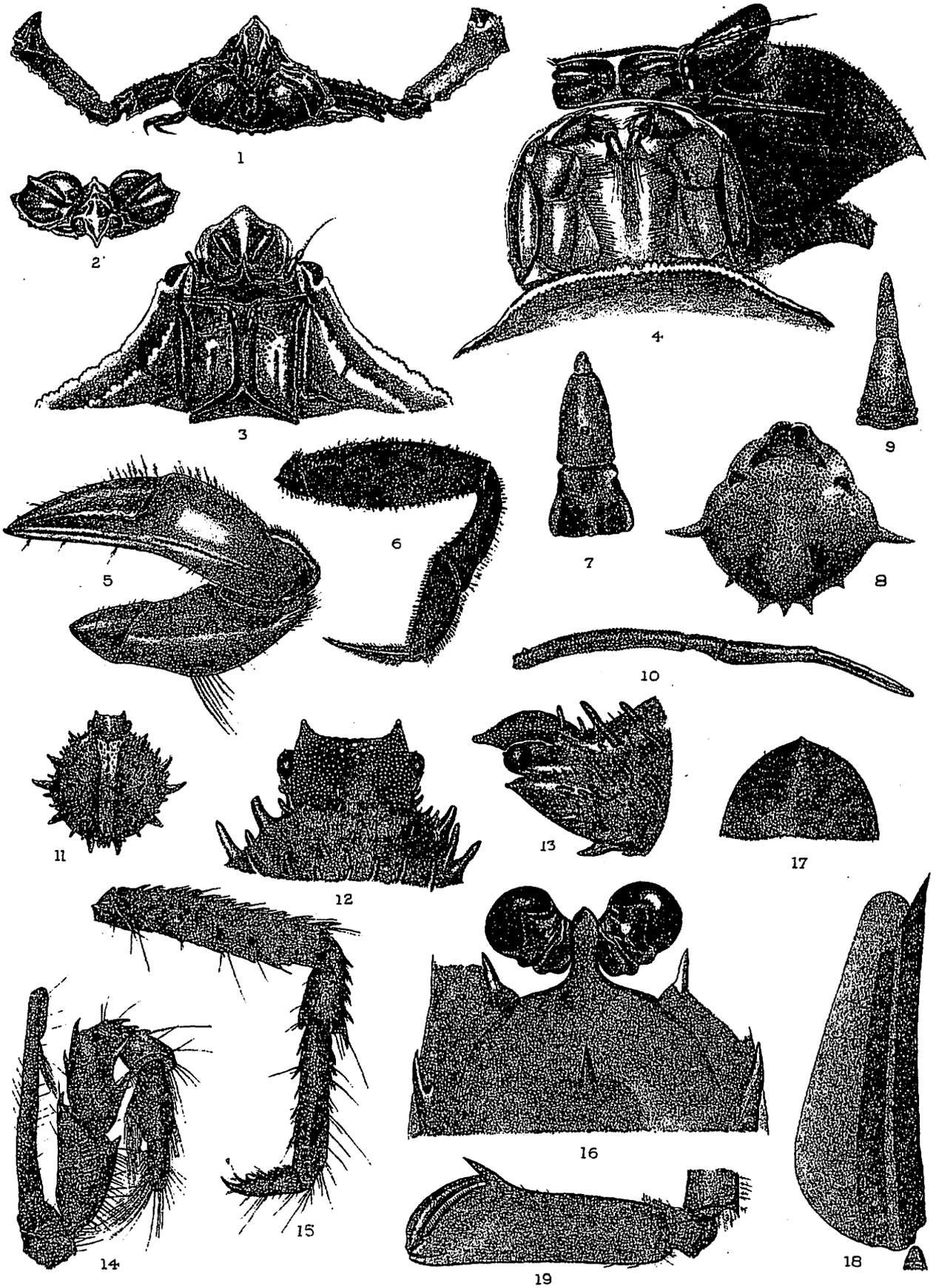
(Page 436.) *PENÆUS TENELLUS*. The thoracic legs seem to be devoid of epipodites, and the exopodite of the fifth pair is rudimentary or wanting. *Parapeneopsis acclivirostris*, Alcock, has a longer rostrum, recurved at the tip, the thelycum different, and the antennular flagella are shorter.

## C.

(Page 441.) *POTAMON SPINESCENS*. The fingers of the *smaller* cheliped are also, in these adult males, distinctly spoon-shaped, excavated at the tips, but those of the larger leg show a tendency to lose this spoon-like shape, the fingers appearing obtuse at their tips. Whereas the fingers of the smaller cheliped still shut nearly close together, those of the larger become gradually more gaping, and in the largest specimen the dactylus is strongly *arched* and there is a *large* interspace between both fingers; the excavation of the tips of the fingers has become quite indistinct, though it is still perceptible. The larger chela of this male is just as long as the cephalothorax is broad; the palm, measured horizontally, appears once and half as long as the fingers, and the height of the palm near the articulation of the dactylus is equal to the horizontal length of the fingers. Palm and fingers are quite smooth; the dactylus carries 12 or 13 obtuse teeth of different size, of which the first, near the base, is larger than the rest; the immobile finger is also armed with some obtuse, unequal teeth.

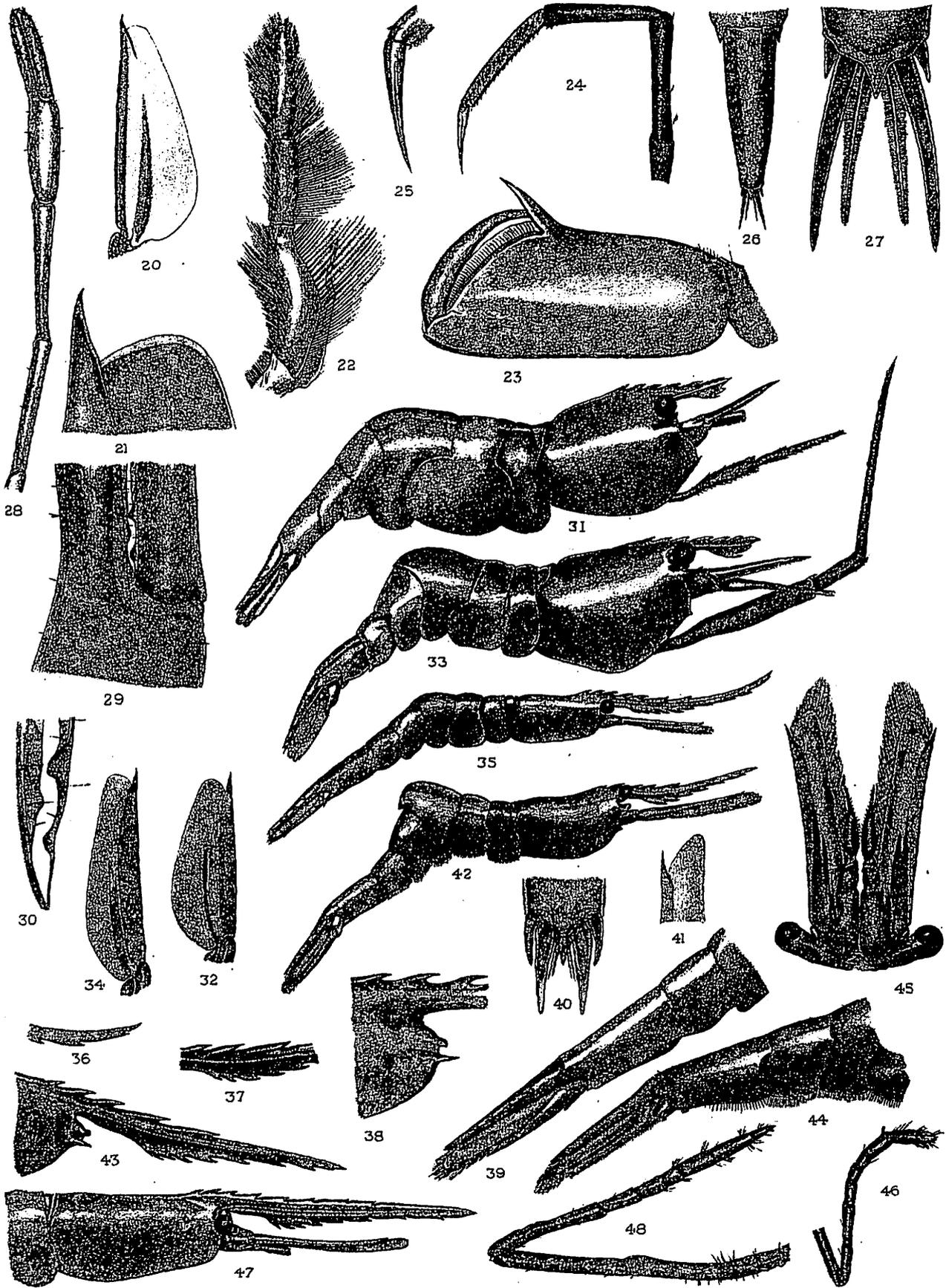
The chelipeds are yellow, but the upper surface of the carpus, the upper border of the palm and of the dactylus, as also the upper end of the arm, are of a beautiful red.

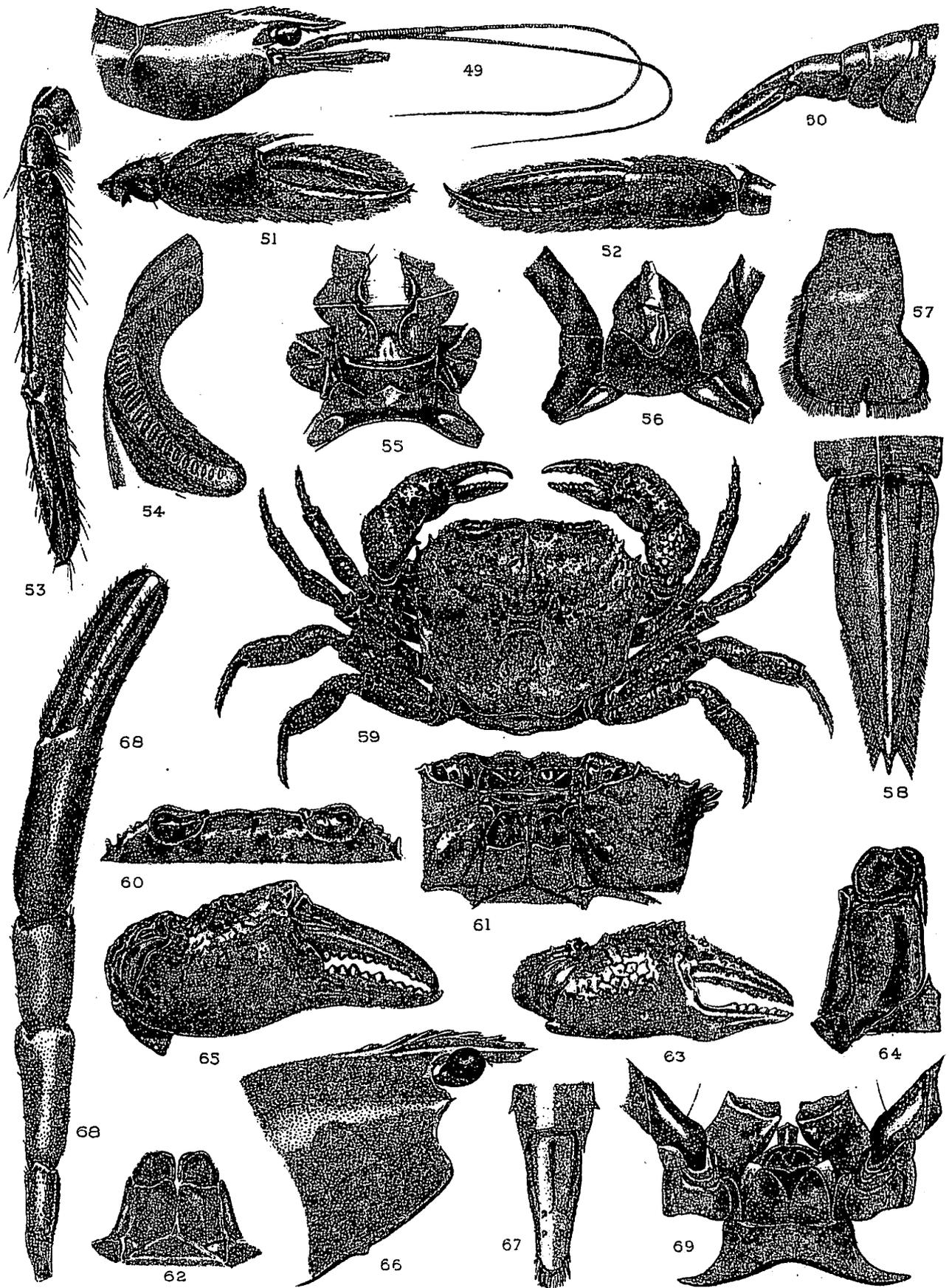
[12th February, 1907.]



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CRUSTACEA FROM JAPAN AND OTHER COUNTRIES.