

The resemblance of the several species to each other appears to be great; the only appreciable distinction in the several descriptions, as given by their authors, exists in the variation of length and form of the rostrum.

Nika processa, n. sp. (Pl. XCV.).

Carapace one-third the length of the animal, anteriorly produced to a narrow pointed rostrum, subequal in length with the ophthalmopoda. Pleon smooth, having all the somites dorsally parallel.

The ophthalmopoda are pyriform and stand upon a small pedicle. The ophthalmus is large and reniform.

The first pair of antenna has the first joint deeply excavate on the upper surface, the second is cylindrical and as long as the first, and the third short and terminally supporting two unequal flagella, the shorter being subequal in length with the peduncle, the longer subequal with the animal.

The second pair carries a scaphocerite that is subequal in length with the peduncle of the first pair, and terminates in a long flagellum, now broken off at the length of the carapace, but in its perfect state it was probably longer than the animal.

The second pair of gnathopoda has the terminal two joints together shorter than the antepenultimate.

The first pair of pereopoda has the left limb, which is of generic value, broken off; that on the right is shorter than the second pair of gnathopoda, it is tolerably robust and terminates in a small chela. The second pair is long and slender, it has the carpos multiarticulate, and terminates in a minute chela; the right appendage being longer and more flexible than the left. The last three pairs are long and slender, the carpos being equal in length to the ischium and meros combined, and more than twice the length of the propodos; the dactylos is long and styliform.

Length, 26 mm. (1 in.).

Habitat.—Amboina; depth, 15 fathoms. One specimen; female.

Observations.—This was the only specimen of this species taken during the Challenger Expedition, and it is laden with numerous small ova. It bears a close general resemblance to the European type (*Nika edulis*); it appears to differ from it chiefly in size, the latter being three inches long, in the form of the ophthalmopoda, which are more pear-shaped, and in the length of the pereopoda, which are more slender.

On the label within the bottle the specimen is recorded as having been taken on the 6th October 1874, at a depth of 15 fathoms, at Amboina, the most southern island of the Molucca Group, near Station 195, while in the list of Stations the sounding is given as 1425 fathoms, so that, the Station being about 30 miles from shore, we may assume our specimen to have been a straggler taken near the surface.

Family ALPHEIDÆ.

This family consists of those genera that have the following common characters:—The rostrum reduced to a minimum; the ophthalmopoda short and entirely covered by the projection of the frontal margin of the carapace; the mandible carrying a psalidoma distinct from the molar process, and a two-jointed synnhipod; the first pair of pereopoda asymmetrical, on one side having the carpos short and the propodos large and normal in form, and on the other very large and variably irregular; the second pair of pereopoda long and slender, with the carpos multiarticulate and terminating in a minute chela; and, finally, the telson broad and rounded.

Athanas, Leach.

Athanas, Leach, Edin. Encycl., vol. vii. p. 432.

„ Leach, Malacos. Pod. Brit., pl. xlv.

„ Milne-Edwards, Hist. Nat. Crust., tom. ii. p. 365.

Dorsal surface of the carapace without a carina; anteriorly produced to a rostrum, not laterally compressed; orbital margin furnished with a supraorbital tooth.

Pleon smooth and gradually tapering.

Ophthalmopoda short, scarcely reaching beyond the frontal margin of the carapace.

First pair of antennæ having a long stylocerite, and terminating in two flagella, of which the upper is unequally biramous.

Second pair long, slender, and carrying a long ovate scaphocerite, armed with a distal external tooth.

Mandible furnished with a two-jointed synnhipod.

Second pair of gnathopoda pediform, five-jointed, robust.

First pair of pereopoda subequal, symmetrical, robust, chelate. Second pair multiarticulate, minutely chelate. Three succeeding pairs simple.

Rhipidura well developed.

Telson dorsally flat and laterally tapering.

Geographical Distribution.—European Shores and Cape Verde Islands.

Hitherto the genus has been represented only by one species, and that sparingly taken on the coasts of England and Norway. On the coasts of Devon and Dorset, and the Channel Islands, it has been taken occasionally and sometimes abundantly, and Sars records it from Christiania Fjord in Norway. I am not aware of its having been previously taken elsewhere, but the new form, *Athanas veloculus*, was captured off the Cape Verde Islands by the Challenger.

Athanas veloculus, n. sp. (Pl. XCVI. fig. 1).

Rostrum reaching nearly to the extremity of the peduncle of the first pair of antennæ.

Ophthalmopoda almost hidden beneath the anterior margin of the carapace.

First pair of antennæ furnished with a long stylocerite, and supporting two flagella, of which the upper is unequally bifid. Scaphocerite of the second pair of antennæ reaching to the extremity of the rostrum.

Second gnathopod reaching beyond the scaphocerite.

Length, entire,	7 mm. (0.27 in.).
" of carapace,	2 "
" of pleon,	5 "

Habitat.—Cape Verde Islands. Two specimens.

This species bears a resemblance to *Athanas nitiscens*, Leach, the type of the genus, but differs in having the ophthalmopoda covered to a greater extent by the orbital margin of the carapace, a portion of the ophthalmus alone being visible. Above the eye on the inner side of the orbit there is a small sharp tooth, which does not exist in *Athanas nitiscens*, and the outer canthus is also produced to a strong tooth, external to which the frontal margin is produced and armed with a sharp tooth both above and below the first antennæ, and the fronto-lateral angle is rounded.

Both pairs of antennæ correspond with those of *Athanas nitiscens*, or differ only in points of specific value. The oral appendages have not been examined in this species, but the second pair of gnathopoda is relatively longer than that represented in Leach's figure of *Athanas nitiscens*.

The first pair of pereopoda is wanting in our specimens. The second is slender and has the carpos multiarticulate, but comparatively longer than in *Athanas nitiscens*. The three posterior pairs are simple and similar in form; the carpos is short, the propodos long, cylindrical, and fringed with hairs on the posterior margin; the dactylos is short and unguiculate.

The pleopoda are biramose and foliaceous, and the lateral plates of the rhipidura are longer than the telson. The outer plate is furnished with a well marked diæresis, the outer margin of which is defined by a small tooth, beyond which the outer plate as well as the inner is fringed with hairs. The telson is tapering, dorsally armed on each side with three single spinules and terminally fringed with small hairs.

Observations.—Although the infraorbital tooth is of generic rather than specific value, I do not consider myself justified in separating this species from *Athanas* until more and better specimens have been examined.

Parathanas, n. gen.

Animal robust. Carapace about one-third of its length. Rostrum short. Pleon having the sixth somite nearly as long as the two preceding. Telson half the length of the sixth somite.

Ophthalmopod short, orbicular.

First pair of antennæ considerably longer than the ophthalmopoda and terminating in two flagella.

Second pair carrying a long and narrow scaphocerite.

First pair of pereopoda robust, chelate; second pair slender, chelate, having the carpos multiarticulate; third and fourth pairs short and simple; fifth pair very long and slender, and (probably) styliform.

There is only one perfect specimen in the collection and that is immature. It is closely allied to *Athanas*, but differs from that genus in having only two simple flagella, one of which is very short, attached to the extremity of the first pair of antennæ, and in having the posterior pair of pereopoda longer than the preceding.

Geographical Distribution.—The two species were taken near the Celebes Islands.

Parathanas decorticus, n. sp. (Pl. LXXXIX. fig. 3).

Animal moderately robust. Rostrum short, dorsally smooth and pointed.

Ophthalmopod orbicular, scarcely longer than the rostrum. First pair of pereopoda larger than the second; second more slender, but not longer than the first; posterior pair of pereopoda longer than the others.

Telson pointed.

Length, entire,	6 mm. (0.23 in.).
„ of carapace,	2 „
„ of rostrum,	0.5 „
„ of pleon,	4 „
„ of sixth somite of pleon,	1.3 „
„ of telson,	1 „

Habitat.—October 23, 1874; taken off Sibago, Samboangan, Philippine Islands, in 80 fathoms. One specimen.

The animal generally is tolerably robust. The carapace, which is 2 mm. long, is rather more than one-third the length of the animal, measured from the frontal margin to the extremity of the telson; the rostrum is short, being about one-fourth the length of the carapace, and is dorsally flat, smooth, and pointed.

The pleon has the anterior somites shorter than the posterior, of which the fourth

and sixth are the longest, the fifth being shorter than the fourth; the sixth, which is 1.3 mm. long, is nearly equal to the fourth and fifth together. The telson is long, narrow and pointed.

The ophthalmopoda are short and orbicular, reaching but slightly beyond the apex of the rostrum.

The first pair of antennæ consists of a peduncle of three joints, of which the first or basal joint reaches considerably beyond the extremity of the eye, the second and third joints are short and subequal, and terminate in two slender flagella, the outer of which consists of four short articuli that taper to a point, and the inner is slender and broken off at a short distance from the base. The second pair of antennæ carries a long and narrow scaphocerite, that is armed with a small tooth at the outer distal extremity. The flagellum is broken off close to the peduncle.

The oral appendages have not been examined, as they could not be dissected out without risk to the specimen.

The first pair of pereopoda (fig. 3*k*) is tolerably robust, and terminates in an ovate chela, of which the fingers are about one-third the length of the palm; the carpos is short, and, like the meros, which is tolerably long, increases in size towards the distal extremity. The second pair of pereopoda (fig. 3*l*) is subequal in length with the first, but is much more slender, and also terminates in an ovate chela of which the fingers are about one-fourth the length of the palm; the carpos is longer than the propodos and quinque-articulate, the distal articulus being the longest. The third and fourth pairs of pereopoda (figs. 3*m*, 3*n*) are alike in size and form, and are subequal to the second pair, but terminate in a short, sharp pointed, and simple dactylos. The fifth pair is broken off beyond the meros, but the portion that remains indicates a much longer appendage; like the preceding, the basis and meros are short and stout, whereas the meros is long, slender, and straight, almost equalling the entire length of the preceding perfect limb.

The first pair of pleopoda is single-branched, and the four succeeding pairs are biramose. The terminal pair, which forms the outer plates of the rhipidura, is biramose.

Observations.—The specimen from which this description is taken is evidently an immature animal, and it is not improbable that in a more fully developed condition some parts may vary in their proportions.

It cannot be the young of *Athanas*, on account of the form of the first pair of antennæ, and of the length of the posterior pair of pereopoda.

The animal, when it was captured, was just about to cast its exuvium, which hangs about it as a thin transparent membrane, and the form which I have just described is rather that of the future appearance than of the loose external skin.

The scaphocerite is visible within the external exuvium, and its form is more perfectly defined than in the latter; the hairs, which are absent from the envelope, are distinctly visible in their connection with the new structure.

The form of the first pair of pereiopoda exactly corresponds with the dermal tissue, excepting that the chelate hand appears to be formed within a case in which the fingers are enclosed within one sac. The second pair is still more evidently undergoing a change, for not only is the hand with its two fingers confined in one and the same sac, but the five articuli of the carpos are enclosed within one continuous envelope, which is minutely corrugated, as if it had the capacity of being stretched by the growth of the included organ.

The third and fourth pairs of pereiopoda are also visible within the outer sac, through the extremity of which the point of the dactylos appears to force its way.

The outer plates of the rhipidura and telson are also seen to be undergoing a change within the exuvium; the outer branch appears to be dividing to form the diæresis, and the hairs at the extremity are all telescoped in their length, as if on being liberated they were capable of shooting out to their full extent.

Parathanas immaturus, n. sp.

A damaged specimen of what appears to be another species was taken in the same region, in Zebu Harbour, in January 1875, at the surface of the sea.

The only distinguishable difference is that the rostrum is longer in proportion to the animal, which has a length of scarcely 5 mm. (0.19 in.).

Unfortunately all the pereiopoda are broken off short, and there is little to determine the true character of the specimen.

Cheirothrix, n. gen.

Carapace anteriorly produced to a sharp rostrum that is separated by a groove from the orbital lobes, which are anteriorly produced to a sharp point. Fronto-lateral angle produced to a point. Anterior somites of the pleon as deep as the carapace.

Ophthalmopoda reduced to a minimum and concealed beneath the frontal margin of the carapace.

First pair of antennæ biramose and furnished with a well-developed stylocerite.

Second pair furnished with a short and broad foliaceous scaphocerite, which is strengthened on the outer side by a rigid margin and a small tooth.

First pair of gnathopoda having the terminal joints reflexed, the basis carrying a long and slender ephysis.

The second pair is slender, four-jointed, and pediform.

The first pair of pereiopoda has large chelæ. The second pair is shorter than the third, slender, having a carpos with five articuli, and terminating in an extremely minute

chela, which breaks up into a brush of numerous, peculiar, thick, scaly hairs. The three succeeding pairs of pereiopoda are moderately robust and terminate in a single unguis.

The pleopoda are biramose, and the rhipidura well developed.

This genus, if it be separate from *Alpheus*, rests its characters chiefly on the form of the second pair of pereiopoda, which, instead of having the carpos long, multiarticulate, and terminating in a small chela, has it short and only five-articulate, the propodos being long, narrow, and gradually tapering to a point that is tipped with a brush of radiating hairs. The dactylos with the polliciform extremity forms an extremely small chela, which is scarcely determinable under a magnifying power of sixty diameters, and the fingers of which are broken up into and support numerous hairs.

Cheirothrix parvimanus, n. sp. (Pl. XCVI. fig. 2).

Dorsal surface of the carapace continuous in the same horizontal line with the pleon. Rostrum slightly elevated at the apex; frontal margin of the orbital lobes produced to a sharp point reaching nearly as far as the rostrum.

Pleon having the somites anteriorly as deep as the carapace and gradually lessening posteriorly.

The ophthalmopoda are short and entirely hidden beneath the carapace.

The first pair of antennæ has the first joint of the peduncle subequal with the length of the rostrum, and carries a strong stylocerite that reaches beyond the extremity of the first joint; the second and third joints are short, and together subequal with the first, the third supports two flagella, of which the principal one is the shorter and is furnished with a thick mat of membranous cilia, and the other is equal in length to the carapace.

The second pair of antennæ is nearly as long as the animal and supports a scaphocerite that is broad, ovate, and armed with a tooth on the outer margin.

The first pair of gnathopoda has the distal joints reflexed, and the basal carries a long cecyphsis.

The second pair is long and slender, carries a long basecephysis, and is tipped with several small spinules.

The first pereiopod on the left side has the propodos long and subcylindrical, the pollex straight, slightly oblique, and tapering, and the dactylos longer than the pollex, and at the extremity strongly curved and pointed. The second pair of pereiopoda is short, having the carpos five-articulate, the propodos long and tapering, and at the extremity tipped with a radiating bunch of hairs.

The rest of the animal is like *Alpheus*, but since the first pereiopod has been lost from the right side, there is no means of determining whether the pair be symmetrical, as in *Athanas*, or asymmetrical, as in *Alpheus*. I am, therefore, induced to consider it as a link between these two genera.

Length, entire,	13 mm. (0.5 in.).
" of carapace,	4 "
Depth of carapace,	3 "
Length of pleon,	9 "
" of second gnathopod,	5 "
" of large chela,	4 "
" of second pereopod,	4.5 "
" of telson,	2.5 "

Habitat.—Station 186, September 8, 1874; lat. 10° 30' S., long. 142° 18' E.; off Cape York; depth, 8 fathoms; bottom, coral mud. One specimen. Dredged.

The dorsal surface of the carapace is not elevated over the gastric region, and the rostrum runs to a sharp point slightly directed upwards anteriorly. The orbital lobes correspond much with those in *Neptunus biunguiculatus*, and the ophthalmopoda (fig. 2a, a) are hidden under the frontal margin of the carapace, which is not sufficiently thin over the ophthalmus to permit of the latter being seen through it, but it is visible in front when viewed anteriorly.

The first pair of antennæ (fig. 2b) has the first joint subequal in length with the rostrum; it is excavate on the upper surface and carries a large stylocerite, at the base of which may be seen the acoustic apparatus in the form of a transparent spherical chamber with a small round body within. The stylocerite is pointed and reaches beyond the extremity of the first joint; the second and third joints are shorter than the first, and terminally support two flagella, the primary, which is the more robust, widens for a distance and carries a considerable number of closely packed membranous cilia, after which it rapidly narrows to a slender extremity; the second flagellum is about twice the length of the first and more slender; it is about the length of the carapace.

The second pair of antennæ (fig. 2c) has a flagellum that is about the length of the animal, and carries a scaphocerite that is a little longer than the peduncle of the first pair; it is broad and rounded at the extremity, and armed on the outer side with a short, stout, sharp tooth, and on the inner and distal margins with long and ciliated hairs.

The mandibles and oral appendages have not been examined in the solitary specimen.

The first pair of gnathopoda (fig. 2h) apparently consists of only four joints; the basis, meros, and ischium appear to be united together to form a single joint, and from a prominence near the base of this joint an ephysis arises that is slender, flexible, nearly double the length of the whole appendage, and multiarticulate almost from the base to the apex, where there are a few unimportant hairs. The next joint is short and probably homologises with the carpos, and the propodos articulates with it on its inner rather than on its distal surface; the latter is long, broad and curved, the lateral margins being parallel, the anterior concave, and the posterior convex; the distal extremity is oblique, straight, and fringed with a series of numerous closely packed

hairs. The anterior margin near the carpal extremity has a small lobe, from the surface of which radiate four stiff straight hairs or spines; this lobe appears to be imperfectly articulated to the propodos, and if so must be the homologue of the dactylos.

The second pair of gnathopoda (fig. 2i) is pediform. It is slender and consists of four joints, of which the coxa is broad, the second joint is narrow, and near the base, which is considerably more slender than the first joint, is a long uniaarticulate basephysis, that is equal in length to the joint to which it is attached, which, I consider represents the basis, ischium, and meros fused into one; the third joint, which represents and probably homologises with the carpos, is short, and the terminal joint, which is probably the propodos, is long, slender and slightly tapering; it is terminally armed with three or four short spinules, and fringed on the inner side with several small bundles of hairs.

The first pair of pereopoda has, in our specimen, the appendage on the right side missing; that on the left is large, but neither of excessive nor abnormal growth; the ischium unites with the meros by an oblique and semi-anchylosed articulation; the carpos is short, slightly produced on the lower margin and excavate on the anterior margin both above and below the point of articulation with the propodos; the propodos is not broader than the carpos, and measured to the extremity of the pollex it is nearly as long as the carapace, it is nearly cylindrical, with the margins slightly waved and parallel; the pollex is long, straight and tapering, it is slightly oblique to the longitudinal axis of the propodos, and impinges closely against a long, curved, and tapering dactylos, which, when closed, overlies and curves over the extremity of the pollex.

The second pair of pereopoda (fig. 2l) is shorter and more slender than the first; the coxa is the shortest and most robust joint; the basis is short and articulates obliquely with the ischium, projecting on the under surface; the ischium is long, enlarges near the middle, and tapers slightly to the meros, with which it articulates at the extremity; the meros is as long as the ischium, enlarges near the middle, and tapers to the carpos, which is a little longer than the meros and is five-articulate, the articuli at the proximal and distal extremities being the longest, and the three in the middle short and equal; the propodos is nearly as long as the carpos, and of the same diameter at the base, whence it gradually tapers to the extremity, from which a bundle of curiously formed hairs radiates, forming a peculiar brush. The chela is extremely minute, since it is difficult to be determined under a power of sixty diameters, but under a higher power it becomes visible (fig. 2l''), the extremity of each finger gradually passing into the condition of a broad hair, and these are flanked on both pollex and dactylos by longer hairs of a similar kind. These hairs (fig. 2l''') appear to be of the same diameter from base to apex, but near the base and for about half their length the surface appears to consist of scales which gradually pass into minute hairs forming a closely packed fur towards the extremity. I counted about twelve in all; they are large in proportion to the size of the chela. In species of *Alpheus* numerous strong but simple hairs not infrequently adorn the

fingers of the chela, but they are only subservient to the larger organ, while in this case the chela is rudimentary. The presence of long calcified tendons within the propodus is strong evidence that the dactylos is a movable joint, and the movable power that it possesses must have its usefulness increased by the presence of these long hairs. It appears to offer an example of how a simple and apparently useless organ may by adaptation become converted into one of importance.

The third pair of pereopoda is longer than the second and more robust, and terminates in a short, single, sharp pointed unguis; the carpos and the meros at their distal articulation on the upper surface overlap the next succeeding joint. The fourth pair of pereopoda resembles the third in proportion and form. The fifth is shorter and terminates in a stunted dactylos.

The pleopoda are biramose and subequal.

The lateral plates of the rhipidura are longer than the telson and possess a small diæresis.

The telson is long, slender, and tapering.

Observations.—This, our only specimen, is small and semi-transparent. It was dredged in the same locality as *Synalpheus*, *Paralpheus*, *Alpheus avarus*, and that which I have thought resembles *Alpheus acuto-femoratus*. The form of the chela in this species so greatly corresponds in appearance with that of the right or smaller one in *Synalpheus falcatus* that I at first thought it must be a younger form of that species, or at least of some species of the same genus, but an examination of certain parts renders this most improbable. In *Synalpheus falcatus* the dorsal surface of the carapace is elevated into a carina, which decreases in intensity on the pleon, but still remains conspicuous, although more as a dorso-lateral compression than as a distinct keel. In *Cheirothrix parvimanus* the carapace is not elevated and the dorsal surface is smooth and even. In *Synalpheus* the first pair of antennæ has a tendency to divide into two at the extremity of the stouter flagellum, which does not appear to be the case in *Cheirothrix*. The second pair of antennæ in *Synalpheus* has the scaphocerite sharp pointed, and the outer styliform process separated from the inner foliaceous plate by nearly half its length. In *Cheirothrix* it is broad and ovate, rigid on the outer margin, and connected with the foliaceous plate to near its distal extremity, where it terminates in a short tooth. The first pair of gnathopoda differs in form, and also apparently in structure, since in *Synalpheus* the position of the dactylos varies from that in *Cheirothrix*, and in the latter genus the second pair at its distal extremity is tipped with short spinules, while in *Synalpheus* it terminates in two points and a few fine hairs.

The generic distinction between this species and those of *Alpheus* or its allies must rest upon the importance of the change in the form of the second pair of pereopoda.

In all species of *Alpheus* and its related genera the second pair of pereopoda is as long as, or longer than the third pair, it is slender and has the carpos more or less

numerously multiarticulate, and terminates in a small but apparently efficient chela, generally ovate in form. In *Cheirothrix* the second pair of pereopoda is shorter than the third, the carpos is only a trifle longer than the meros and only five-articulate, and the propodos is as long as the carpos—a feature unknown in *Alpheus*—and instead of being ovate it gradually tapers from the same diameter as the carpos to a point, which appears to be broken into hairs of unusual and peculiar form as above described.

It is to be regretted that there is but one specimen, which precludes my being able to examine other and less conspicuous parts.

Alpheus, Fabricius.

Alpheus, Fabricius, Suppl. Entom. Syst., p. 404, 1778.

„ Risso, Crust. de Nice, p. 88, 1816.

Alphæus, Desmarest, Consid. sur les Crust., p. 222, 1825.

Alpheus, Milne-Edwards, Hist. Nat. Crust., tom. ii. p. 349.

This genus was first established by Fabricius, but was not clearly defined until Milne-Edwards described it.

The whole of the animal is dorsally rounded and laterally compressed; the ophthalmopoda are reduced in size, so that they are hidden beneath the anterior region of the carapace, which is so extremely thin over them as to become transparent, thus protecting the eyes without interfering with vision. The rostrum is short and pointed.

The first pair of antennæ has the peduncle short; the first joint is flattened, and carries a short stylocerite on the outer side, and the terminal supports two flagella, the inner of which has a tendency to bifurcate.

The second pair carries a long flagellum and a strong scaphocerite that terminates in a subapical point or sharp tooth.

The mandibles are robust, furnished with a molar protuberance distinctly separated from the concave and serrate psalidoma, and carry a short three-jointed synhipod.

The first pair of gnathopoda is short and five-jointed, the ultimate joint articulated at the inner and posterior angle of the penultimate, and reflexed against its inner margin.

The second pair of gnathopoda is pediform, five-jointed, subcylindrical, and carries a short and slender basephysis.

The first pair of pereopoda is chelate, carries a large propodos, that on the right side being generally larger than that on the left, and is of a more or less abnormal form especially in the male. The second pair of pereopoda is slender, minutely chelate, having the carpos long, cylindrical, and multiarticulate. The posterior three pairs are simple and terminate in a short robust dactylos.

The pleon is short and terminates in a telson that is broad and rounded; the outer plates of the tail-fan are furnished with a strongly marked diæresis.

The branchial arrangement, as I have observed it in the specimens of *Alpheus edwardsii* from the Cape Verde Islands, may be tabulated as follows:—

Pleurobranchiæ,	.	.	.	...	...	1	1	1	1	1
Arthrobranchiæ,	.	.	.	...	1	...	...	...	...	...
Podobranchiæ,	.	.	.	...	...	...	...	...	...	...
Mastigobranchiæ,	.	.	.	r	r	r	r	r	r	...
				h	i	k	l	m	n	o

The mastigobranchiæ are all rudimentary in appearance, but they evidently have some office to fulfil, since they terminate in a strong and peculiarly shaped hook.

The branchial plume belonging to the second pair of gnathopoda is small, and consists of a bundle of leaflets attached to the flexible membrane of the coxal articulation.

Development.—The brephalos in this genus may be a Zoea or Megalopa. In the Zoea (Pl. LXXXIX. fig. 4) there is neither rostrum nor dorsal tooth, and the ophthalmopoda are large. The figure is from a specimen obtained direct from the parent by Mr. Power, from a species resembling *Alpheus neptunus*, Dana, procured at the Mauritius. The ophthalmopod is orbicular and consists of the ophthalmus only. The first pair of antennæ has a single-jointed peduncle and two small branches, one being a long plumose hair, the other short, conical, and carrying three membranous cilia. The second pair of antennæ consists of a peduncle, flagellum, and scaphocerite which is multiarticulate and fringed with hairs. The oral appendages I have not examined, but they are succeeded by three pairs of biramose appendages, by the deciduous representatives of the third pair of siagnopoda, and the first and second pairs of gnathopoda. Posterior to these there appear to be no other appendages either on the pereion or pleon. The telson terminates in a broad fish-tail fan, fringed with ciliated hairs and flanked by a simple spine at each extremity. A specimen which I consider to be the young of this genus was taken at the surface, off the African coast of the Atlantic, on April 13, 1876, apparently only recently hatched.

In some species the brephalos appears to be in a more advanced form and is hatched in the Megalopa stage (Pl. CXXII. fig. 1), and this distinction occurs in species very closely resembling those producing the Zoea form.

This peculiarity of development was first described by myself in a memoir with drawings communicated to the Royal Society,¹ from specimens obtained by Mr. Power in the Mauritius, and the fact has since been confirmed by Mr. Puckard.²

The original of my drawing is 2 mm. in length and was procured from a specimen 14 mm. long, resembling the figure that I have given of *Alpheus minus*, Say.

The carapace is about one-fourth the length of the animal and has no rostrum. The

¹ *Proc. Roy. Soc.*, vol. xxiv. p. 375, 1876.

² *American Naturalist*, vol. xv. p. 788, 1881.

pleon is nearly three times as long as the carapace and terminates in a telson that is rounded at the extremity and fringed with ciliated hairs, flanked with a small spine on each side, and one on each side of the median line.

The ophthalmopod is orbicular and projects free in front of the frontal margin.

The first pair of antennæ carries two short flagella. The second pair is styliform and supports a small bud-like process near the middle.

The mandibles and first pair of siagnopoda have not been examined.

The second and third pairs consist of a peduncle and two unequal branches, the longer, which I take to be the basephysis, is tipped with four or five long ciliated hairs; the shorter, which appears to be the incipient condition of the permanent joints, terminates in three or four simple hairs.

The first and second pairs of gnathopoda resemble the preceding two pairs of appendages but are slightly longer.

The first pair of pereiopoda is in an advanced condition and chelate, but unequal in form and proportion; that on the right side is the smaller, carries a multiarticulate basephysis, and consists of a united ischial and meral joint, a short carpos, a propodos that has the margins parallel and forming with the dactylos a well-developed chela; that upon the left side differs in having the propodos very much larger, and the margins of that joint are not parallel, but much larger at the carpal extremity, gradually narrowing distally and terminating in a sharply pointed chela. The three succeeding pairs are biramose and resemble the four anterior, excepting that they are rather longer.

Each of the anterior five somites of the pleon carries a pair of short biramose pleopoda; the sixth is associated with the telson and has as yet no appendage.

The Megalopa was got from the ovum of a near ally of *Alpheus minus*, but differing in having a long powerful tooth on the outer margin of the scaphocerite, the foliaceous part being smaller, membranous and very thin. I previously (*loc. cit., supra*) named this specimen *Homaralpheus*, making it a separate genus, from the impression that species producing a Megalopa could not be placed in the same genus as those producing a Zoa.

Geographical Distribution.—The several species given in the following list, with their habitats and depths, so far as known, appear to belong to the shallow waters or to depths less than 60 fathoms. Only one locality is recorded with a greater depth than this—*Alpheus avarus* having been procured off Japan, at Station 234, in 2675 fathoms, but as this species is known to inhabit comparatively shallow seas, this case is probably due to some accidental circumstance. Their geographical range is very extensive between the north and south temperate zones, and in one instance a specimen of *Alpheus minus* has been recorded from an inland fresh-water pond in south-west Colorado.

	Fathoms.	Habitat.
<i>Alpheus acuto-femoratus</i> , Dana, . . . . .	...	Balabec ?
" <i>affinis</i> , Guise (not Kingsley), . . . . .	...	Channel Islands.
" <i>armillatus</i> , Milne-Edwards, . . . . .	...	Antilles.
" <i>avarus</i> , Fabricius,	18	Cape York. Off Japan, 2657 fathoms.
" <i>bellimanus</i> , Lockington, . . . . .	...	California.
" <i>bermudensis</i> , n. sp.,	15	Atlantic.
" <i>bidens</i> , Olivier, . . . . .	...	Asiatic Sea.
" <i>bispinosus</i> , Streets, . . . . .	...	Panama.
" <i>biunguiculatus</i> , Stimpson,	18	Hawaii.
" <i>bouvieri</i> , A. Milne-Edwards, . . . . .	...	Cape Verde Islands.
" <i>brevipes</i> , Stimpson, . . . . .	...	Hawaii.
" <i>brevirostris</i> , Olivier, . . . . .	...	Australia.
" <i>candei</i> , Guérin (<i>transversodactylus</i> , Kingsley), . . . . .	...	Key West and Cuba.
" <i>charon</i> , Heller, . . . . .	...	Nicobar Islands.
" <i>chiragricus</i> , Milne-Edwards, . . . . .	...	New Zealand.
" <i>clamator</i> , Lockington, . . . . .	...	California.
" <i>collumianus</i> , Stimpson,	1	Bonin.
" <i>crassimanus</i> , Heller, . . . . .	...	Australia.
" <i>crinitus</i> , Dana,	18	Asiatic Seas; Balabec Straits.
" <i>cristidigitus</i> , n. sp.,	52	Cape Verde Islands.
" <i>cylindricus</i> , Kingsley, . . . . .	...	Panama.
" <i>dentipes</i> , Guérin, . . . . .	...	Mediterranean.
" <i>diadema</i> , Dana, . . . . .	...	Hawaiian Islands.
" <i>doris</i> , White, . . . . .	...
" <i>edwardsii</i> , Audouin,	52	Europe; Cape Verde Islands.
" <i>equalis</i> , Kingsley, . . . . .	...	Panama.
" <i>euchirus</i> , Dana, . . . . .	...	Borneo.
" <i>floridanus</i> , Kingsley, . . . . .	...	Florida.
" <i>gracilipes</i> , Stimpson,	40	Bass Strait; Tahiti.
" <i>gracilis</i> , Heller, . . . . .	...	Red Sea.
" <i>hardfordii</i> , Kingsley, . . . . .	...	California.
" <i>heterocheles</i> , Say = { <i>armillatus</i> , Milne-Edwards, . . . . .	...	America, Atlantic coast.
<i>lutasius</i> , Saussure, . . . . .	...
<i>equidactylus</i> , Lockington, . . . . .	...	California.
" <i>insignis</i> , Heller, . . . . .	...	Red Sea.
" <i>intermedius</i> , Stimpson, . . . . .	...	North Carolina.
" <i>intrinsecus</i> , n. sp.,	7-20	South America.
" <i>lævis</i> , Randal,	1	Pacific; Sandwich Islands.
" <i>leviusculus</i> , Dana,	15	Pacific.
" <i>latimanus</i> , Costa, . . . . .	...	Mediterranean.
" <i>longidactylus</i> , Kingsley, . . . . .	...	California.
" <i>longimanus</i> , n. sp.,	5-20	Japan.
" <i>lothinii</i> , Guérin, . . . . .	...
" <i>malleator</i> , Dana, . . . . .	...	Rio Janeiro ?
" <i>minus</i> , Say,	7-20	America, Atlantic coast.
" <i>mitis</i> , Dana,	1	Balabec Passage.
" <i>neptunus</i> , Dana,	6-9	Zooloo Sea; Fiji Islands.
" <i>normani</i> , Kingsley, . . . . .	...
" <i>novæ-zealandiæ</i> , Miers, . . . . .	...	New Zealand.
" <i>obeso-manus</i> , Dana, . . . . .	...	Fiji Islands.
" <i>pachychirus</i> , Stimpson, . . . . .	...	Loo Choo.
" <i>pacificus</i> , Dana, . . . . .	...	Sandwich Islands.
" <i>packardii</i> , Kingsley, . . . . .	...	Key West.
" <i>panamanensis</i> , Kingsley, . . . . .	...	Panama.

	Fathoms.	Habitat.
<i>Alpheus parvimanus</i> , Kingsley, . . . . .	...	Panama.
" <i>parvi-rostris</i> , Dana,	8	Balabec.
" <i>prolificus</i> , n. sp.,	18	Pacific Ocean.
" <i>pugillator</i> , A. Milne-Edwards, . . . . .	...	Cape Verde Islands.
" <i>pugnax</i> , Dana, . . . . .	...	Hawaiian Islands.
" <i>rapax</i> , Fabricius,	10	Asiatic Seas.
" <i>ruber</i> , Rafinesque,	6	Europe.
" <i>rugimanus</i> , A. Milne-Edwards, . . . . .	...	Cape Verde Islands.
" <i>socialis</i> , Heller, . . . . .	...	Australia.
" <i>spinicercus</i> , Costa, . . . . .	...	Mediterranean.
" <i>spinifrons</i> , Milne-Edwards, . . . . .	...	Chili.
" <i>spiniger</i> , Stimpson,	18	Asiatic Seas, Loo Choo.
" <i>strenuus</i> , Dana, . . . . .	...	Australia; Tongatabu.
" <i>streptochirus</i> , Stimpson,	20	Cape Verde Islands.
" <i>sulcatus</i> , Kingsley, . . . . .	...	Panama.
" <i>tridentulatus</i> , Dana, . . . . .	...	Rio Janeiro?
" <i>ventrosus</i> , Milne-Edwards, . . . . .	...	Mauritius.
" <i>websterii</i> , Kingsley, . . . . .	...	United States.

Observations.—The genus may be divided into three divisions—

- A. Those without rostrum or supraorbital teeth.
- B. Those with rostrum but without supraorbital teeth.
- C. Those with rostrum and with supraorbital teeth.

This arrangement, however, can only be considered as convenient for purposes of classification, since the above characters are found to exist in various degrees, and Mr. J. S. Kingsley,¹ in regard to *Alpheus minus*, Say, says:—"In some specimens the ocular spines are present, while the rostrum is wanting; in others the front is truncate, no spines being present. The proportions of the joints of the carpos of the second pair of pereiopoda also vary," and he continues "the relative lengths of rostrum and ocular spines can be of no great importance when they vary as I have shown."

If these observations of Mr. Kingsley be justified by further experience of this intricate genus, then many of the recorded species must be merely varieties. For instance, Dana² considers his species of *Alpheus leviusculus*, of which I have figured (Pl. XCVIII. fig. 1) a variety, to be itself only a variety of *Alpheus edwardsii*, and says further that it is near to *Alpheus bi-spinosus* of de Haan, which de Haan considers a variety of *Alpheus avarus* of Fabricius, but which Stimpson affirms to be distinct.

Alpheus avarus, Fabricius, appears to be not very distinct from *Alpheus edwardsii* of Audouin. Yet the figure given in this Report of *Alpheus leviusculus* bears but little resemblance to Audouin's figure of *Alpheus edwardsii*.

Again, some of the species correspond in almost every point except in the presence

¹ Bull. U.S. Geol. Survey, vol. iv., No. 1, p. 191, 1878.

² U.S. Explor. Exped., Crust., p. 543, pl. xxxi. fig. 3.

or absence of the supraorbital teeth, as for instance *Alpheus crinitus*, Dana, appears to differ only in this respect from *Alpheus minus*, Say. The one was obtained amongst the islands of the Eastern Archipelago, and the other on the western coast of America.

Alpheus edwardsii (Audouin) (Pl. XCVII. fig. 1).

Athanas edwardsii, Audouin, Planches de la description de l'Égypte par M. Savigny, Crust., pl. x. fig. 1.

Alpheus edwardsii, Dana, U.S. Explor. Exped., Crust., p. 543, pl. xxxiv. fig. 2a.

” ” Heller, Crust. Fauna des Rothen Meeres, p. 267.

” ” Norman, Ann. and Mag. Nat. Hist., vol. ii. p. 173, September, 1868.

Our specimens correspond with those of Dana from St. Iago, Cape Verde Islands, and agree with Audouin's figure more closely than with the description of *Alpheus edwardsii* given by Milne-Edwards, which is a Mediterranean form described by him as having the anterior margin of the orbital lobes armed with a small spine or tooth.

The frontal margins above the eyes are smooth, rounded, and without a supraorbital tooth, projecting nearly to the extremity of the rostrum.

The first pair of pereopoda has the left hand the larger, the posterior portion is smooth, the anterior suddenly constricted, the pollex is short, curved, and pointed, and the dactylos broad and flat, rounded on the outer side and straight on the inner, forming in section an almost perfect semicircle. The right hand is long and slender, having the fingers nearly as long as the rest of the propodos. The third pair of pereopoda is without a tooth on the infero-distal angle of the meros.

The males of our specimens are all about one-third smaller than the females. The side on which the larger propodos occurs varies, some having it on the right side instead of the left, but those that have it on the left are proportionally more numerous.

Among those procured at the Cape Verde Islands were numerous small specimens, which from their general appearance I take to be half grown individuals of this species, but besides these immature forms there were numerous others, the females of which were gravid with ova, so closely resembling the small individuals that they could only be separated by close observation. These all have the anterior margin of the orbital lobes armed with a small tooth, and correspond very closely with Milne-Edwards' description; they differ, however, from *Alpheus megacheles* (Pl. XCVII. fig. 4) which I suppose to be that which the distinguished European carcinologist believed to be the same as *Alpheus edwardsii* (Audouin).

The females attain the length of 25 mm. or more, though they reach maturity and become gravid when very small, and even at only half that length, but I have not met with a male that was more than 13 mm. long.

¹ Milne-Edwards, Hist. Nat. Crust., tom. ii. p. 352.

Length—female, 25 mm. (1 in.); male, 13 mm. (0·5 in.).

Length, entire (female),	25	mm.
„ of carapace,	11	„
„ of pleon,	14	„
„ of large hand,	13	„
„ of dactylos of large hand,	4	„
„ of small hand,	9	„
„ of dactylos of small hand,	5	„
„ of telson,	3·5	„

Habitat.—Off St. Vincent, Cape Verde Islands. The station is not recorded, but it was probably Station 93c, at a depth of 52 fathoms, on coralline mud.

Heller took his specimen in the Red Sea, where probably also that was obtained from which Audouin's original figure was taken.

Off Albany Island, Cape York, a specimen was taken that only differs from the female obtained at the Cape Verde Islands by having the smaller hand upon the left side; the larger on the right side being broken off. Beyond this I see nothing either in form or arrangement of parts that distinguishes it from the Atlantic and Red Sea forms.

Alpheus avarus, Fabricius,¹ appears to have no strongly marked feature separating it from *Alpheus edwardsii*, and I think we shall not be far wrong in saying that *Alpheus edwardsii*, Audouin, *Alpheus avarus*, Fabricius, *Alpheus strenuus*, Dana, *Alpheus parvirostris*, Dana, and *Alpheus pacificus*, Dana, are merely varieties of a cosmopolitan species which have arisen by local selection. Dana considers *Alpheus leviusculus* to be only a variety of *Alpheus edwardsii*.

Mr. Edward J. Miers, F.L.S., late of the British Museum, considers the two specimens which the late Mr. Adam White named *Alpheus doris* and *Alpheus neptunus* to be respectively *Alpheus edwardsii* and *Alpheus strenuus*, but they correspond very closely with *Alpheus avarus* of this Report and *Alpheus strenuus* and *Alpheus parvirostris* of Dana.

It moreover appears that in a genus so generally distributed as *Alpheus*, a specific character that is largely dependent upon the form of one abnormally developed appendage must be very untrustworthy as a natural distinction of species, inasmuch as the tendency to vary in that organ must be great.

¹ See de Haan, in Siebold's Fauna Japonica, p. 179, pl. xlv. fig. 3.

Alpheus avarus, Fabricius (Pl. CI. fig. 1).

- Alpheus ararus*, Fabricius, Suppl. Entom. Syst., p. 404.
 „ „ de Haan, in Siebold's Fauna Japonica, Crust., p. 179 (*bis-incisus*) pl. xlv. fig. 3.
 „ „ Heller, Reise der Novara, Crust. p. 108.
Palæmon brevirostris, Olivier, Encycl., tom. viii. p. 664, pl. cccxix. fig. 4.
Alpheus parvirostris, Dana, U.S. Explor. Exped., Crust., p. 551, pl. xxxv. fig. 30.
 „ *brevirostris*, Milne-Edwards, Hist. Nat. Crust., tom. ii. p. 350.
 „ *doris*, White, List. Brit. Crust., p. 75, 1847.
 „ *strenuus*, Dana, U.S. Explor. Exped., Crust., p. 543, pl. xxxiv. fig. 4, 1852.
 „ *strenuus*, Miers, Ross's Voyage of the "Erebus" and "Terror," Crust., p. 5, 1874.
 „ *doris*, White, Ross's Voyage of the "Erebus" and "Terror," Crust., tab. 4, fig. 2, 1873.

This species was first described by Fabricius and again by de Haan. The latter has figured it under the name of *Alpheus bis-incisus* on the plate but corrected it in the text to *Alpheus avarus*.

It appears to differ very little from the species that I have figured as *Alpheus edwardsii* from Cape Verde Islands, and which corresponds very closely with the figure of *Athanas edwardsii* given by Audouin. With the specimens of the two species before me, the only variation between them that I can detect is that in *Alpheus avarus* the larger hand is horizontally grooved on each side from the notch on the upper surface, whereas in *Alpheus edwardsii* it is on the outer side only, and the prominence behind the same notch in *Alpheus edwardsii* is less in the form of a tooth than in *Alpheus avarus*.

Milne-Edwards says that *Alpheus avarus* is probably identical with *Alpheus brevirostris*, Olivier, and according to his description there is nothing to distinguish between them.

Among the specimens that I think may be attributed to this species is one from Torres Strait, which very closely agrees with the description, so far as it goes, of a species given by Dana under the name of *Alpheus acuto-femoratus*, as shown on the next page.

Length, entire,	22 mm. (0·8 in.)
„ of carapace,	8 „
„ of pleon,	14 „
„ of large hand,	12 „
„ of dactylos of large hand,	4 „
„ of small hand,	8 „
„ of dactylos of small hand,	4 „
„ of telson,	4 „

Habitat.—Arafura Sea ; Albany Island, Cape York.

Station 172, June 22, 1874 ; lat. 20° 58' S., long. 175° 9' W.; off Nukalofa, Tongatabu ; depth, 18 fathoms ; bottom, coral mud. Two specimens, males (?). Dredged.

Station 234, June 3, 1875 ; lat. 32° 31' N., long. 135° 39' E. ; off Japan ; depth, 2675 fathoms ; bottom, blue mud ; bottom temperature, 35°·8. One specimen, female.

Milne-Edwards records his species from New Holland, and de Haan his from Japan.

Observations.—The specimen from Station 234, which was laden with ova, has lost the chelæ, but agrees in all other respects with the other specimens. As is often the case it is rather more robust than the male.

Some drawings of what appears to be this species, in Sir Walter Elliot's collection, show the variability of colour. One is beautifully marked with cream-coloured spots on a general ground of red, with deeper dots of the same. Another is a dark olive-green, dark on the back and shading to buff on the claws.

Alpheus acuto-femoratus, Dana (Pl. XCVII. fig. 2).

Alpheus acuto-femoratus, Dana, U.S. Explor. Exped., Crust., p. 550, pl. xxxvi. fig. 2.

Carapace anteriorly produced to a sharp-pointed rostrum, with a longitudinal groove on each side, separating it from the orbital lobes, which are anteriorly produced to a very small point.

The first pair of antennæ carries a stylocerite that is about half the length of the first joint of the peduncle, and terminates in two flagella that are slightly longer than the peduncle; the shorter is the more robust, and it exhibits a tendency to a bifid termination, one branch being short and the other abruptly truncate.

The second pair carries the rudiment of a tooth on the basal joint, and supports a scaphocerite that is subequal in length with the peduncle of the first pair.

The first pair of pereopoda is asymmetrical, that on the left being the larger, resembling closely in form that of *Alpheus avarus* and *Alpheus edwardsii*; that on the right also resembles the same limb in *Alpheus edwardsii*, but has the fingers of the chela somewhat shorter. The second pair of pereopoda is longer than the third, and the first joint of the carpus is longer than the second.

Length, 21 mm. (0·8 in.).

Habitat.—Station 186, September 8, 1874; lat. 10° 30' S., long. 142° 18' E., between Cape York and the Arrou Islands; depth, 8 fathoms; bottom, coral mud. Dredged.

Observations.—Dana says of his species—"Length nine lines. The hands of the specimen are gone, and we are not sure that the species should not be in the preceding division" ("a Orbitæ margo inermis," instead of in "b Orbitæ margo spinula denteve armatus," where he places it), "although its general characters are more like those in which the lower margin of the hand is straight, it is peculiar in having a spine at the apex of both the second and third joints of the third and fourth pairs of legs, the fifth pair of legs is more narrow than the fourth." A drawing taken from the living animal, in the late

Sir Walter Elliot's collection, from a specimen obtained at Waltair on the coast of Madras, which corresponds with this form, shows the animal to be of an orange colour with a broad dark crimson stripe on each side of the median line from head to tail, and one across the rhipidura.

Alpheus cristidigitus, n. sp. (Pl. XCVII. fig. 3).

Carapace having a slender rostrum. Orbital lobes dorsally elevated above the median crest and armed anteriorly with a small tooth that does not reach so far as the apex of the rostrum.

The first pair of antennæ has the upper branch but little longer than the peduncle, robust, truncate, without any slender terminal flagellum. The lower branch is slender and much longer than the upper, being two-thirds the length of the animal. The stylocerite is broad, flat, and tipped with a minute, slender, sharp tooth.

The second pair of antennæ is as long as the animal, and supports a scaphocerite that reaches to the extremity of the peduncle.

The first pair of pereopoda is very unequal, the right being the greater in most of our specimens, and is very large and irregular in form. The propodos is rather more than half the length of the animal, it has a deep notch on the upper surface and a corresponding one on the lower, at the base of the dactylos; on the upper margin there is a sharp tooth, and a second and stronger one is placed a little posterior to it. The dactylos is broad, obtuse, obliquely articulated, and only one-fourth the length of the palm. The left (fig. 3*k*) has the propodos about two-thirds the length of the right, and has a notch on the upper and lower margins opposite to each other; on the upper side anterior to the notch, close behind the dactyloid articulation, is a strongly projecting tooth or sharp angle; the pollex is straight and smooth, the dactylos is straight on the inner or proximal margin and arched on the outer side, on which a thin marginal crest is continuous from the base to the apex. This crest is so peculiar, that I have derived the specific name of the animal from it. The second pair of pereopoda is slender; the third and fourth pairs have the meros armed with a strong tooth on the lower distal angle.

The fifth pair is more slender and shorter than the preceding, has no tooth on the meros, and terminates in a simple, pointed dactylos, resembling those of the two preceding pairs.

The pleopoda are slender and the telson is broad, slightly tapering, distally rounded, fringed with hairs, and armed on the dorsal surface with two small equidistant spines on each side of the median line.

Length, entire,	.	.	.	.	.	10 mm. (0·4 in.).
„ of carapace,	.	.	.	.	.	4 „
„ of pleon,	.	.	.	.	.	6 „
„ of large hand,	.	.	.	.	.	7 „
„ of dactylos of large hand,	.	.	.	.	.	1 „
„ of small hand,	.	.	.	.	.	4 „
„ of dactylos of small hand,	.	.	.	.	.	2 „
„ of telson,	.	.	.	.	.	1·5 „

Habitat.—Station 93c, July 27, 1873; lat. 16° 57' 15" N., long. 25° 1' W., St. Vincent, Cape Verde Islands; depth, 52 fathoms; bottom, coralline mud. Nineteen specimens; ten females bearing ova, and nine males.

Observations.—This species was found with *Alpheus edwardsii*, and when mingled with the younger forms, required close observation to be distinguished from them. It bears a close resemblance to *Alpheus megacheles*, Hailstone, from the English Channel, and which the Rev. Canon Norman states to be *Alpheus edwardsii*, Milne-Edwards. It differs, however, from the British form, in having a strong tooth on the meros of the third and fourth pairs of pereiopoda. The large chela is very similar, and has the dactylos impinging obliquely against the pollex; but there is a deeply incised notch in the upper and lower margins, which in *Alpheus megacheles* (Pl. XCVII. fig. 4) are smooth. The smaller chela has also a peculiar resemblance in general form, but possesses a narrow crest on the upper surface of the dactylos, which is wanting in the British species. The largest specimen that we have of *Alpheus cristidigitus* is only 10 mm. in length; and they are undoubtedly mature, since the females are laden with ova. *Alpheus megacheles* on the other hand is 50 mm. long; but this may not necessarily be a specific feature, as specimens of *Alpheus edwardsii*, quite as small as *Alpheus cristidigitus*, were found associated, also having ova attached.

Alpheus bermudensis, n. sp. (Pl. XCVIII. fig. 3).

Rostrum short, slightly depressed anteriorly, forming a carina that extends posteriorly as far as the orbital lobes, and separated from them by a small groove. Fronto-orbital margin produced to a blunt point that reaches nearly to the extremity of the rostrum.

First pair of antennæ having the first joint of the peduncle not longer than the extremity of the rostrum, the second joint about the same length as the first, and the third shorter than the second. The stylocerite is flat and pointed, reaching nearly as far as the end of the first joint. The flagella are unequal, the upper branch being about the same length as the peduncle, and the lower being about two-thirds that of the whole animal.

Second pair of antennæ having a scaphocerite that is a little longer than the peduncle of the first pair.

First pair of pereopoda having the larger hand broad and long, obliquely attached and laterally compressed, the upper margin indented a little behind the dactylar hinge, from which indentation a longitudinal groove runs back on the inner and outer sides and gradually dies out towards the posterior or carpal extremity. The hand upon the left side is broken off in all the specimens in the collection. The four following pairs are also wanting in our type specimen, but in the others they exhibit no specially noticeable feature.

The telson is short, broad and ovate at its posterior extremity, which is fringed with hairs.

	Female.	Male.
Length, entire,	22 mm. (0·8 in.).	19 mm. (0·7 in.).
„ of carapace,	7 „	6·5 „
„ of pleon,	15 „	12·5 „
„ of large chela, . . . . .	...	9 „
„ of dactylos of large chela, . . . . .	...	4 „
„ of telson,	3·5 „	2·5 „

Habitat.—Bermuda, shallow water. Three specimens; one male and two females of which one bears mature ova.

St Thomas, West Indies. A damaged female, laden with ova, which appears to belong to this species.

Observations.—I cannot identify this form with any species known from the western shores of the Atlantic, or with any in Kingsley's Synopsis of the North American Species, but it corresponds with *Alpheus avarus* of Fabricius more nearly than with any other form. The female specimen, which is laden with ova, has lost both its chelæ; it is longer and stouter than the others.

Alpheus crinitus, Dana (Pl. XCVIII. fig. 2).

Alpheus crinitus, Dana, U.S. Explor. Exped., Crust., p. 548, pl. xxxiv. fig. 8, *a-f*.

Rostrum short, scarcely reaching beyond the orbital lobes, which are prominent but without frontal teeth.

First pair of antennæ having the three joints of the peduncle subequally short, upper flagellum not longer than the peduncle, the lower being a little longer and more slender than the upper.

Second pair of antennæ having the peduncle a little longer than that of the first, and the outer tooth of the scaphocerite quite as long.

Second pair of gnathopoda reaching as far as the distal extremity of the peduncle of the second pair of antennæ.

First pair of pereopoda having the right hand very long, thick, smooth, and pear-shaped, tapering towards the dactylos. The pollex is shorter than the dactylos which is curved and obtusely pointed, the entire hand being about two-thirds the length of the animal.

	Female.	Male.
Length, entire,	18 mm. (0·7 in.).	11 mm. (0·4 in.).
„ of carapace,	6 „	4 „
„ of pleon,	12 „	7 „
„ of telson,	2·5 „	1·5 „
„ of large chela,	6 „	6·5 „

Habitat.—Samboangan, Philippine Islands ; reefs. One specimen, male.

Station 208.—January 17, 1875 ; lat. 11° 37' N., long. 123° 31' E. ; off Manila ; depth, 18 fathoms ; bottom, blue mud. One specimen, female. Trawled.

Observations.—The specimen taken at Station 208 was a female, in which the large hand was relatively small ; it was laden with ova of a pale yellow or lemon colour, and was associated with a specimen of *Alpheus spiniger* (Stimpson).

It corresponds very closely in general appearance with *Alpheus minus*, Say, but it has no tooth on the orbital lobes. However, if Kingsley be correct (and I think we require more extensive experience in our knowledge of these animals before deciding) in determining that these orbital teeth are of no specific value, the separation of this form from *Alpheus minus* becomes more difficult. It has, however, a more robust carpos and propodos on the third and fourth pairs of pereopoda, carries a tooth on the under or posterior angle of the meros, has the propodos fringed with long spines, and the dactylos tipped with a small secondary unguis.

Alpheus leviusculus, var., Dana (Pl. XCVIII. fig. 1).

Alpheus edwardsii, var. *leviusculus*, Dana, U.S. Explor. Exped., Crust., p. 543, pl. xxxiv. fig. 3.

Carapace about one-third the length of the animal ; anterior dorsal surface elevated over the gastric region, and produced anteriorly to a rostrum that is separated from the orbital lobes by a slight longitudinal groove. Orbital lobes without a tooth, but the angle on the inner side projects slightly, so that when held in some positions there appears to be a small tooth.

First pair of antennæ pubescent and having the second joint twice the length of the first, the stylocerite broad, flat, pointed, and as long as the first joint. Flagella subequal ; the inner, which is the more slender, is about as long as the carapace.

The second pair has a scaphocerite that is rather longer than the peduncle, and terminates in a sharp point which is separated for a short distance from the foliaceous portion.

The second pair of gnathopoda is slender and short, not reaching beyond the extremity of the peduncle of the second pair of antennæ.

The first pair of pereopoda has the large chela on the right side in our solitary specimen; it is about as long as the carapace and about three times as long as broad; the upper surface has a slight depression behind the dactyloid articulation on the inner, outer and inferior surfaces, and is continued longitudinally backwards near the middle of the outer surface, where it gradually dies out. The smaller chela is wanting. The second pair has the two first articuli of the carpos subequal and together longer than the three succeeding. The following pairs have the dactylos long and single-jointed.

Telson broad, slightly tapering, terminal margin rounded, having a small spine at each angle, and the margin fringed with hairs; dorsal surface armed with two small spines on each side.

Length, entire,	.	.	.	.	.	32 mm. (1.2 in.).
„ of carapace,	.	.	.	.	.	11 „
Depth of carapace,	.	.	.	.	.	9 „
Length of pleon,	.	.	.	.	.	21 „
„ of large chela,	.	.	.	.	.	10 „
„ of dactylos,	.	.	.	.	.	4 „

Habitat.—Station 203, October 31, 1874; lat. 11° 6' N.; long. 123° 9' E.; off Panay, Philippine Islands; depth, 20 fathoms; bottom, mud. One specimen; female, laden with ova. Trawled.

Observations.—This specimen corresponds very closely with Dana's figure and description of *Alpheus leviusculus*, but differs in having the great chela somewhat narrower in proportion (figs. 1*k*, 1*k''*), and the depression on the propodos behind the dactyloid articulation is less decided. In the second pair of pereopoda the articuli also vary a little, the second articulus being nearly as long as the first, whereas Dana says that "the first is hardly as long as the second, and thin," although his figure does not show such decided variation. His specimen was taken off Wakes Island in the North Pacific, and ours at the Philippine Islands. I therefore consider this specimen to be only a variety of Dana's species, and retain for it the same name as that proposed by the distinguished American carcinologist. He, however, considers his species as being only a variety of the specimens of *Alpheus edwardsii* which he took off the Cape Verde Islands in the Atlantic. He also says—"It is near the *A. 2-incisus* of de Haan, which de Haan considers a variety of *A. avarus* of Fabricius." Dana also remarks that "the large hand is proportionately narrower, but this is often a varying character in the same species."

Alpheus longimanus, n. sp. (Pl. XCVIII. fig. 4).

Rostrum narrow and sharp pointed. Orbital lobes prominent but not pointed.

First pair of antennæ with the stylocerite broad, flat and disc-like, anteriorly produced to a small, sharp pointed tooth; the second joint of the peduncle is longer than the first, and the third is shorter and terminates in two flagella, the longest of which is about two-thirds the length of the body of the animal.

The second pair of antennæ carries a very minute tooth at the base, and a scaphocerite that reaches as far as the extremity of the peduncle of the first pair of antennæ, but scarcely as far as that of the second pair.

The first pair of pereiopoda is unequal on the two sides; the larger, which is generally on the right side, has the margins nearly parallel until near the base of the dactylos, where a constriction takes place so as to form a tooth above and below.

The pollex is produced anteriorly and curved at the point, the lateral margins being elevated in the form of cusps that form a hollow or spoon-like space between them, into which a blunt tooth or protuberance on the inner surface of the dactylos projects. The smaller hand is long, slender, and subcylindrical, the fingers being nearly, and in some instances quite, as long as the propodos.

Length, entire,	44 mm. (1.7 in.).
" of carapace,	14 "
Depth of carapace,	10 "
Length of pleon,	30 "
" of large chela,	20 "
" of dactylos of large chela,	7 "
" of small chela,	18 "
" of dactylos of small chela,	9 "

Habitat.—Off Yokoska, Japan, in from 5 to 20 fathoms. Four females, bearing ova.

Stations 233, 233A, May 17, 19, 1875; off Kobé, Japan; depth, 8 to 50 fathoms; bottom, sand and mud. Four specimens; two males, one female, and one young. Dredged.

The body of the animal is generally robust, smooth, and even, having no groove or carina on the dorsal surface of the carapace, except a small depression between the orbital lobes and the rostrum, and another at the frontal margin external to the orbital lobes (fig. 4c).

The first pair of antennæ has the first joint about the length of the rostrum and supports an oval scaphocerite, tipped with a small tooth; the second rather longer than the first, and the third about half the length of the second; the flagella are very unequal, the shorter and more robust is a little longer than the peduncle, the stouter portion being produced to a rudimentary second branch, while the more slender flagellum is nearly as long as the body of the animal.

The second pair of antennæ (fig. 4c) has the peduncle a little longer than that of the first, the basal tooth is very small and unimportant, and the scaphocerite has the squamous plate continuous with the outer margin to near the distal extremity, where it terminates in a sharp tooth; the flagellum of this pair of antennæ is delicately slender and longer than the entire animal. The second pair of gnathopoda extends to a little beyond the peduncle of the second antennæ, and carries a branch that reaches to the distal extremity of the antepenultimate joint.

The first pair of pereopoda (figs 4k, 4k') is long and unequal on the two sides; the larger being sometimes on one side, sometimes on the other. The meros of the larger hand is produced to a point on the upper distal angle and is fringed with hairs. The carpos is triangular and produced anteriorly above and below. The propodos is long and flattened on each side, the upper and lower margins being nearly parallel; a short distance behind the articulation of the dactylos there is a deep and receding notch, which brings about the formation of a sharp pointed tooth-like process behind it; in a corresponding position on the lower margin there is a similar tooth-like process. The pollex is directed horizontally forward and has the margin on each side elevated into a ridge, between which the edge of the dactylos, which is furnished with a blunt tuberclose tooth, impinges. The left hand (fig. 4k') is long, narrow, and nearly cylindrical, being slightly compressed laterally; the fingers are about as long as the palm. In the specimen which, from being the most perfect, I have selected as the type, and from which I have taken the figures, the fingers are not so long as they are in some of the other specimens.

The second pair of pereopoda has the carpos six-articulate, the first articulus being a little longer than the second, and the two equal to half the carpos.

In the Bay of Bengal, off Waltair, on the coast of Madras, a species was taken by the late Sir Walter Elliot that resembles this in all respects, except in the presence of the deep notch on the upper and lower margins.

Alpheus rapax, Fabricius (Pl. XCIX. fig. 1).

Alpheus rapax, Fabricius, Suppl. Entom. Syst., p. 404.

„ „ Milne-Edwards, Hist. Nat. Crust., t. ii. p. 353.

„ „ de Haan, in Siebold's Fauna Japonica, Crust., p. 177, tab. xlv. fig. 2.

Rostrum reaching nearly to the extremity of the first joint of the peduncle of the first pair of antennæ, laterally compressed, producing a small carina that extends backwards and fades away on the gastric region. Orbital lobes separated from the dorsal carina by a deep groove.

The first pair of antennæ has the stylocerite short, flat, and broad, with a small tooth at the anterior extremity, which reaches nearly to the end of the first joint; the second

joint is three times as long as the first, and the third is about one-fourth the length of the second. The flagella are very unequal, the upper being stout and about the length of the peduncle, the lower slender and about two-thirds the length of the animal.

The second pair of antennæ has the inferior tooth at the base very short, and the scaphocerite pointed and a little longer than the peduncle of the upper pair, and terminates in a flagellum which is half as long again as the entire animal.

The first pair of pereiopoda is asymmetrical. In our specimen that on the right is the smaller. It has the palm of the propodos short, and the pollex and dactylos long, slender, and gaping, thickly fringed with long hairs on the inner and outer margins, on which they extend back nearly to the carpal articulation; the meros is furnished at the upper anterior angle with a small tooth; the left hand is not much longer than the right, but has the propodos long and the dactylos short; the extremities of pollex and dactylos are abruptly curved to meet each other; the carpos is short and the meros is armed with a small tooth at the antero-superior angle. The second pair of pereiopoda has the carpos five-articulate; the first two articuli are subequally long, the three following are subequally short, as also is the terminal minute chela. The third and fourth pairs of pereiopoda have the meros long and broad, whereas that of the fifth pair is slender and not quite so long.

The rhipidura is well developed, having the lateral plates longer than the telson, which has the distal angles furnished with a small spine, and two others placed longitudinally on the dorsal surface on each side of the median line, subequally distant from the anterior and posterior extremities, the latter of which is fringed with long hairs.

Length, entire,	39 mm. (1.5 in.).
„ of carapace,	14 „
Depth of carapace,	8 „
Length of pleon,	25 „
„ of large chela,	19 „
„ dactylos of large chela,	7 „
„ small chela,	17 „
„ dactylos of small chela,	12 „
„ telson,	5 „

Habitat.—Hong Kong, at a depth of about 10 fathoms. One specimen, male.

Judging by the description of Milne-Edwards I have little doubt that this species is *Alpheus rapax* of Fabricius, but the figure given by de Haan exhibits markings on the outer side of the great chela that are scarcely consistent with the following, which he quotes from Fabricius—“Manu majore compressa lævi digitis brevibus;” and de Haan also says of his own specimen—“Manus majoris subparallelæ latere externo bicostato,” and figures it with longitudinal ribs; it differs, apparently, only in degree from that of *Alpheus malabaricus*, Fabr. (*brevicristatus*) in his pl. xlv. fig. 1.

The late Sir Walter Elliot, S.I., obtained a specimen at Waltair, near Madras, which, so far as I could determine from a well-executed drawing, resembles this in every detail. He says in his notes that in the living state the colour on the back is green, and that on the large pair of legs blue, mottled with white spots, the claws being tipped with yellow; the three pairs of pereopoda are also blue, and the long pair of antennæ, which is one and a half times the length of the body, measured from the base of the first joint to the end of the tail, is also bluish.

Alpheus crassimanus, Heller (Pl. XCIX. fig. 2).

Alpheus crassimanus, Heller, Reise der Novara, Crust., p. 107, pl. x. fig. 2.

Rostrum short, spiniform, anteriorly depressed; separated by a groove on each side from the orbital lobes, which are prominently developed.

First pair of antennæ having the second joint of the peduncle longer than the first, with the stylocerite reaching to the extremity of the first joint. Flagella unequal, the upper and more robust being as long as the peduncle, the lower and more slender as long as the carapace.

Second pair of antennæ having a small tooth at the base and a scaphocerite that is as long as the peduncle.

First pair of pereopoda having the larger hand upon the left side, the upper and lower margins being slightly constricted, the former close behind the dactyloid articulation and the latter still more posteriorly. The pollex is broad, flattened, internally concave and produced anteriorly to a lanceolate point. Dactylos broad and flat, lanceolate in form, constricted posteriorly, broadly ribbed down the centre, and pointed anteriorly in the form of a curved tooth; the outer margin is thickly fringed with cilia. The right or smaller hand is wanting, nor is it figured by Heller, but he describes it in the male as being "half the size of the other, having the palm a little compressed and sinuated on both margins near the apex. Fingers scarcely shorter than the palm."

The second and following pairs of pereopoda rather long; the fifth pair more slender than the third and fourth.

Length, entire,	20 mm. (0·8 in.).
„ of carapace,	7 „
„ of pleon,	13 „
„ of large chela,	7 „
„ of dactylos,	3 „

Habitat.—Off Albany Island, near Cape York; depth not given.

Heller records his specimen as having been found at the Nicobar Islands.

Observations.—There can, I think, be little doubt that the specimen which I figure belongs to the same species as that described by Heller as *Alpheus crassimanus*.

The only distinction that I can determine is that in the Challenger specimen, the dactylos of the great chela terminates in a long, slightly curved, tooth-like projection, attached not at the apex but on the under surface near the margin. It may be that it gets worn off by use, or it may have been so hidden in Heller's specimen by the hirsute margin that it escaped notice, as it did in this specimen for some time.

Alpheus lævis, Randall (Pl. XCIX. fig. 3).

Alpheus lævis, Randall, Journ. Acad. Nat. Sci. Philad., vol. viii. p. 141.

„ „ Dana, U.S. Explor. Exped., Crust., p. 556, pl. xxxv. fig. 8.

„ „ Heller, Reise der Novara, Crust., p. 107.

Rostrum spiniform, reaching to nearly the extremity of the first joint of the peduncle of the first pair of antennæ, and separated from the orbital lobes by a deep fissure on each side. Orbital lobes prominent and armed with a small tooth on the frontal margin.

First pair of antennæ furnished with a stylocerite that reaches beyond the extremity of the first joint of the peduncle, and to nearly the middle of the second; second joint scarcely longer than the first, third shorter than the second. The flagella are short, the upper being about the length of the peduncle, and the lower about twice the length of the upper.

Second pair of antennæ having the tooth at the base moderately long, and the scaphocerite as long as the peduncle of the first pair, but scarcely so long as that of the second; the flagellum is about half the length of the animal.

First pair of pereopoda subequal on the two sides, both being smooth and compressed, that on the left side having the dactylos shorter than that on the right, and armed at the dactyloid articulation with two blunt teeth, whereas that on the right has none. Second pair of pereopoda a little longer than the third, and having the second articulus of the carpos subequal with the first, which is rather the longer. The third and fourth pairs of pereopoda have the meros broad and long, and the carpos and propodos stout and short, the latter being armed on the posterior margin with short spines. The fifth pair is broken, but from the remnant it appears to be more slender than the preceding.

Telson slightly tapering, with two spines on the dorsal surface, on each side of the median line; posterior margin rounded and fringed with long hairs, and armed at the outer angles with a small spine.

Length, entire,	25 mm. (1 in.).
„ of carapace,	7 „
Depth of carapace,	7 „
Length of large chela,	14 „
„ of small chela,	13 „

Habitat.—Honolulu, reefs. One specimen; male.

Dana obtained his specimens from the Sandwich Islands, and also from the Fiji Group, and Heller records it from the Nicobar Islands, Sydney and Tahiti.

Observations.—This species is undoubtedly *Alpheus lævis*, Randall, as figured and described by Dana. In our specimen the left hand is broken off, but one found in the bottle agrees with the figure in Dana's plates, and if it belongs to our specimen the left hand is rather larger than the right, being 14 mm. long, while the right is 13 mm.; in width the right is 5 mm., and the left 7 mm. The detached limb, although it has the character of being from the left side, and corresponds with Dana's figure, may be that of a second specimen, but as there was no other in the bottle to which it could belong, I believe it to have dropped from this one, and so describe it, having, however, figured it detached (fig. 3*k*). Each of them has the upper surface covered with small spots, and a number of short hairs.

On the branchial region of the carapace, corresponding with the upper extremity of the branchial chamber, a series of capillary vessels are seen within a circular margin of transparent tissue (fig. 3*c*).

Alpheus prolificus, n. sp. (Pl. XCIX. fig. 4).

Carapace two-thirds of the length of the pleon. The rostrum narrow. The orbital lobes pointed, broad, and nearly equal in length to the rostrum.

First pair of antennæ having the second joint of the peduncle shorter than the first, the third subequal with the second. Stylocerite a little longer than the first joint, flagella subequal and about as long as the carapace.

Second pair of antennæ as long as the animal, peduncle longer than that of the first pair, basal tooth as long as the stylocerite and nearly half as long as the scaphocerite, which is subequal with the peduncle.

First pair of pereopoda lost. Second slender, having the carpos five-articulate, the first articulus being longer than the four following ones. Third and fourth pairs robust, meros broad, compressed, without distal tooth; carpos anteriorly produced on the upper distal margin; propodos curved, furnished with spines on the posterior margin; dactylos stout, bluntly pointed, with a small secondary unguis on the outer surface (fig. 4*m*).

The pleopoda are broad and foliaceous.

Telson broad, smooth, furnished with two spinules on the dorso-lateral surface, tapering and rounded at the extremity.

Length, entire,	20 mm. (0·8 in.).
„ of carapace,	8 „
Depth of carapace,	5·5 „
Length of pleon,	12 „

Habitat.—Off Honolulu, Sandwich Islands; depth, 18 fathoms. One specimen; female.

Observations.—This species is one of those that approach *Alpheus neptunus*, Dana (Pl. CI. fig. 2), and *Alpheus biunguiculatus*, Stimpson. It differs from the former in having the carpos of the third and fourth pairs of legs anteriorly produced at the upper distal extremity, and in having the dactylos biunguiculate, and from the latter (Pl. CI. fig. 4) in being generally more robust, in having the rostrum and supraorbital teeth less prominent, the carpos of the third pair of pereopoda produced on the upper margin, and the dactylos short and thick, the second unguis being rudimentary and situated behind the larger on the outer margin.

Our specimen is a female and carries a very large mass of ova, which are oval; hence the specific name.

Alpheus intrinsecus, n. sp. (Pl. C. fig. 1).

Dorsal surface arched from the frontal margin of the carapace to the telson. Carapace and pleon smooth. Rostrum reaching to the extremity of the first joint of the first pair of antennæ. A sulcus separates the rostrum from the orbital lobes, which are armed with a sharp tooth on the inner dorsal surface.

The first pair of antennæ has the first joint armed with a stylocerite that is broad, sharp pointed, and reaching to the extremity of the first joint, which is hollowed on the upper surface and furnished with a small bunch of hair. The terminal flagella are unequal in length and size, the inner one being nearly as long as the animal.

The second pair of antennæ has a scaphocerite that reaches to the distal extremity of the peduncle of the first pair of antennæ, terminates in a sharp rigid point united to the inner squamous part nearly as far as the extremity, towards which it gradually narrows from the base; at the extremity of the previous joint is a sharp but not long tooth. The terminal joint of the peduncle reaches as far as that of the first pair, and carries a flagellum twice the length of the animal.

The first pair of pereopoda is unequal, that on the left side (fig. 1*k*) being the smaller and more normal. It has the meros long and not excavated to receive the posterior lobe of the carpos, and is crenated along the lower margin; carpos long, triangular; propodos long and narrow, scarcely broader than the anterior diameter of the preceding joint; dactylos resembling the pollex, being long, straight, and slightly curved at the distal extremity. That on the right side has the meros slightly excavated to receive the posterior lobe of the carpos; carpos short, broader than long, propodos large and wide, armed with a tooth on the upper surface, with a sulcus anterior to it, and two small sharp teeth, one on each side of the dactyloid articulation; on the lower margin, corresponding in position, are two

other small teeth or points, and in front of them a sulcus that unites faintly with the one on the upper side. The pollex is sharp pointed and curved upwards towards the anterior extremity; the dactylos is broad, arcuate, obtuse at the point and furnished posteriorly with a large tubercle, that corresponds with a deep notch in the posterior portion of the pollex. The second pair of pereopoda has the carpos six-articulate. The three posterior pairs are subequal, the last being but slightly more slender than the preceding two pairs, and has the propodos fringed with small spines.

The pleopoda are long and slender, and carry in the female a large number of small round ova.

The posterior pair of pleopoda forms the lateral plates of the rhipidura. The outer margin of the outer plate is rigid, and terminates in two small teeth, the space between them being occupied by a spine; the diæresis is well defined, and the terminal portion of the plate is broad and short; the inner plate is terminally rounded, and both are distally fringed with long plumose hairs.

The telson is long and tapers to the distal extremity, it is armed on the dorsal surface with two short spines on each side of the median line; the terminal margin is convex, armed at each corner with a small spine and fringed with long and ciliated hairs.

Length, entire,	28 mm. (1.1 in.).
„ of carapace,	10 „
Depth of carapace,	8 „
Length of rostrum,	1 „
„ of pleon,	18 „
„ of sixth somite of pleon,	2.5 „
„ of telson,	4 „
„ of large chela,	13 „
„ of dactylos of large chela,	5 „
„ of small chela,	10 „
„ of dactylos of small chela,	6 „

Habitat.—Off Bahia; in from 7 to 20 fathoms. One specimen; female, laden with ova.

Alpheus minus, Say (Pl. C. fig. 2).

Alpheus minus, Say, Journ. Acad. Nat. Sci. Philad., vol. i. p. 245, 1818.

„ „ Milne-Edwards, Hist. Nat. Crust., tom. ii. p. 356.

„ „ Kingsley, Bull. U.S. Geol. Survey, p. 190, 1878.

Carapace anteriorly produced to a sharp pointed rostrum that reaches to about the extremity of the first joint of the peduncle of the first pair of antennæ. Orbital margin anteriorly produced to a point subequal with the rostrum.

First pair of antennæ rather longer than the carapace.

First pair of pereopoda unequal, the larger pair long, ovate, and the smaller elongate. Three posterior pairs of pereopoda triangulate.

Length, entire,	14 mm. (0.5 in.).
„ of carapace,	6 „
Depth of carapace,	4 „
Length of pleon,	8 „
„ of telson,	3 „
„ of large chela,	9 „
„ of dactylos of large chela,	3 „
„ of small chela,	3 „
„ of dactylos of small chela,	1 „

Habitat.—Off Bahia. Three specimens; one female, two males.

Station 113A, September 2, 1873; lat. $3^{\circ} 47' 0''$ S., long. $32^{\circ} 24' 30''$ W.; off Fernando Noronha; depth, 7 to 25 fathoms; bottom, volcanic sand and gravel. One specimen, female (6 mm. long), with ova. This specimen has lost its longer chela.

St. Paul's Rocks, the Atlantic. Two specimens, females (9 mm. long), from which ova had just been cast.

This species appears to be common in the tropical and temperate regions of the Atlantic Ocean from Bermuda in the north to St Paul's Rocks in the south.

Observations.—Kingsley in his full description of this species says that the larger hand has "a strong spine (tooth) above, and a smaller one near it at the articulation of the dactylos." I only saw this tooth conspicuously developed in one specimen. As a rule it is not a specific character, as in a great number of specimens of this and other species a tooth normally exists at the dactyloid hinge, but it is frequently rudimentary or rubbed down by use.

The same author also says that "in some specimens the ocular spines are wanting; in others the point is truncate, no spines being present. The proportions of the joints of the carpos of the second pair also vary."

"The relative length of the rostrum and ocular spines can be of no great importance when they vary as I have shown." He says, moreover, that he was not able to separate specimens from Pearl Island, Bay of Panama, from Floridan examples. "The antennular spines also are not incurved. Other than these I can detect no important points of difference."

One peculiarity has been overlooked by previous observers, namely, that the dactylos has an extremely long and robust tubercle projecting posteriorly, and generally lying inserted in a circular hollow in the median line at the base of the pollex; anterior to this tubercle is a second smaller one. The posterior projecting tubercle is common to many species, but in this it is remarkable for its length.

With reference to this species Mr. J. S. Kingsley further remarks,¹ "In the Annual Report of the U. S. Geological and Geographical Surveys of the Territories for 1874, p. 388, Mr. Ernest Ingersoll says—'From the pond mentioned, between camps E. and F. [in south-western Colorado] a small crab was brought home, which Professor I. S. Smith pronounced to be a true marine form, belonging to the Astacidoæ (sic).' Professor Smith informs me that the specimen shown to him was undoubtedly *Alpheus minus*, and thought it more than probable that some confusion of localities or mixture of specimens had occurred, but, on the other hand, Mr. Ingersoll is as positive as it is possible to be that the specimen was found in the pond mentioned."

Alpheus spiniger, Stimpson (Pl. C. fig. 3).

Alpheus spiniger, Stimpson, Proc. Acad. Nat. Sci. Philad., p. 110, January 1860.

Body robust, coxal plates of the pleon as deep as the lateral walls of the carapace, rostrum acute, straight, reaching beyond the first joint of the peduncle of the first pair of antennæ, and separated by a groove on each side from the orbital lobes, which are armed with a sharp and straight tooth that is about half the length of the rostrum.

First pair of antennæ having the first joint a little longer than the second, and furnished with a stylocerite that is equal to it in length. The flagella are subequal, neither being much longer than the peduncle.

The second pair of antennæ has the basal tooth reaching nearly as far as the extremity of the rostrum, and the scaphocerite as long as the peduncle of the first pair.

The second pair of gnathopoda has the terminal joint extending beyond the peduncle of the second pair of antennæ, and has the margins fringed with hairs.

The first pair of pereopoda (figs. 3*k*, 3*k'*) has the larger hand upon the right side; carpos small; propodos ovate, smooth, thick and tapering; pollex hollowed, with the lateral margins elevated; dactylos rounded at the apex and posteriorly produced on the inner side to a stout tubercle, which, when the hand is closed, is impacted deeply into a cavity at the posterior extremity of the pollex. The smaller or left chela (fig. 3*k'*) is normal in form and much resembles that of a species of *Brachyura*; it has the pollex and dactylos slightly curved, closely impinging, parallel, and about half the length of the palm. The second pair of pereopoda is not much longer than the third, it has the four distal articuli of the carpos subequal in length, and the first nearly as long as the other four. The third, fourth and fifth pairs are subequally robust, the anterior being the most and the posterior the least so. The carpos has the upper distal angle produced to a blunt tooth or process, which is most conspicuous on the anterior pair and least so on the posterior. The propodos is slightly curved and

¹ Proc. Acad. Nat. Sci. Philad., p. 14, August 1878.

free from spines, but furnished with a few hairs towards the distal extremity. Dactylos biunguiculate, most conspicuously so on the anterior pair.

Telson (fig. 3z) shorter than the outer plates of the rhipidura; broad at the base and evenly tapering to the posterior margin, where it is truncate and armed with two small spines at the outer angles. There are no spines on the dorsal surface, which is quite smooth and grooved in the median line.

Length, entire,	18 mm. (0.7 in.)
„ of carapace,	7 „
Depth of carapace,	4 „
Length of pleon,	11 „
„ of telson,	3 „

Habitat.—Station 208, January 17, 1875; lat. 11° 37' N., long. 123° 31' E.; off Manila; depth, 18 fathoms; bottom, blue mud. One specimen; female, with ova. Trawled.

The specimen from which we have drawn this description appears to correspond with that given by Stimpson, which was taken at the Island of Amakirrima near Loo Choo.

Ours was trawled in shallow water in the narrows of the Philippine Islands associated with a male specimen of *Alpheus biunguiculatus*, which Stimpson says it resembles.

Alpheus gracilipes, Stimpson (Pl. CI. fig. 3).

Alpheus gracilipes, Stimpson, Proc. Acad. Nat. Sci. Philad., p. 100, January 1860.

„ „ Heller, Reise der Novara, Crust., p. 108.

Carapace one-third the length of the animal. Rostrum long and sharp; orbital lobes (fig. 3c) armed with short teeth, broad at the base.

First pair of antennæ having the three joints of the peduncle subequal, stylocerite reaching as far as the extremity of the first joint of the peduncle; outer flagellum stout at the base, and becoming suddenly slender, inner flagellum slender.

Second pair of antennæ having the peduncle a little shorter than that of the first; scaphocerite subequal in length with the peduncle; flagellum wanting.

First pair of pereopoda (fig. 3k) having the chelæ unequal, the larger being on the left side. It is as long as the carapace, three times as long as broad, smooth on the lower side, and notched near the dactyloid articulation on the upper; dactylos about one-fourth the length of the propodos. Smaller chela wanting. Third and fourth pairs with the meros unarmed at the infero-distal angle; propodos (fig. 3m) furnished with long solitary spines, subequally distant, with a dactylos that is long, sharp, and uniunguiculate.

The telson (fig. 3z) is narrow, tapering, armed with a spine at each posterior angle, and a few long hairs between them; dorsal surface smooth.

Length, entire,	15	mm. (0.6 in.).
„ of carapace,	5	„
„ of pleon,	10	„
„ of large chela,	5	„
„ of dactylos of large chela,	1.5	„

Habitat.—Station 162, April 2, 1874; lat. 39° 10' 30" S.; long. 146° 37' 0" E.; off East Moncœur Island, Bass Strait; depth, 38 fathoms; bottom, sand and shells. Two specimens. Dredged.

Dr. Stimpson obtained his specimens from a coral reef near the Island of Tahiti, at the depth of 1 fathom; and Heller records it from the same locality.

Observations.—Our specimens appear to differ from Stimpson's description, in having the joints of the peduncle of the first pair of antennæ subequal instead of the second being twice as long as the first, as that author has described it. Although the one in the Challenger collection was taken south of Australia, and Dr. Stimpson's at Tahiti, I do not think that the slight differences warrant a specific separation.

Alpheus biunguiculatus, Stimpson (Pl. CI. fig. 4).

Alpheus biunguiculatus, Stimpson, Proc. Acad. Nat. Sci. Philad., p. 100, 1860.

„ *charon*, Heller, Sitzungsber. math.-nat. Cl. k. Akad. Wiss. Wien, Bd. xliv. p. 272, Taf. iii. figs. 21, 22.

„ „ Heller, Reise der Novara, Crust., p. 107.

Rostrum and supraorbital teeth subequal in length.

First pair of antennæ a little longer than the carapace.

The second pair a little shorter than the entire animal; the peduncles of each pair being subequal, that of the second reaching a little beyond that of the first. The stylocerite is longer than the first joint of the peduncle, and the scaphocerite is, sharp pointed and as long as the peduncle.

The larger chela is lost in the two Challenger specimens, the smaller is of narrow form, and has the dactylos and pollex subequal, and about half the length of the palm. The second pair of pereopoda has the carpos six-articulate, the first articulus being nearly as long as all the rest. Third and fourth pairs having the meros unarmed, the propodos furnished with small spines, and the dactylos biunguiculate.

Telson broad, slightly tapering to the extremity, which is convex, fringed with hairs and armed with two small spines at the angles, and two others on the lateral dorsal surface.

Length, entire,	11 mm. (0.44 in.).
„ of carapace,	4 „
Depth of carapace,	2 „
Length of pleon,	7 „
„ of rostrum,	1 „
„ of telson,	2 „

Habitat.—Station 208, January 17, 1875; lat. 11° 37' N., long. 123° 31' E.; off Manila; depth, 18 fathoms; bottom, blue mud. Two specimens; females, one with ova. Trawled.

Observations.—This species, which comes from the same station as *Alpheus spiniger*, corresponds very closely with Stimpson's description of *Alpheus biunguiculatus*. According to that author it differs from *Alpheus neptunus* in having no spine on the palm at the base of the fingers in the larger hand (“manus majoris palma spina ad basin digitorum armata”). In the two specimens in this collection the larger hand is wanting. Dana does not figure any such spine, neither does he allude to it in his description, and he also figures his species *Alpheus neptunus* as having the dactylos of the third and following pairs uniunguiculate, whereas Stimpson says that it is biunguiculate. Had Dana figured the fifth or last pair as being so formed, we might have supposed that he overlooked that of the third and fourth pairs; for frequently, if not always, when the dactylos of the third and fourth pair is biarticulate, that on the fifth is single; but as he figures the third pair we cannot suppose him to have been incorrect. I therefore attribute our specimens to Stimpson's species *Alpheus biunguiculatus*.

This species corresponds with Heller's description of *Alpheus charon*, which was procured off the Nicobar Islands, and of which he says that “this species possesses on the frontal margin three pointed, spine-like processes, the central one of which is somewhat the longest, and reaches as far as the anterior end of the first joint of the first antennæ. On the last three pairs of pereiopoda the chela is very short and furnished with a double claw. In most other points this species corresponds closely with *Alpheus neptunus*.” I have thus been induced to associate them as the same species.

Alpheus neptunus, Dana (Pl. CI. fig. 2).

Alpheus neptunus, Dana, U.S. Explor. Exped., Crust., vol. i. p. 553, pl. xxxv. fig. 5.

„ „ Stimpson, Proc. Acad. Nat. Sci. Philad., p. 100, January 1860.

Anterior margin of the carapace anteriorly produced to a short sharp-pointed rostrum. Orbital margins anteriorly produced into a long tooth over each ophthalmopod, and subequal with the rostrum.

Pleon short, robust.

First pair of antennæ having the flagella unequal; first joint of the peduncle subequal with the two succeeding ones; stylocerite prolonged.

Second pair of antennæ having the scaphocerite short, not extending to the extremity of the terminal joint of the peduncle.

First pair of pereopoda unequal, larger hand ovate, smooth; chela short; dactylos rounded, arcuate, scarcely one-third the length of the palm. The smaller hand robust and more normal in its form. Second pair of pereopoda slender and multiarticulate, subequal in length with the first pair.

Length, entire,	17 mm. (0·6 in.).
„ of carapace,	8 „
Depth of carapace,	3·5 „
Length of pleon,	9 „
„ of telson,	2 „

Habitat.—Arafura Sea. One specimen; female.

Dana records his specimen from the Sooloo Sea at a depth of 6 fathoms, and from the Fiji Islands.

Betæus, Dana.

Betæus, Dana, U.S. Explor. Exped., Crust., vol. i. p. 558.

“Like *Alpheus* in the eyes, antennæ and feet. Front without beak. Anterior hands more or less inverted, the movable finger being the lower and outer.”

Such is Dana's description, but it appears to me to be one more convenient for classificatory purposes than natural in arrangement.

In the most marked cases the rostrum is a very unimportant feature in this group, and is frequently reduced to a slender point, so that its absence altogether is a character that appears to me to be of secondary importance. Nevertheless it appears to be a very constant law, that an important, but not conspicuous, internal variation may be correlated with a slight but constant external variation in form.

Dana says that the inverted position of the propodos is also a marked character of the genus, but this appears not to vary much from the condition in some species of *Alpheus*, as the abnormal form of the propodos in its relation to the dactylos is one of the striking features of many of the species.

The arrangement of the branchiæ is the same as in *Alpheus*, and so are most of the external parts, but in one specimen, in which the female was gravid with ova, I observed that they differed from those of *Alpheus* both in form, size, and arrangement. In *Alpheus* the ova are generally round, small, and massed together, as in most *Macrura*, by small connecting threads, while in *Betæus* they are larger and more oval.

Geographical Distribution.—In the Challenger collection there are species from the Fiji Islands and Cape York.

Dana records *Betæus truncatus* from Hermite Island, Tierra del Fuego, where it was dredged in 10 fathoms. *Betæus æquimanus* from the "shores of Black Rocks, among seaweed, Bay of Islands, New Zealand," and *Betæus scabro-digitus* from Valparaiso, Chili.

Stimpson obtained *Betæus australis* from Port Jackson, among sublittoral seaweed, and *Betæus trispinosus* at a depth of 6 fathoms in the same locality.

Betæus malleodigitus, n. sp. (Pl. CI. fig. 5).

Dorsal surface of the carapace (in female) depressed over the cervical fossa. Orbital lobes enlarged, anteriorly produced to an obtuse point. Branchial walls deep, lessening anteriorly and posteriorly from the second pair of pereopoda. Centre of frontal margin depressed and excavate (fig. 5c), the median line being slightly elevated, the elevation widening posteriorly to the orbital lobes.

The first pair of antennæ is slender and the stylocerite reduced to a minimum. The first joint of the peduncle is as long as the two following joints together.

The second pair of antennæ carries a long and slender scaphocerite, which consists chiefly of a spine that reaches as far as the extremity of the first joint of the peduncle of the first pair of antennæ, and scarcely to more than half the length of the terminal joint of the peduncle of the second pair.

The second pair of gnathopoda has the terminal joint evenly fringed with stiff hairs on each margin.

The first pair of pereopoda is unequal in size, that on the right being smaller and more normal; the propodos is long, ovate, and the dactylos and pollex correspond in length and are about half the length of the palm. The propodos on the left side is large (fig. 5k), thick and rounded towards the carpal extremity, and tapering towards the dactylos, the extremity of which passes the articulation; the dactylos is short, stunted, and projects in two opposite directions, being shaped like a mallet.

The second pair of pereopoda (fig. 5l) is long and slender, the carpos being five-articulate, the three distal articuli being equal, and the two proximal longer and subequal; the propodos is long and slender and with the dactylos forms a minute chela that is about half the length of the carpos. The posterior three pairs of pereopoda are wanting, but the joints that remain show the posterior pair to be more slender than the two preceding.

The lateral walls or coxal plates of the pleopoda are less deep than the carapace.

Length, entire (female),	17 mm (0.68 in.).
„ of carapace,	6 „
Depth of carapace,	4.5 „
Length of pleon,	11 „
„ of telson,	2.5 „
„ of large chela,	8 „
„ of small chela,	4 „
„ of dactylos,	1.5 „
„ of second pereopod,	16 „

Habitat.—Levuka, Fiji Islands, reefs. One specimen; female.

Observations.—As shown in the plate this specimen has attached to the pleopoda (fig. 5*q*) a number of egg-like bodies (fig. 5*par*), which I at first took to be the ova, but a close inspection showed that each was attached by a peduncle to the stalk of the pleopoda. The surface of the capsule has a roughened appearance, and when it was ruptured by compression a number of what appeared to be the eggs of some animal, unknown to me, were liberated. Within each small sac was an embryo, but not sufficiently advanced to enable me to determine its characters (fig. 5*par*). It is probably a parasite, and in general aspect resembles a minute *Sacculina*, but I do not think it belongs to that group, inasmuch as the embryo exhibits no Crustacean peculiarities.

Alpheus malleator, Dana, and *Alpheus obesomanus*, Dana, have the larger hand of the first pair of pereopoda with the same peculiar mallet-shaped dactylos as is present in this species.

Betæus microstylus, n. sp. (Pl. CI. fig. 6).

Orbital lobes considerably produced, leaving the median line of the frontal margin depressed and excavate.

First pair of antennæ having the stylocerite not longer than the first joint of the peduncle.

Second pair of antennæ having the scaphocerite deeply cleft between the outer tooth and the squamous portion, which is fringed with hairs on the inner side.

Telson quadrate, laterally and dorsally armed with two small spines, and terminally fringed with hairs.

Length, entire,	25 mm. (1 in.).
„ of carapace,	8 „
Depth of carapace,	5 „
Length of pleon,	17 „
„ of telson,	3 „

Habitat.—Albany Island, Cape York. One specimen.

Observations.—There is only one specimen of this species in the collection, and that, unfortunately, has all the pereopoda wanting, except the fourth on the left side. The general aspect of the animal corresponds nearly with that of *Betæus æquimanus*, Dana, from New Zealand, to which species I should have assigned it, had not Dana's description stated that "the basal spine of the inner antennæ (stylocerite) was very long, and the second joint was shorter than the first," whereas in our species the second joint is longer than the first and the stylocerite is very short, scarcely reaching to the extremity of the first joint; and further, that the "Basal scale of the outer antennæ (scaphocerite) is a little shorter than base, outer spine very short;" whereas in *Betæus microstylus* "the outer spine" is long, reaching to the extremity of the peduncles of both pairs of antennæ, and is separated by a deep narrow cleft or notch from the squamous portion of the same part of the organ.

This species is named from the smallness of the stylocerite, which forms the distinguishing feature that separates it from *Betæus æquimanus*, but I am very much inclined to doubt whether the length of this process is a feature sufficiently permanent to warrant a specific distinction.

Paralpheus, n. gen.

Anterior margin of the carapace dorsally carinated and produced to a laterally compressed rostrum; lateral walls of the carapace deep. Orbital lobes strongly defined and anteriorly produced to a point. Antennal margin of the carapace smooth, and the fronto-lateral angle rounded.

Ophthalmopoda hidden beneath the frontal margin of the carapace.

First pair of antennæ having a small stylocerite, and terminating in two flagella, of which the shorter divides near the extremity into two branches.

Second pair of antennæ having a long style attached to the basal joint, and carrying a scaphocerite that is rigid and styliform on the outer side, and separated from the foliaceous portion for a considerable distance from the extremity.

Mandible having the molar process cylindrical; psalidoma separate, flat and serrate; synnhipod short, broad, and uniarticulate.

Second pair of gnathopoda five-jointed; the coxa supporting a small podobranchia and the basis a long ecpysis; the penultimate joint, which probably homologises with the carpos, is short, and the terminal is long and tapering.

First pair of pereopoda having the ischium produced at the infero-distal angle and freely articulating with the meros at the upper angle; the meros increases distally in breadth, and is produced at the upper angle to a point, and articulates with the carpos at the lower, the space between the two angles being excavate to receive the posterior extremity of the carpos, which is short, stout, and triangular. The propodos is

very broad, very long, thick, ovate, and terminates in a short pollex and a curved short dactylos. The second pair of pereopoda is slender and multiarticulate; the third and fourth pairs are more robust than the second, and the fifth pair more slender than the preceding.

The pleopoda are long and biramose, and the rhipidura is broad, and fringed with hairs and strong teeth.

This genus probably belongs to the same group as that which Milne-Edwards calls the second, or those species which carry a pointed rostrum, viz.:—

B. A large spine fixed upon the external border of the basal joint of the second antennæ and directed forwards.

In this group Milne-Edwards places *Alpheus spinifrons*, Milne-Edwards, *Alpheus heterocheles*, Say, *Alpheus minus*, Say, *Alpheus villosus* (Olivier), and *Alpheus diversimanus* (Olivier).

Paralpheus diversimanus (Olivier) (Pl. CII.).

Palemon diversimanus, Olivier, *Encycl.*, t. vii. p. 663.

„ *villosus*, Olivier, *loc. cit.*, t. viii. p. 664.

Alpheus villosus, Milne-Edwards, *Hist. Nat. Crust.*, t. ii. p. 354.

„ *diversimanus*, Milne-Edwards, *loc. cit.*, p. 355.

Body of the animal generally granulated and papillose, sparsely covered with rigid hairs.

The carapace is produced anteriorly into a rostrum that reaches as far forwards as the extremity of the first joint of the first pair of antennæ, and in the median dorsal line a second point projects above the orbits. The frontal margin projects over the ophthalmopoda, and is elevated into a prominent tubercle which is anteriorly armed with a sharp pointed tooth directed forwards. The branchial region is deeply produced on each side.

The first pair of antennæ has the first joint armed with a stylocerite that reaches nearly to the extremity of the joint; the second joint is cylindrical and a little longer than the first; the third joint is short and supports two slender flagella, of which the upper is the more robust for the greater part of its length, and then it suddenly becomes more slender.

The second pair of antennæ has the penultimate joint of the peduncle armed with a long and slender tooth that reaches nearly to the extremity of the scaphocerite, which also terminates in a sharp point and carries on the inner side a narrow plate that is separated for some distance from the rigid outer styliform extremity. The ultimate joint is cylindrical and reaches a little beyond the extremity of the scaphocerite, and carries a slender tapering flagellum that is as long as the animal.

The mandible has the psalidoma distinct from the molar process, broad, convex, and evenly serrate, and the synhipod is broad, flat, spatuliform, and fringed with hairs.

The second pair of gnathopoda is robust, flattened on one side, and five-jointed, thickly fringed with hairs, and carrying a slender basecephysis.

The first pair of pereopoda is unequal on the two sides, sometimes the left and sometimes the right being the larger. The smaller is normal in form, having the pollex and dactylos subequal and about as long as the palm; the carpos is short and triangular, and not so wide as the propodos; the ischium is long and anteriorly excavate to receive the carpos. The propodos on the larger limb is a characteristic feature, being about half the size of the animal; it is convex on the inner and flat on the outer side, ovate generally, broader towards the carpal joint and tapering towards the dactyloid. The pollex is short and tuberculated, the dactylos obliquely articulated, arched and obtuse at the point. The second pair is slender, long, and has the carpos five-articulate, and the chela minute and ovate. The third and fourth pairs are robust, with the posterior margin serrate and terminating in a short stout dactylos. The fifth or posterior pair is shorter and more slender than the preceding, and free from a serrate margin.

The rhipidura is broad and fan-shaped; the outer plate having two spines between two teeth on the outer margin.

The telson is shorter than the lateral plates, quadrate in form, the two posterior angles terminating in a short point or tooth and one spine, and fringed with long hairs.

	Male.	Female.
Length, entire,	25.5 mm. (1 in.)	38 mm. (1.5 in.).
„ of carapace,	8 „	14 „
„ of rostrum,	2 „	2.5 „
Depth of carapace,	7.5 „	11 „
Length of pleon,	17.5 „	24 „
„ of telson,	4 „	6.7 „
„ of large chela,	14 „	23 „
„ of dactylos of large chela,	3 „	5 „
„ of small chela,	12 „	18 „
„ of dactylos of small chela,	5 „	9 „
„ of second pereopod,	21 „	28 „

Habitat.—Station 186, September 8, 1874; lat. 10° 30' S., long. 142° 18' E.; between Cape York and the Arrou Islands; depth, 8 fathoms; bottom, coral mud. Five specimens; one male and four females (length 39 mm.). Dredged.

Near Albany Islands, off Cape York. Two specimens; one male (28 mm. long), and one female (38 mm. long) bearing about twenty-five large, round ova.

The dorsal surface of the carapace carries a median subcarinated ridge, that projects forwards in the form of a compressed rostrum and is armed on the dorsal surface between the eyes with one strong tooth, and continues posteriorly until it fades away a little anterior to the posterior margin. The lateral walls of the carapace are deep

and project posteriorly beneath the coxal plate of the first somite of the pleon. The ophthalmopoda are short, movable, and lodged in a hollow tubercle that is elevated so as to appear almost as if it were the organ it covered, and is armed with a sharp pointed tooth projecting forwards.

The first pair of antennæ (*b*) has the first joint armed with a sharply pointed stylocerite that is nearly as long as the joint, and on the outer side with short stiff spines. The second joint is narrower than the first, a little longer, and cylindrical, while the third is less than half the length of the second and terminates in two slender flagella. The outer and upper flagellum, which is the stouter, remains thick for a considerable distance, and then lessens abruptly, and divides into two, one division being short and truncate and the other continuously slender.

The second pair of antennæ (*c*) carries on the second joint a long, slender, and sharp tooth that in length nearly equals the scaphocerite, which is also armed with a long and straight spine that reaches to the extremity of the terminal joint of the peduncle, and is separated for nearly half its length from the inner squamiform plate to which it is attached.

The mandibles (*d*) have an evenly serrate, convex, tenuous psalistoma, and a long, cylindrical, robust, molar tubercle, at the base of which a short, broad, thin, two-jointed synaphipod is attached.

The first pair of siagnopoda (*e*) is three-branched; the central branch is broad and spinous at the outer extremity, and smooth on the inner and outer margins; the inner plate is long, curved, and rigid, and the outer short, obtuse, and membranous; the two latter are almost free from hairs or cilia.

The second pair of siagnopoda (*f*) consists of a short central branch, an inner branch consisting of two plates, and an outer branch, which is produced anteriorly and posteriorly in the form of a scale, the margin of which is fringed with radiating cilia.

The third pair of siagnopoda (*g*) approximates to the preceding pair, but differs chiefly in having the mastigobranchial plate separated distinctly from the basecephysis.

The first pair of gnathopoda (*h*) is short and of great tenuity. It is seven-jointed, subpediform, and has the terminal joints squamiform, the dactylos, being broad and short, forms a ciliated marginal plate along the anterior portion of the propodos. The basis carries a long and slender ephysis, and the coxa is furnished with a short triangular mastigobranchial plate without a branchia.

The second pair of gnathopoda (*i*) is pediform, long, robust, and five-jointed. The coxa carries a small podobranchial plume; the basis a short and slender ephysis; the third joint, which probably represents the ischium and meros combined, is long, curved, and transversely triangulate; the following joint, which I presume represents the carpos, is short and triangular, and the terminal joint, which represents the propodos

and dactylos united, is long, tapering, tipped with long hairs, and fringed, particularly on the lower side, with numerous short ones, as also is the carpos and meros.

The first pair of pereiopoda (*k*) is unequal on the two sides, and has sometimes one sometimes the other hand the larger. In the typical specimen, that upon the right side is the smaller and more normal in form; it is moderately large and well developed; the propodos is long, and has the pollex as long as the dactylos and a little more slender, and both are inwardly curved at the apex, and have the inner margin fringed with hairs. The carpos is short, narrow and triangular; the meros is cupped at the carpal extremity, and articulates with the carpos at the inferior angle only, the upper angle being produced to a point and tipped with a bunch of hairs; the meros is long and the ischium short, as are also the basal joints. The coxa carries a short rudimentary mastigobranchial process. The hand upon the left side differs from that on the right in having the meros larger, and the antero-superior process more distinctly developed and hollowed to receive the posterior lobe of the carpos; the carpos is short and triangular; the propodos is unusually large, ovate, broader at the carpal extremity than at the dactyloid infero-anterior angle, which is produced in an obtuse pollex; the dactylos is broad, arcuate, and diagonally articulated with the propodos on the outer side. The second pair of pereiopoda is long and slender, with the hand minute and oval, the carpos five-articulate, the meros slender and the ischium robust. The third and fourth pairs of pereiopoda are stout and well developed, with the posterior margin serrate; the ischium is short, the meros and carpos long, the dactylos short and single-pointed. The fifth or posterior pair of pereiopoda resembles the preceding, but is generally more slender, and has the ischium proportionately longer, and the posterior margin smooth.

The pleopoda are long and flexible. The first pair (*p*) in both sexes carries one normally developed, and one rudimentary branch. The second (*q*) and following pairs are furnished with a long stylamblys, and the terminal pair, which forms the outer plates of the rhipidura (*vzv*), is armed at the outer distal angle with two strong divergent teeth, and between them two long movable spines, the plate having a well-marked diæresis. The distal margin of the outer as well as of the inner plate is fringed with a series of small teeth and fine hairs, of which those on the outer margin of the inner plate are the larger.

The telson is shorter than the lateral plates, and elongo-quadrante in general form; the posterior margin is slightly convex, fringed with long hairs, and armed at each angle with a sharp tooth and a small spine. The lateral margins are smooth but on each side of the median line is a strong ridge armed with two short spines, one distantly behind the other.

Our specimens appear to correspond more nearly with *Alpheus diversimanus* than with *Alpheus villosus*, as they are described by Milne-Edwards, and as they are

undoubtedly the same species, it is better to retain the specific name proposed by the author of the older though less recognised synonym.

Several specimens of this species were taken at the two localities given above. In the case of those from Albany Island the depth is not recorded, but I presume they were also taken in shallow water, and we may conclude that the species generally are the inhabitants of shallow seas, or swim near the surface of deeper waters. The ova are large and not numerous.

The branchial arrangement corresponds with that of *Alpheus* excepting by the absence of the mastigobranchial appendage to the second pair of gnathopoda and all the pereopoda, in which it closely corresponds with *Synalpheus*, as may be seen by the following table:—

Pleurobranchiæ,	.	.	.	...	...	1	1	1	1	1
Arthrobranchiæ,	.	.	.	...	...	...	...	...	...	...
Podobranchiæ,	.	.	.	...	1	...	...	...	...	...
Mastigobranchiæ,	.	.	.	1	...	...	...	...	...	...
				h	i	k	l	m	n	o

Synalpheus, n. gen.

Carapace arcuate, dorsally elevated in the median line into a carina, and anteriorly produced to a slender rostrum that is subequal with the length of the peduncle of the first pair of antennæ. Orbital margin projected over the ophthalmopoda and produced to an anteriorly directed, prominent, sharp tooth; fronto-lateral angle produced to a point.

Ophthalmopoda concealed beneath the frontal margin of the carapace.

First pair of antennæ furnished with a strong sharply pointed stylocerite; upper flagellum the shorter and divided into two branches, of which one is truncated.

The second pair of antennæ furnished with a strong tooth on the outer side of the first and second joints of the peduncle; scaphocerite sharply pointed, the styloform process separated from the foliaceous plate for nearly half its length; flagellum long and slender.

The mandibles possess a stout molar process, a curved, sharply pointed, and almost rudimentary psalidoma, and a small two-jointed synhipod.

The first pair of gnathopoda has the terminal joints enlarged and reflexed, the basis furnished with a strong multiarticulate ephysis, and the coxa bearing a short and broad mastigobranchia.

The second pair of gnathopoda is five-jointed and pediform, the basis carries a long uniarticulate ephysis, and the coxa has a small podobranchial plume.

The first pair of pereopoda is slightly asymmetrical, having the carpos short, with the upper and lower distal angles projecting, and the chelæ large. The second pair is long and slender, having the carpos multiarticulate, and the chela minute. The posterior three pairs of pereopoda terminate in a single pointed dactylos.

The somites of the pleon are deep and not strongly compressed; the three posterior somites rapidly narrow to the extremity of the telson, which is ovate, the lateral plates having a short diæresis, the outer angle of which is furnished with two strong spines.

The branchial apparatus corresponds with that of *Paralpheus* very nearly, and differs from that of *Alpheus* only in the absence of the rudiments of the mastigobranchiæ attached to the second pair of gnathopoda and all the pereopoda in that genus, as shown in the following table :—

Pleurobranchiæ,	.	.	.	...	...	1	1	1	1	1
Arthrobranchiæ,	.	.	.	...	...	...	...	...	...	...
Podobranchiæ,	.	.	.	...	1	...	...	...	...	...
Mastigobranchiæ,	.	.	.	1	...	...	...	...	...	...
				h	i	k	l	m	n	o

The aspect of the animal as a whole at once gives the idea of its distinctness from *Alpheus* and also from *Paralpheus*. The carina in the median line on the dorsal surface, the length of the smooth rostrum, and the production of the fronto-lateral angle of the carapace to a point, are suggestive of a separation from *Alpheus*, and the form of the mandibles and the absence of the mastigobranchiæ support this conclusion. But the separation from *Paralpheus*, although equally important is less conspicuous. The rostrum in both is remarkable for its length, but in *Paralpheus* it has a feeble tendency to denticulation on the upper surface. The stylocerite in *Paralpheus* is small, in *Synalpheus* it is large. There is only one tooth, and that remarkable for its length, attached to the base of the second pair of antennæ in *Paralpheus*, whereas there are two in *Synalpheus*.

The mandible in *Paralpheus* has a strong cylindrical molar process, a broad, flat, serrate psalistoma, and a short, spatuliform, uniarticulate synnaphipod, while in *Synalpheus* the molar process is stout and cylindrical, the psalistoma is almost rudimentary, being little more than a large curved and pointed tooth, and the synnaphipod is short and biarticulate. The first pair of gnathopoda carries a circular mastigobranchial plate in *Synalpheus* and a semicircular one in *Paralpheus*. The second pair of gnathopoda in *Paralpheus* is more robust, terminates in a point, and carries a slender uniarticulate basephysis, while in *Synalpheus* this pair of appendages is less robust and has the distal two joints shorter than the preceding, terminates in a bifid apex, and carries a long, stout, uniarticulate basephysis.

The first pair of pereopoda is more asymmetrical in *Paralpheus* than in *Synalpheus*. The second pair corresponds in all respects, except in the numerical value of the articuli of the carpos. The third and fourth pairs are larger than the fifth in *Paralpheus*, whereas in *Synalpheus* they are correspondingly equal in form and power.

The rhipidura bears some general resemblance in the two genera, but differs in detail. In *Paralpheus* there is one large tooth at the outer angle of the basal joint of

the sixth pair of pleopoda, whereas in *Synalpheus* there are two, and the telson is quadrate in the former and ovate in the latter, being fringed with strong spines or teeth in *Paralpheus* as well as by numerous long hairs, whereas there are only marginal hairs in *Synalpheus*.

A strict comparison of the several features that distinguish *Paralpheus* from *Synalpheus* induces me to believe that the distinction in the form of the mandibles is the only one of true generic value, all the others only being points of greater or less specific difference, which gradually lead us to the family of the Hippolytidae, as illustrated in the genus *Spirontocaris*.

Geographical Distribution.—This genus is limited to the only species known, and that has only been taken in the narrow and shallow strait between New Guinea and Australia.

Synalpheus falcatus, n. sp. (Pl. CIII.).

Carapace broad, deep, longitudinally arcuate, and about two-fifths the length of the animal; dorsally elevated into a carina that commences over the gastric region and is produced anteriorly to a rostrum that reaches as far as the distal extremity of the second joint of the peduncle of the first pair of antennæ. The orbital lobes are produced as sharp teeth that reach to half the length of the rostrum; a deep groove separates them from the median carina.

The first pair of antennæ has the three joints of the peduncle subequal, the first being rather the longest, and carries a stylocerite that reaches anteriorly as far forwards as the extremity of the rostrum; it terminates in two unequal flagella, the outer being about as long as the peduncle, and bifid at the extremity, and the inner being half the length of the animal.

The second pair of antennæ has the basal tooth as long as the tooth of the orbital lobe; the scaphocerite is pointed, longer than the rostrum, and shorter than the peduncle; the antennæ terminate in a flagellum that is as long as the animal.

The second pair of gnathopoda reaches about as far forwards as the extremity of the rostrum.

The first pair of pereiopoda has the larger chela on the left side; in our specimens of the female it is wanting, but in the male it is more than half the length of the animal and narrow, being about three times longer than broad. The meros is armed with a tooth at the upper distal angle; the carpos is short and armed with a tooth at the lower and upper angles; the dactylos is broad, curved, and furnished with a large tuberclose tooth near the joint on the under side, which, when closed, shuts into a hollow. The smaller chela is very short, the meros is armed with a strong tooth at the upper distal angle; the carpos having a similar one at the upper and lower angles;

the propodos is not longer than the dactylos of the larger chela; the dactylos is much longer than the pollex and curved in the form of a hook. The second pair of pereopoda is long and slender, and the carpos seven-jointed, the first articulus being as long as the three following; it terminates in a small chela.

Telson broad at the base and tapering, rounded at the distal margin, fringed with hairs and dorsally armed with two spines on each side of the median line.

Length, entire (female),	.	.	.	.	33 mm. (1.3 in.).
" of carapace,	.	.	.	.	13 "
Depth of "	.	.	.	.	10 "
Length of pleon,	.	.	.	.	20 "

The males are smaller and less robust.

Length, entire (male),	.	.	.	.	23 mm. (0.9 in.).
" of carapace,	.	.	.	.	9 "
Depth of "	.	.	.	.	6 "
Length of pleon,	.	.	.	.	14 "
" of large chela,	.	.	.	.	16 "
Width of " "	.	.	.	.	4 "
Length of dactylos of large chela,	.	.	.	.	5 "
" of small chela,	.	.	.	.	5 "
" of dactylos of small chela,	.	.	.	.	3 "
" of pollex of "	.	.	.	.	1.5 "

Habitat.—Station 186, September 8, 1874; lat. 10° 30' S., long. 142° 18' E.; between Cape York and the Arrou Islands; depth, 8 fathoms; bottom, coral mud. Six specimens; four males and two females. Dredged.

This species may be readily known by the elevated dorsal median ridge, which rises from the apex of the rostrum and continues as a small carina to the posterior extremity of the gastric region, where it is lost. The female is more than one-fourth longer and broader than the male and carries many broadly ovate ova, 1.5 mm. in the longest diameter.

The ophthalmopoda are observable as semi-movable organs beneath the carapace and a longitudinal ridge corresponds with the outer angle of the first pair of antennæ. The stylocerite is nearly as long as the rostrum and longer than the first joint of the peduncle (*c*, *b*). The phymacerite attached to the second pair of antennæ terminates in a strong, tooth-like, but not very prominent point. The mandible (*d*) has a large molar protuberance, a small tooth-like process representing the psalistoma, and a small two-jointed synaphipod, and bears a closer resemblance to the same organ in *Spirontocaris* than to that in *Alpheus*. The other oral appendages agree with those of *Alpheus*, or when they differ the differences are only such as may be expected in characters of

specific importance. The chelæ are unequal, and although the larger has a resemblance to that of *Alpheus*, yet it approaches to the more normal character of that appendage in other genera, rather than to the oblique and distorted form that is frequently found in *Alpheus*.

Family HIPPOLYTIDÆ.

The genera in this family comprise those in which the carapace is produced to an important rostrum, in which the first pair of pereiopoda is chelate and moderately robust; the second pair slender with the carpos multiarticulate, and the posterior three pairs of pereiopoda simple.

It contains several genera, of which those represented in the Challenger collection are briefly defined below :—

Platybema, n. gen.

Rostrum laterally compressed, deep.
Mandible without synnhipod or psalistoma.
First pereiopod chelate; carpos excavate.
Second pereiopod chelate; carpos biarticulate.

Latreutes, Stimpson.

Rostrum laterally compressed, deep, serrate.
Mandible without synnhipod or psalistoma.
First pereiopod chelate; carpos excavate.
Second pereiopod chelate; carpos triarticulate.

Hippolyte, Leach.

Carapace with a supraorbital and an antennal tooth. Rostrum slender, toothed.
Mandible without synnhipod, and with psalistoma.
First pereiopod chelate; carpos distally excavate.
Second pereiopod chelate; carpos triarticulate.
Branchiæ five in number; mastigobranchiæ four, rudimentary.

Spirontocaris, n. gen.

Carapace carinated, with two supraorbital and an antennal tooth. Rostrum deep, serrate.
Mandible with a rudimentary biarticulate synnhipod, and with a rudimentary psalistoma.

First pereopod chelate ; carpos not, or but slightly, excavate.
 Second pereopod chelate ; carpos seven-articulate.
 Branchiæ six in number ; mastigobranchiæ five, rudimentary.

Nauticaris, n. gen.

Carapace without supraorbital, but with an antennal tooth. Rostrum compressed, slender, serrate.
 Mandible with triarticulate synnhipod ; without psalistoma.
 First pereopod chelate ; carpos not excavate.
 Second pereopod chelate ; carpos seven-articulate.
 Branchiæ thirteen in number ; mastigobranchiæ six, rudimentary.

Hetairus, n. gen.

Carapace with one supraorbital and one antennal tooth. Rostrum long, narrow, and dentate.
 Mandible with two-jointed synnhipod ; without a psalistoma.
 First pereopod chelate ; carpos not excavate.
 Second pereopod chelate ; carpos seven-articulate.
 Branchiæ six in number ; mastigobranchiæ four, rudimentary.

Merhippolyte, n. gen.

Carapace without any supraorbital teeth. Rostrum long, slender, serrate.
 Mandible with triarticulate synnhipod, and with psalistoma.
 First pereopod chelate ; carpos not excavate.
 Second pereopod chelate ; carpos multiarticulate.
 Branchiæ twelve in number ; mastigobranchiæ six, rudimentary.

Chorismus, n. gen.

Carapace without any supraorbital tooth. Rostrum long, deep at base, laterally compressed.
 Mandible with triarticulate synnhipod, and rudimentary psalistoma.
 First pereopod chelate ; carpos not excavate.
 Second pereopod chelate ; carpos multiarticulate.
 Branchiæ seven in number ; mastigobranchiæ four.

Amphiplectus, n. gen.

Carapace without supraorbital tooth, but with orbital and antennal teeth.

Rostrum slender, minutely serrate.

Mandible with biarticulate synhipod and psalistoma, but without molar process.

First pereopod chelate, slender; carpos not excavate.

Second pereopod chelate; carpos multiarticulate.

Branchiæ ten; mastigobranchia, one.

Platybema,¹ n. gen.

Cyclorhynchus, de Haan, in v. Siebold's Fauna Japonica, p. 174 (nom. præoc.).

Rhynchocyclus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1860, p. 96 (nom. præoc.).

Rostrum orbiculatum, compressum, membranaceum, oculis et antennis intervenit. Antennæ internæ bisetaceæ, setis brevibus. Max. 5^{arum} art. secundus articulis duobus ultimis conjunctis æqualis; art. ultimis spinulosus, penultimo bis longior; palpi oblongi. Max. 4^{arum} art. tertius longior secundo; penultimus abbreviatus. Mandibulæ incurvatæ, corona simplice cylindrica, palpibus nullis. Pedes secundi didactyli, tenuiores primis, carpis brevibus annulatis. Sternum trigonum." (De Haan, *loc. cit.* *Rhynchocyclus (Lysmata) planirostris*,² de Haan, type.

Carapace dorsally carinated, produced anteriorly to a large, laterally compressed, deep rostrum, which projects below the level of the dorsal ridge and is inserted between the antennæ. Pleon generally, but slightly, compressed laterally, having the lateral coxal plates largely developed.

Ophthalmopoda short.

First pair of antennæ short, the peduncle not reaching to the extremity of the scaphocerite; flagella two, short, extending but little beyond the extremity of the rostrum.

Second pair of antennæ having a short and broad scaphocerite that narrows towards the extremity, is armed with a small tooth on the outer margin and fringed with long hairs on the inner, and does not reach beyond the extremity of the rostrum; flagellum about half the length of the animal.

Mandibles short, strong, cylindrical, without a psalisiform process or synhipod.

First pair of gnathopoda six-jointed. Whether the coxa carries any rudiment of a branchial plume or not I have not determined. The basis carries a long and robust two-jointed ephysis; the other joints are short, the carpos is sinuous and partially encroaches on the propodos, which articulates against the anterior margin in its entire length, and has the margin armed with long, curved, ciliated spines.

¹ πλατύς, flat, βῆμα, rostrum.

² *Hippolyte planirostris*, de Haan, in v. Siebold's Fauna Japonica, Crust., tab. xlv. fig. 7.

Lysmata planirostris, *loc. cit.*, tab. O.

Cyclorhynchus planirostris, *loc. cit.*, p. 175.

The second pair of gnathopoda is five-jointed. Whether the coxa carries a small podobranchial plume or not I have not determined. The basis supports a two-jointed ecpysis; the ischium is long, straight, robust, and is probably combined with the meros; the carpos or penultimate joint is short and the terminal one long.

The first and second pairs of pereopoda are short; the first is robust and chelate, having the carpos short, and anteriorly excavate to receive the extremity of the propodos, which articulates with it at the infero-distal angle. Second pair of pereopoda slender and minutely chelate; carpos biarticulate.

Pleopoda biramose, foliaceous, unequal.

Telson triangular.

I have not seen the typical species of this genus, but comparing the specimen in the collection, which I have named *Platybema rugosus*, with de Haan's description and figure of *Platybema (Hippolyte) planirostris*, I consider that the two belong to the same genus. Stimpson in his diagnostic description of the genus, from a specimen of *Platybema planirostris* that he took in the Gulf of Hakodadi, near the northern shores of Nippon Island, says that the anterior four pairs of pereopoda are furnished with an ecpysis (epipod), and that the carpos of the second pair of pereopoda is triarticulate. De Haan in his description says that it is annulated, but he does not so figure it in his plate, but makes the carpos long, straight, and uniarticulate. This appears to be also the condition of the part in *Platybema rugosus* when examined under a low magnifying power, but under a higher one it is resolved into a biarticulate condition.

Platybema rugosus, n. sp. (Pl. CIV. fig. 2).

Robust and dorsally arcuate. Carapace dorsally carinated and anteriorly produced to a deep rostrum that suddenly slopes from the crest, which is armed with teeth from the posterior margin of the carapace to the distal extremity of the rostrum. Pleon having the anterior two somites elevated in front, the third and succeeding somites smooth, excepting the sixth, which is armed with small teeth near the posterior margin. Telson having the lateral and distal margins serrate.

Length, entire,	19	mm. (0.7 in.)
" of carapace,	7	"
" of rostrum,	2.5	"
Depth of rostrum,	2	"
" of carapace,	5	"
Length of pleon,	12	"
" of telson,	2.8	"
" of first pereopod,	4.5	"
" of second pereopod,	7	"

Habitat.—Station 24, March 25, 1873; lat. $18^{\circ} 38' 30''$ N., long. $65^{\circ} 5' 30''$ W.; off Culebra Island, West Indies; depth, 390 fathoms; bottom, Pteropod ooze. One specimen; female. Dredged.

The carapace is nearly half the length of the animal; it is dorsally carinated and anteriorly produced to a laterally compressed and deep rostrum, that projects below the level of the dorsal ridge, and is inserted deeply between the antennæ. It is serrate on the dorsal surface, two rather large teeth being placed posterior to the cervical fissure, and the others anterior to it; the latter gradually decrease in size and traverse the margin of the rostrum to the under surface of the distal extremity. The inner and the outer canthus of the orbit is furnished with a small tooth. The fronto-lateral angle of the carapace is produced to a prominent point, and the lateral walls are adorned with tubercles.

The anterior two somites of the pleon are dorsally smooth, but their anterior margins are elevated, so that when viewed laterally the elevations resemble teeth. The third, fourth, and fifth somites are smooth and even, and the sixth is dorsally armed with two rows of teeth.

The telson (fig. 2z) is triangular and furnished with small spines on each lateral margin and on the terminal extremity.

The ophthalmopoda are short and orbicular.

The first pair of antennæ scarcely reaches beyond the apical extremity of the rostrum; the first joint of the peduncle is longer than the ophthalmopod, the second and third are short and subequal. The second pair of antennæ is about as long as the carapace, and carries a scaphocerite that does not reach quite to the extremity of the rostrum.

The mandibles (fig. 2d) are short and robust, and have the molar process furnished with a series of small serrate teeth, and one strong conical tooth in the centre. The first pair of gnathopoda (fig. 2h) is six-jointed, the last two joints being reflexed against the preceding; the basis carries a long and slender ephysis that is three times as long as the limb.

The first pair of pereopoda (fig. 2k) is robust and short, having the chela strong, articulating with the carpos at the inferior angle; the pollex and dactylos are tipped with hairs, and a fasciculus of similar hairs tips the upper distal extremity of the carpos and meros also. The second pair of pereopoda (fig. 2l) is slender and feeble; the two articuli of the carpos being each subequal in length to the palm of the propodos; the dactylos is short and stout, the pollex slender.

The third pair of pereopoda is also feeble, corresponds in length with that of the second pair, and terminates in a short simple dactylos. The fourth and fifth pairs are broken off at the coxal joints.

The pleopoda are biramose, the second pair (fig. 2*q*) has the branches foliaceous, the outer tapering, the inner broad, discoidal, and fringed with plumose hairs, and on the inner margin is a single short stylamblys tipped with a few cincinnuli. On the inner side of the basal joint there are numerous long hairs to which the ova are attached.

Latreutes, Stimpson.

Latreutes, Stimpson, Proc. Acad. Nat. Sci. Philad., January 1860, p. 96.

Resembles *Platybema*. Rostrum elongate, being more than half the length of the carapace, laterally compressed and deep.

First pair of antennæ subequal in length to the rostrum.

Second pair carrying an acutely pointed scaphocerite.

Mandible without synnhipod or psalistoma, the molar process alone being present, and curved at nearly a right angle with the apophysis.

The first pair of gnathopoda is seven-jointed and carries a mastigobranchia and an ephysis.

The second pair is five-jointed, robust and rigid, carries a small podobranchial plume and a short ephysis, and terminates in an obtuse extremity.

The first pair of pereopoda is short and robust and terminates in strong and simple chelæ; the propodos articulates with the carpos at the inferior angle, the upper portion falling into an excavation in the distal margin of the carpos; the carpos also articulates with the meros at the infero-distal extremity, and when extended falls into a similar excavation. The second pair of pereopoda is slender and chelate, the carpos being triarticulate. The posterior three pairs of pereopoda are slender and terminate in a simple dactylos.

The pleopoda are biramose, the branches being subequal. The telson tapers to a point.

This diagnosis differs in some points from that given by Stimpson. That author says that the carapace is armed with a dorsal median tooth; this is the case in his typical species, *Latreutes ensiferus*, while in *Latreutes unidentatus* and in *Latreutes dorsalis* there are two; but on the other hand *Latreutes planus* has none, and with this exception the resemblance of this species to *Latreutes unidentatus* is very close.

The chief distinction of this genus from *Platybema* appears to me to exist in the number of articulations in the carpos of the second pair of pereopoda. In the typical species, *Latreutes ensiferus*, of which I have had a great number for examination, the carpos is triarticulate, and in *Platybemas* according to my experience of *Platybema rugosus*, the carpos is only biarticulate. The species of the two genera

resemble one another so closely in form that their distinction may be most easily determined by the length of the rostrum and the general robust character of those of *Platybema* when compared with those of *Latreutes*.

The branchial arrangement consists of six plumes, of which five are pleurobranchiæ and one podobranchia, attached to the coxa of the second pair of gnathopoda, as shown in the annexed table:—

Pleurobranchiæ,	.	.	.	...	...	1	1	1	1	1
Arthrobranchiæ,	.	.	.	...	...	...	...	...	...	...
Podobranchiæ,	.	.	.	...	1	...	...	...	...	...
Mastigobranchiæ,	.	.	.	...	...	...	...	...	...	...
					h	i	k	l	m	n	o

Geographical Distribution.—*Latreutes ensiferus* is abundant among the common floating Gulf-weed, *Sargassum bacciferum*, in the Atlantic Ocean, and therefore lives at the surface of the sea, whereas *Latreutes dorsalis* is common near Japan on a shelly bottom at the depth of 8 fathoms; *Latreutes unidentatus* and *Latreutes planus* were taken near the surface at the Philippine Islands, but were not apparently very abundant.

Observations.—This genus was established by Stimpson to receive a species which was first described by Milne-Edwards from a specimen taken in the North Atlantic Ocean near the Azores, and which he named *Hippolyte ensiferus*.¹ Dr. Stimpson considered it to belong to the same genus as his *Latreutes dorsalis*, which he found common on a shelly bottom at the depth of 8 fathoms in the Gulf of Hakodadi, Japan, and says that it is in close affinity with *Cyclorhynchus (Platybema)* of de Haan, which was taken in the same locality. Close comparison of the figures of the parts given by de Haan under the name of *Lysmata planirostris*² and of the figure under the name of *Hippolyte planirostris*,³ supports the opinion of the close affinity of de Haan's genus *Cyclorhynchus (Platybema)* with that of *Latreutes*, Stimpson.

De Haan describes his genus as having the "Rostrum orbiculatum," but this cannot be accepted as of generic value, inasmuch as the length of the rostrum is liable to vary in the same genus, consequently its orbicular condition would become oval as it is in *Platybema mucronatus* (Stimpson). In a species brought from Australia, by Mr Angas, and preserved in the British Museum, which I described in 1863⁴ under the name of *Caradina truncifrons*, there is little to define it from *Platybema planirostris* (de Haan), excepting that the rostrum, instead of being orbicular, has the upper distal extremity quadrate, and the carpos of the second pair of pereiopoda is triarticulate.

The two genera possess the peculiar feature in the first pair of pereiopoda of the

¹ Hist. Nat. Crust., tom ii. p. 374.

² Loc. cit., tab. xlv. fig. 7.

³ In v. Siebold's Fauna Japonica, tab. O.

⁴ Trans. Zool. Soc. Lond., p. 499, pl. xl. fig. 2, 1863.

propodos articulating with the carpos at the inferior angle only, giving the appendage the appearance of partial dislocation. This is a character that was first noticed by Milne-Edwards in the genus *Caridina*, and has been overlooked by Stimpson and de Haan in their descriptions of *Platybema*. The type of *Latreutes* is distinguishable from that of *Platybema* by the form of the rostrum, which is orbicular in one and cultriform in the other, but according to my observations the two genera approach each other even in this character, and the only anatomical features that appear to distinguish one from the other, exist in the first pair of gnathopoda and in the second pair of pereiopoda, and these can be better appreciated by comparing the figures than from a complicated description.

Latreutes ensiferus (Milne-Edwards) (Pl. CIV. fig. 1).

Hippolyte ensiferus, Milne-Edwards, Hist. Nat. Crust., t. ii, p. 374.

Latreutes ensiferus, Stimpson, Proc. Acad. Nat. Sci. Philad., January 1860, p. 96.

Body slender and but slightly sinuous at the third somite of the pleon. Carapace dorsally rounded, armed with a small tooth on the gastric region. Rostrum nearly as long as the carapace, vertically broad, of extreme tenuity, slightly curved upwards on the upper surface towards the apex; extremity serrate, lower margin smooth and curved downwards in the middle. Antero-lateral angle of the carapace serrate with five or six small teeth.

Ophthalmopoda of medium size.

Second pair of gnathopoda (fig. 1*i*) having the penultimate joint short and fringed with spines on the distal margin, the terminal joint long and fringed with spines on the inner margin, and the antepenultimate as long as the two preceding, which circumstance de Haan considers of sufficient importance to be regarded as of generic value. This joint is armed on the distal half of the outer margin with stiff movable spines, the basis carries a short ephysis, and the coxa a podobranchial plume.

The first pair of pereiopoda (fig. 1*k*) is short and robust, the meros is excavate to receive the carpos, and the carpos is excavate to receive the posterior upper lobe of the propodos; the upper distal angle projects over the propodos and is tipped with a fasciculus of long hairs. The propodos articulates with the carpos at the lower angle and is broader at this extremity than at the dactyloid; the dactylos is broad and spoon-shaped, and corresponds in length with the pollex. The second pair of pereiopoda (fig. 1*l*) is longer than the first, slender, feeble, and minutely chelate; the carpos is triarticulate, the central articulus being the longest, and together the three are longer than the propodos, of which the fingers are nearly half the length. The other pereiopoda are moderately long and robust, the propodos is long and the dactylos short; the former is furnished with long spines on the under surface, and the dactylos

with a series of small spines on the same side, that increase in length as they approach the distal extremity, where the ultimate spine nearly equals the unguis in importance (fig. 1*m*).

The pleon is smooth and the telson is triangulate.

	Female.	Male.
Length, entire,	16 mm. (0·6 in.).	12 mm. (0·4 in.).
" of rostrum,	3·5 "	2·5 "
" of carapace,	4 "	3 "
Depth of carapace,	3 "	2 "
Length of pleon,	12 "	9 "
" of telson,	3 "	2 "

Habitat.—Atlantic Ocean, on Gulf-weed.

In the open ocean near the Azores by M. Reynaud (Milne-Edwards).

In the Atlantic Ocean, lat. 30° to 35°; common on the Sargasso weed (Stimpson).

The typical specimens in the Challenger collection were taken near Bermuda, in April 1873, in large numbers, many hundreds, of both sexes, in apparently equal proportions, associated in equal abundance with *Palæmon natator*. On the 4th of May 1876, on the homeward passage of the ship, between Stations 355 and 354, south of the Azores, about a dozen others were taken, and some among these showed a variation which enabled me more readily to determine the sexes, since the males generally had the extremity of the rostrum less perfectly dentated, the first pair of antennæ with the outer branch thicker and longer, and the scaphocerite longer, and more pointed.

Palæmon fucorum, Fabricius,¹ undoubtedly belongs to this genus, and from the statement that the rostrum is armed at the extremity with five teeth, I should have believed it to be the original of this species had not the author stated that the carapace is smooth ("Thorax lævis"), whilst a small tooth stands above the gastric region in *Latreutes ensiferus*.

On one specimen I found a small species of *Bopyrus* which I name *Bopyrus latreutis*, since it differs from *Bopyrus squillarum*, Latr., in having a rounded caudal extremity, as well as in size.

Latreutes planus, n. sp. (Pl. LXXXIX. fig. 5).

Carapace dorsally unarmed and produced to a robust rostrum which is deep, laterally compressed, anteriorly pointed, and serrate. Dorsal surface of the carapace smooth and free from ornamentation. Pleon dorsally smooth, posterior extremity of the sixth somite produced to a small tooth.

¹ Suppl. Entom. Syst., p. 404.

First pair of antennæ more robust than the second.

First pair of pereopoda shorter and more robust than the second.

Telson about half the length of the lateral plates of the rhipidura.

Length, entire,	6 mm. (0·2 in.).
„ of rostrum,	1·5 „
„ of carapace,	1·5 „
Depth of carapace,	1 „
Length of pleon,	4·5 „
„ of telson,	0·6 „

Habitat.—Off Sibago, Samboangan, Philippine Islands, October 23, 1874. One specimen.

The body of the animal is moderately robust, the carapace being the broadest part and dorsally elevated, anteriorly depressed and produced to a deep, laterally compressed rostrum, which projects to an acute point at the apex and is armed with a serrature of teeth, five of which are below the apex and ten above; the dorsal surface of the carapace is smooth, rising behind the gastric region, and continuous with the dorsal surface of the pleon. The telson is about half the length of the sixth somite.

The ophthalmopoda are short, stout, and carry a prominent tooth on the inner side of the globular ophthalmus.

The first pair of antennæ has the first joint of the peduncle subequal in length with the ophthalmopod and curved in correspondence with it, the upper distal angle being produced to a strong tooth or process; the second and third joints are short and subequal in length, and produced on the upper distal angle. The inner flagellum is short, stout, and tapering, reaching a little beyond the apex of the rostrum, it is multiarticulate, and fasciculi of membranous cilia arise from alternate articuli.

The second pair of antennæ is broken off at the extremity of the peduncle; the scaphocerite is narrow and reaches nearly to the distal extremity of the rostrum.

The oral appendages have not been examined in this species.

The second pair of gnathopoda is moderately long and robust; the lower or posterior surface is smooth and straight, the upper or anterior is arcuate and furnished with transverse rows of fasciculi of hairs, and tapers to an acute point.

The first pair of pereopoda is short and robust. The second pair is long and slender, and terminates in a chela that has the dactylos longer than the pollex. The posterior three pairs of pereopoda are slender and subequal, and terminate in a moderately long and slender dactylos, the propodos of each being fringed with fasciculi of hairs.

The first pair of pleopoda is simple, the others are biramose, the posterior pair being furnished with subequal rami that terminate in rounded extremities.

Observations.—This species was found associated with *Latreutes unidentatus*.

Latreutes unidentatus, n. sp. (Pl. LXXXIX. fig. 6).

Robust. Carapace armed with one large tooth on the gastric region, and anteriorly produced to a rostrum that is nearly as deep as the carapace, pointed in front, and having the margin serrate above with eight teeth, and below with five.

The pleon is smooth and the telson is as long as the sixth somite.

Length, entire,	5.5 mm. (0.2 in.)
„ of carapace,	1.5 „
„ of rostrum,	1 „
Depth of carapace,	1.5 „
Length of pleon,	4 „
„ of telson,	0.7 „

Habitat.—Off Sibago, Samboangan, Philippine Islands, October 23, 1873. Associated with the preceding species.

The animal is not so robust as *Latreutes planus* but more so than *Latreutes ensiferus*.

The dorsal surface of the carapace is flattened, and armed with a strong tooth over the gastric region, whence the frontal margin projects to a rostrum that is nearly as long and as deep as the carapace. The serrature on the upper surface reaches about halfway between the apex and base, and is formed by eight small teeth, and the lower margin by five; the apical tooth being sharp and prominent. The pleon is dorsally smooth, and has no tooth on the posterior margin of the sixth somite, which is shorter than in the preceding species, and has the telson subequal in length with it.

The ophthalmopoda are moderately robust, but longer than in the preceding species, and do not carry a projecting tooth upon the inner surface, but are perfectly smooth. The first pair of antennæ is robust, and does not reach beyond the apex of the rostrum; the first joint of the peduncle is subequal with the ophthalmopod, the second and third are shorter and subequal in length, and the inner flagellum, which is robust and tapering, reaches as far as the apex of the rostrum, and supports a series of fasciculi of membranous cilia. The second pair of antennæ is broken off at the extremity of the peduncle, and supports a slender pointed scaphocerite that is nearly as long as the rostrum.

The oral appendages of this species have not been separately examined.

The second pair of gnathopoda is robust and powerful, smooth on the lower surface, arcuate and firm, with rows of hairs on the upper, and terminates in an acute point.

The first pair of pereopoda is short and robust, the second long and slender, the dactylos and pollex being subequal and fringed with fasciculi of hairs. The posterior three pairs correspond with those of *Latreutes planus*.

The pleopoda are of generic value, only the posterior pair having the rami subequal, and about one-third longer than the telson.

Observations.—Dr. Stimpson¹ describes a species under the name of *Latreutes dorsalis*, which is armed with two teeth on the dorsal surface of the carapace, of which the anterior is spiniform and directed anteriorly, and the other obtuse and nearly obsolete. His species was taken in the Gulf of Hakodadi, Japan, where it is common on shelly bottoms at a depth of 8 fathoms. He describes its colour as being a brilliant scarlet ("coccineus"), and having a white dorsal band.

Hippolyte, Leach.

- Hippolyte*, Leach, Trans. Linn. Soc. Lond., vol. ix. p. 346; Edin. Ency., vol. viii. p. 432, 1815; Ency. Brit., Supp. 1, p. 421; Mal. Pod. Brit., tab. xxxviii., 1815-17.
 ,, Milne-Edwards, Hist. Nat. Crust., t. ii. p. 370.
Verbius, Stimpson, Proc. Acad. Nat. Sci. Philad., p. 104, 1860.
 ,, Heller, Crust. süd. Europ., p. 284, 1863.
Hippolyte, Kinahan, Proc. Nat. Hist. Soc. Dublin, p. 47, figs. 1-6, 1867.
Verbius, Miers, Cat. Stalk-Eyed Crust. of New Zealand, p. 81, 1876.
 ,, Kingsley, Proc. Acad. Nat. Sci. Philad., p. 421, 1879.
 ,, Sars, Forhandl. Vidensk. Selsk., No. 18, p. 7, 1882.

Carapace anteriorly carinated and produced into a laterally compressed rostrum, the upper margin of which is parallel with the dorsal surface of the carapace and armed with teeth; the under margin is excavated at the base and serrate towards the extremity. The fronto-lateral surface is armed on each side with a supraorbital and an antennal tooth. Pleon smooth, third somite posteriorly produced in the median dorsal line, and somewhat arcuate. Telson dorsally flat, laterally compressed, posteriorly tapering, and furnished with two solitary spines on each side, longitudinally situated on the dorso-lateral surface.

The ophthalmopoda are short, uniarticulate and pyriform.

The first pair of antennæ has the first joint of the peduncle excavate, and armed with a sharp stylocerite that is subequal with it in length. The second and third joints are smaller and subcylindrical, the terminal supporting two short flagella, of which the outer is the shorter and more robust.

The second pair of antennæ carries a terminally ovate scaphocerite that is distally armed with a tooth on the outer margin, and a flagellum that is subequal with the length of the animal.

The second pair of gnathopoda carries a short basephysis, and terminates in a joint that is distally truncate and furnished with small spinules.

The first pair of pereopoda is short, stout and chelate; the carpos is triangulate

¹ Proc. Acad. Nat. Sci. Philad., January 1860, p. 96.

and excavated to receive the extremity of the propodos. The second pair of pereopoda is slender, a little longer than the first, chelate, and has the carpos triarticulate. The posterior three pairs of pereopoda are short, slightly decrease in length posteriorly, and have the dactylos "spinulose within."

This diagnosis is drawn up after an examination of the type specimen of *Hippolyte varians* in the British Museum, and from Leach's description, to which he adds, "Montagu sent to me *Hippolyte varians*, the type of this genus," the definition of which he gives as "*Hippolyte* rostro acuminato ante medium subtus bi-serrato; pone medium et ad apicem supra uniserrato."

The following additions to the above definition are taken from recent specimens which have been found on the coasts of Devon and Cornwall.

The mandible has the molar process at less than a right angle with the apophysis; the psalidoma is reduced to a narrow process serrate on the inner margin, and the synnhipod is wanting.

The first pair of pereopoda is stout and short, having the propodos articulating with the carpos at the lower angle, a concave excavation being formed by the advanced condition of the upper angle, in which hollow the extremity of the propodos lies when the appendage is extended; chela having the fingers subequal and hollow. The second pair of pereopoda is slender, and has the carpos triarticulate.

Dr. Leach in his description of the genus says "carpo multi-articulato," but figures the joint as triarticulate. The variance between the figure and the description was probably due to the desire to bring other forms within the generic range. Thus he has figured *Hippolyte spinus*, which he makes the type of a separate division of the genus, with seven articuli to the carpos, so that the term multiarticulate was intended to mean any number of articuli more than one. In 1865, in a report to the British Association on the Marine Fauna of South Devon and Cornwall, the following passage written by myself occurs:—"Among the prawns we are enabled to add a new genus to the British fauna, namely, *Caridina* of Professor Milne-Edwards. In making this interesting addition we must remark that it is one of name only, since it is, we believe, the same that Dr. Leach described under the name of *Hippolyte varians*, which has remained misinterpreted. We have occasionally taken this species when dredging in Plymouth Sound, but never so abundantly as of late. We have previously observed the peculiar robust-looking first pair of pereopoda, but it was not until recently we observed that it had the peculiar structural formation peculiar to the genus *Caridina*, in which the propodos articulates with the carpos, not at the centre, but at the infero-anterior angle, and thus appears as a partially dislocated joint."

The fact, however, that Leach made *Hippolyte varians* the type of the genus *Hippolyte*, compels me to restore it to its original position, especially since *Caridina* has only been recognised as a fresh-water form, and has the dorsal surface of the rostrum

smooth, and the carpos of the second pair of pereopoda uniarticulate, according to Milne-Edwards' figure and description.

Dr. Stimpson¹ described a new genus founded on *Hippolyte acuminata*, Dana, under the name of *Verbius*, in which he placed *Hippolyte varians* as one of the recognised typical forms. This arrangement has been followed by Heller,² for he figures *Hippolyte varians*, Leach, as *Verbius varians*; by Miers,³ by Mr. J. S. Kingsley in his list of North American Crustacea,⁴ and in his revision of the genera of Crangonidæ and Palæmonidæ,⁵ and more lately by Professor Sars.⁶ Dr. Stimpson establishes his genus *Hippolyte* on Fabricius' species of *Cancer aculeatus*, which corresponds with the forms of Milne-Edwards' third division of *Hippolyte*, in which also falls Sowerby's species of *Cancer spinus*. The latter species Kingsley⁷ regards as the type of the genus *Hippolyte*. It is to be regretted that neither Stimpson nor Kingsley gave priority to Leach's definition of *Hippolyte*,⁸ and which was founded on the species known as *Hippolyte varians*, in 1815. In the same volume in which this definition appeared, Sowerby's prawn was named *Alpheus spinus*⁹ by Leach, and therefore at that time it was not recognised as belonging to *Hippolyte*, and it was not until he published the twenty-ninth plate of his Malacostraca Podophthalmia Britannica, a work which came out in parts between 1815 and 1817, that Sowerby's *Cancer spinus* was named *Hippolyte sowerbæi*.

Undoubtedly *Hippolyte varians*, Leach, and *Cancer spinus*, Sowerby, belong to two distinct genera, a fact that was probably recognised by Leach himself when he placed the latter, under the name of *Hippolyte sowerbæi*, in a second division of *Hippolyte*. This arrangement was followed by Milne-Edwards, who divided *Hippolyte* into three divisions, placing *Hippolyte varians* in the first, and *Hippolyte sowerbyi* in the third division.

Extended research has undoubtedly justified the division of the genus, upon purely anatomical grounds, into distinct genera.

When Leach first described the genus he had only one specimen to classify, and that was sent to him by Montagu from Devonshire, and this specimen he states to be the type of the genus. The specimen that he had named *Alpheus spinus*, the "Cancer spinus" of Sowerby, he evidently saw approached nearer to the new genus *Hippolyte* than to *Alpheus*; he therefore made a division and arranged it within the genus upon grounds which would not now be accepted, namely, the number of teeth on the dorsal surface of the telson, the number of articuli of the second pair of pereipoda and the presence of a synnhipod on the mandible.

¹ *Loc. cit.*

² *Loc. cit.*

³ *Proc. Acad. Nat. Sci. Philad.*, p. 421, 1879.

⁴ *Loc. cit.*, p. 419.

⁵ *Loc. cit.*, p. 347.

⁶ *Loc. cit.*, taf. x. fig. 4.

⁷ *Bulletin Essex Inst.*, vol. x. p. 63.

⁸ *Loc. cit.*

⁹ *Trans. Linn. Soc. Lond.*, vol. ix. p. 346.

When Milne-Edwards published his *Histoire Naturelle des Crustacés* in 1837, there were twenty-two species of *Hippolyte* known, and these he classified under three distinct divisions, dependent upon the extent to which the dorsal carina extends posteriorly. To these Dana added five, arranged in two divisions, corresponding with the first and third divisions of Milne-Edwards, and classified on the same character, and many others have since been added by Stimpson, Heller, Kröyer, Sars, and other carcinologists. To these may be added the specimens in this collection which differ from the typical *Hippolyte* of Leach in more or less important anatomical features, but all of which have certain external characters in common that are visible on superficial examination.

The form and disposition of the branchiæ are shown in the following table—

Pleurobranchiæ,	.	.	.	...	...	...	1	1	1	1
Arthrobranchiæ,	.	.	.	...	...	...	...	...	...	...
Podobranchiæ,	.	.	.	...	...	...	...	...	...	...
Mastigobranchiæ,	.	.	.	1	...	...	...	...	...	...
				h	i	k	l	m	n	o

Observations.—The late Professor Kinahan in a paper on this genus,¹ says of *Hippolyte varians*:—"This species occurs in great numbers in the sand-pools among the *Zostera* banks at Sandycove, near Kingstown; spawns in May. The specimens vary remarkably and beautifully in colour; pink, red, salmon, emerald-green, cobalt-blue, gray, chocolate-brown, opal white, are among the prevailing tints; the ova of a chocolate-brown.

"It is remarkably sensitive of handling; in no case could I succeed in keeping it for over forty-eight hours in a tank, although specimens of *Crangon fasciatus* and *Mysis chameleon*, from the same locality, lived with me for days. A volume might be written on the forms of the beak of this species. I have figured (pl. x.) the best marked varieties, which occurred in the following proportions:—

"Plate x. fig 1.—*a.* Normal type; rostrum nearly straight; apex bidentate, directed upwards, upper tooth shortest; below, two teeth, the anterior much posterior to the upper tooth of apex; proportional frequency of occurrence, 63 per cent.

"Fig. 2.—*b.* Rostrum straight; apex tri-dentate, teeth directed forwards, upper and lower teeth nearly equal in length; below one tooth only; proportional frequency, 25 per cent.

"Fig. 3.—*c.* Rostrum strongly curved upwards, scimitar-shaped; apex tridentate, upper tooth slightly longer than the lower; below a single tooth; proportion, 8 per cent. *N.B.*—The whole animal is much slenderer than the normal type; query a *species*?

¹ *Proc. Nat. Hist. Soc. Dublin*, 1857, p. 48.

"Fig. 4.—*d.* Rostrum straight; apex broadly truncated, directed forwards, quadridentate, apical teeth very minute; below, two teeth; proportion, 2 per cent.

"Fig. 6.—*e.* Rostrum straight; apex acuminate, *simple*, directed upwards; rostrum with two teeth below; one specimen out of 300 examined.

"Fig. 5.—*f.* Rostrum straight; apex bifid; rostrum with three teeth below, viz., one beneath apex and two closely approximated in the broadest portion of the rostrum; one specimen.

"All these specimens in addition have the basal superior tooth (characteristic of the species). Another curious form had the rostrum very much curved upwards, apex simple, and teeth below absent. These all were from the same pools,—in company with *Mysis chameleon*, *Carcinus mænas*, *Cancer pagurus*, and that strange Edriophthalmous Crustacea *Apseudes talpa*."¹

Hippolyte bidentatus, n. sp. (Pl. CV. figs. 1, 2).

Carapace smooth, having the dorsal surface level with the rostrum, which is more than half the length of the carapace; upper margin armed with a small tooth, halfway between the orbital margin and the apex of the rostrum; the lower margin with a similar tooth a little in advance of that on the upper surface. Supraorbital tooth well developed. Pleon slightly curved at the extremity of the third somite, which is produced posteriorly in the median line; the fourth somite is dorsally smooth; the fifth is armed on the posterior margin with two sharp teeth, one on each side of the median line; sixth somite unarmed. Telson long, narrow, tapering, extremity truncate and furnished with a small spine at each angle, and another more important on its inner side.

The ophthalmopoda are about half the length of the rostrum.

First pair of antennæ only slightly longer than the rostrum.

Second pair having the scaphocerite subequal in length with the rostrum, and a flagellum that is about the length of the animal.

First pair of pereopoda short and robust. Second pair a little longer than the preceding and more slender. Third, fourth, and fifth pairs longer than the first two, robust, and terminating in a strong unguis flanked on the inner side by numerous spinules.

Length, entire (male and female),	14 mm. (0.5 in.).
" of carapace,	4 "
" of rostrum,	3 "
Depth of carapace,	3 "
Length of pleon,	10 "
" of telson,	3 "

¹ *Loc. cit.*, p. 47.

Habitat.—April, 1873, Atlantic Ocean; on Gulf-weed. Two specimens; one male, one female.

June 18, 19, 1873; between Stations 62 and 63. One specimen, female, laden with ova. Taken at the surface.

This species bears some resemblance to *Hippolyte varians*, Leach, of which Professor Kinahan in his observations above quoted says "A volume might be written on the forms of the beak of this species," and he figures six of the best marked varieties. In every variety, however, the two teeth on the upper line of the rostrum are constant, one near the base, the other subapical, while those on the lower margin are as frequently two as three, two being the typical number.

Dr. Leach figures his specimen as having three teeth on the upper surface of the rostrum, but the posterior of these I believe to be the supraorbital tooth on the distant side, brought into view, as is not uncommonly the case, in the examination of the animal under compression or by the strain induced by using a too low magnifying power. If this view be correct, as I think it is, then Milne-Edwards' species of *Hippolyte tenuirostris* approximates closely in form to the variety of *Hippolyte varians*, which Kinahan describes as varying remarkably in the form of the rostrum (see p. 590).

Our present species, *Hippolyte bidentatus*, has the rostrum about two-thirds the length of the carapace, and in the same line with its dorsal surface. It is not elevated anteriorly, but comes to a point of lanceolate form at the apex (fig. 2c'); it is armed on the upper surface near the centre with a single tooth, and on the lower with one also, which is a little in advance of that on the upper margin. A well-developed supraorbital tooth flanks the rostrum at the base, posterior to which the carapace is smooth. The first antennal tooth is small and not conspicuous, but the second is more distinct. The third somite of the pleon is slightly arcuate towards the posterior extremity, and projects in the median line over the dorsal surface of the fourth. The fourth somite is smooth, and so is the fifth in the median line, but on each side a slender tooth projects from the posterior margin. The sixth somite is smooth and cylindrical, about one and a half times longer than the fifth, and a little shorter than the telson, which is long, narrow, and tapering.

The ophthalmopoda are small, pyriform, without any appearance of an ocellus.

The first pair of antennæ (fig. 1b) has the first joint broad and stout, excavate on the upper surface to afford room for the ophthalmopod, distally armed on the outer side with a stout tooth, and carrying a strong stylocerite that is about half the length of the joint. The second and third joints are short, cylindrical, and subequal in length, the third is distally divided and supports on each lobe a short flagellum. The flagellum on the outer and upper lobe is the more robust, it is shorter than the peduncle, and is divided into about ten or twelve articuli. The lower distal margin of each

articulus, projects beyond the base of the next and supports a few simple hairs, while two fasciculi of membranous cilia stand on each. The lower and inner flagellum is longer and much more slender than the outer, and is divided into twelve or fifteen articuli, fringed at each articulation with minute hairs.

The second pair of antennæ is about the length of the animal and carries a scaphocerite that reaches beyond the extremity of the rostrum, the squamiform portion is square at the extremity and fringed with ciliated hairs, the outer margin is smooth, rigid, and armed with a tooth near the distal extremity.

The mandibles (fig. 1*d*) correspond with those of *Hippolyte varians*, and consist of a stout molar projection, obliquely truncate, and covered with minute teeth, hairs and spinules, and a psalidoma that is slightly curved, pointed, and serrate at the inner distal extremity.

The first pair of siagnopoda (fig. 1*e*) is three-lobed, the outer lobe being styloform, the style consisting of a long and nearly straight, sharp pointed spine. The second pair was not examined. The third pair (fig. 1*g*) consists of three foliaceous plates of great tenuity, fringed on the inner margin with ciliated hairs, the third plate supports a long, slender, two-jointed appendage; at the base of the first joint a membranous mastigobranchial lobe is attached.

The first pair of gnathopoda (fig. 1*h*) is six-jointed. The joints are broad and flat, and fringed on the inner and distal margins with stout hairs delicately ciliated, the terminal two joints are reflexed against the preceding; the second joint carries a stout and long basecephysis, terminating in a few obscure articuli and long and ciliated hairs.

The second pair of gnathopoda (fig. 1*i*) is of moderate length and tolerably robust. It consists of five joints and is pediform. The coxa is broad and short, and supports a double foliaceous appendage, as if it were the rudiment of a branchial plume; the basis supports a short and stout ephysis that is about half the length of the next joint, which is long and robust, and probably represents the ischium and meros combined; the fourth joint is short and broader at the distal extremity than at the base, and supports a long, slightly tapering and curved joint that terminates in three or four short stout spines.

The first pair of pereopoda (fig. 1*k*) is short and robust; the meros is armed with a sharp projecting process on the upper distal angle, which receives and supports the carpos when thrown back; the carpos is short, broader at the propodal extremity than at the meral, the upper margin projecting beyond the articulation and forming a hollow cup, in which the basal portion of the propodos falls when the limb is extended. The propodos articulates with the carpos at the lower angle, it is dilated on the upper surface, and is lodged in the hollow formed in the frontal wall of the carpos; the pollex is pointed and curved, and corresponds in form with the dactylos;

so as to make a long ovate chela, the margins of which are ornamented with several fasciculi of strong and simple hairs.

The second pair of pereopoda (fig. 1*l*) corresponds with the typical form, it is scarcely longer but much more slender than the first, and the chela is small and ovate; the carpos is twice the length of the propodos and distally as broad, it is divided into three articuli, of which the middle one is the shortest, each of which supports one or two fasciculi of hairs. The three following pairs are robust and longer than the preceding.

Hippolyte projecta, n. sp. (Pl. CV. fig. 3).

The rostrum is broken just beyond the orbit. Dorsal crest armed with teeth, four of which are present, the posterior being placed on the gastric region. A supra-orbital tooth is situated on each side, in a line corresponding with the third tooth from the posterior one, and a slender antennal tooth. The pleon is but slightly elevated at the third somite, which dorsally projects over the fourth; the sixth equals in length the preceding two, and the telson is subequal in length with the sixth somite.

The ophthalmopoda (fig. 3*a*) are pyriform and furnished with an incomplete ocellus.

The first pair of antennæ (fig. 3*b*) is robust and has the peduncle armed with two teeth on the first joint and one on the upper surface of the second and third joints. The upper flagellum is stout and the lower one slender.

The second pair of antennæ has a scaphocerite that reaches beyond the extremity of the peduncle of the first pair. The flagellum is broken off short.

The second pair of gnathopoda is robust, fringed with short hairs, and reaches as far as the extremity of the scaphocerite.

The first pair of pereopoda is robust and short, the carpos articulating with the propodos at the lower angle. The second pair of pereopoda is wanting; the third pair is long and robust; the meros is armed with three teeth on the lower distal margin. The fourth and fifth pairs are shorter than the preceding, and smooth.

Length, entire (male),	22 mm. (0·8 in.).
„ of carapace,	6 „
„ of rostrum, . . . . .	...
„ of pleon,	16 „
„ of third somite of pleon,	4 „
„ of sixth somite of pleon,	4 „
„ of telson,	4·5 „

Habitat.—Station 49, May 20, 1873; lat. 43° 3' N., long. 63° 39' W.; south of Halifax, Nova Scotia; depth, 85 fathoms; bottom, gravel, stones; bottom temperature, 35°·0. One specimen, male (?). Dredged.

Spirontocaris,¹ n. gen.

- Hippolyte*, Leach, Malacos. Pod. Brit. (Division **).
 „ Milne-Edwards, Hist. Nat. Crust., tom. ii., pp. 375, 378 (Divisions 2 and 3).
 „ Bell, Brit. Stalk-eyed Crust., p. 283 (Part).
 „ Dana, U.S. Explor. Exped., Crust., p. 565 (Division 2).
 „ Stimpson, Proc. Acad. Nat. Sci. Philad., p. 102, 1860.

Carapace carinated and armed with teeth. Rostrum deep, laterally compressed and armed on the upper and lower margins with numerous strong teeth. Frontal margin having two supraorbital, one antennal and one fronto-lateral teeth. First pair of pereopoda subequal, having the carpos not excavate at the anterior extremity. Second pair having the carpos seven-jointed. Branchiæ twelve.

The carapace is anteriorly carinated and produced to a laterally compressed rostrum, that is furnished with teeth on the upper and lower margins, and elevated to a crest over the gastric and frontal regions. The frontal region is armed with two supraorbital teeth and an antennal tooth, and one is situated at the infra-anterior angle of the carapace. The pleon is dorsally smooth, having the third somite arcuate and posteriorly produced in the median line over the fourth somite.

The ophthalmopoda are uniarticulate, pyriform, short; the ophthalmus being furnished with an ocellus.

The first pair of antennæ is but little longer than the rostrum, having the first joint of the peduncle slightly excavated, broadly expanded, and armed on the outer margin with a stylocerite that is subequal in length with the first joint of the peduncle. The second and third joints are cylindrical, and support two short unequally stout flagella.

The second pair is subequal in length with the animal, and has a scaphocerite that is armed with a tooth on the outer distal extremity.

The mandibles have a broad molar process that is curved at right angles to the apophysis; the psalistoma is rudimentary and not connected with the molar process; the synhipod is small, feeble and two-jointed.

The first pair of gnathopoda is small, feeble, and of great tenuity; the carpos and propodos are compressed, dilated, and reflexed against the inner margin of the meros; the basis carries a long ephysis and the coxa supports a mastigobranchial plate, to which is attached a small podobranchial plume.

The second pair of gnathopoda is subpediform and five-jointed, the terminal joint is longer than the preceding, and distally compressed, the basis furnished with a short ephysis, and the coxa carries the rudiment of a mastigobranchia but no branchial plume.

The first pair of pereopoda short, robust and chelate, having a carpos that is anteriorly as broad as the proximal extremity of the propodos. The second pair is more slender than the first, minutely chelate and unequal in length, having the carpos

¹ From *σπίλας*, a sower.

seven-articulate. The third, fourth, and fifth pairs are subequal in length, and resemble each other in form, they are moderately robust and terminate in a dactylos that is serrate on the inner margin and terminates in a double unguis.

The posterior pair of pleopoda is subequal in length with the telson, the outer ramus being furnished with a diæresis that is armed with a tooth at the outer margin, and the telson is dorsally smooth and dorso-laterally furnished with short spines on each side, and spines and hairs at the extremity.

The preceding description is taken from *Cancer spinus*, Sowerby, which is synonymous with *Hippolyte spinus*, Leach, and which the latter made the type of his second division of *Hippolyte*. But since Leach's definition was chiefly based on the variable feature of there being four instead of two spines on each side of the dorso-lateral surface of the telson, its position in the genus with *Hippolyte varians* cannot be maintained in the face of more important structural differences.

The branchiæ consist of six pairs arranged as in the annexed table :—

Pleurobranchiæ,	.	.	.	...	...	1	1	1	1	1
Arthrobranchiæ,	.	.	.	...	...	...	...	...	...	...
Podobranchiæ,	.	.	.	r	...	...	...	...	...	...
Mastigobranchiæ,	.	.	.	l	r	r	r	r	...	...
				h	i	k	l	m	n	o

Geographical Distribution.—North Atlantic Ocean and Arctic Seas.

Spirontocaris spinus (Sowerby) (Pls. CVI., CVII.).

Cancer spinus, Sowerby, Brit. Misc., 1806, pl. xxi.

Alpheus spinus, Leach, Trans. Linn. Soc. Lond., vol. xi. p. 244; Edin. Encyclop. Sup., vol. vii. p. 421.

Hippolyte sowerbæi, Leach, Malacos. Podophth. Brit., pl. xxxix. figs. 1, 10.

„ *sowerbæi*, Desmarest, Consid. sur les Crust., p. 223, pl. xxxix. fig. 1.

„ *sowerbyi*, Milne-Edwards, Hist. Nat. Crust., tom. ii. p. 380.

Hippolyte spinus, Owen, Ross's Second Voyage for the Discovery of a North-West Passage, Append., p. lxxxiii., pl. iii. fig. 2.

„ „ Bell, Brit. Stalk-eyed Crust., p. 284.

„ „ White, A., Pop. Hist. Brit. Crust., p. 118, pl. ix. fig. 1.

„ *securifrons*, Norman, Brit. Assoc. Rep., 1861; Trans. Tyneside Field Club, p. 267, pl. xii. figs. 1, 7, 1862.

Hippolyte spina, Stimpson, Proc. Acad. Nat. Sci. Philad., 1869, p. 106.

„ „ Kingsley, Proc. Acad. Nat. Sci. Philad., 1879, p. 418.

Leach's definition is as follows :—“ H. rostro alto obtuso supra multi-serrato apice emarginato serrulato; subtus unisonato.”

Carapace dorsally carinated and armed with five large teeth, commencing close to the posterior margin. Rostrum armed with one or two large teeth and a serrature of several minute ones, terminating more or less abruptly posterior to a sharp apical point; lower margin deep anteriorly and armed with two large teeth, and a serrature of several

smaller ones near the apex. Frontal surfaces of the carapace furnished with two supra-orbital teeth, a well-developed antennal tooth, and another at the fronto-lateral angle. Pleon having the third somite dorsally arcuate and posteriorly produced over the fourth, but not elevated into a tooth.

The first account of this species was given under the name of *Cancer spinus*, in a figure and description by Mr. Sowerby in the British Miscellany 1806; this was followed by a short notice by Leach under the name of *Alpheus spinus*, in the Transactions of the Linnean Society for 1815 (?), and in 1817 by a figure with the details enlarged but with meagre description in his Malacostraca Podophthalma Britannica.

A fuller description was given by Milne-Edwards, but even this leaves out some very important points, so important that it appears to me to be impossible naturally to retain this species in the same genus with *Hippolyte varians*, which Leach states to be the type of *Hippolyte*.

As the species appears to have a very large area of distribution, it is highly desirable that we should have a clear idea of its form and anatomical details, inasmuch as it appears to bear largely upon the specific value of other forms, more particularly since it has erroneously been accepted as the type of the genus *Hippolyte* by Stimpson, Kingsley, and other authors.

Leach's figure¹ was from another and more perfect specimen, but was accompanied by only a meagre description. The rostrum is drawn enlarged (Pl. CVI. fig. 1), and stands at the anterior extremity of a conspicuous carina that extends to the posterior margin of the carapace; on the dorsal crest, posterior to the orbit, are five large teeth, anterior to which, commencing just above the orbital margin, and continuous on the rostrum, is a series of twelve small teeth, of which those near the centre of the series are the largest, and the most anterior terminates at a little distance behind the apex. The apex forms a cylindrical sharp pointed tooth, that is produced posteriorly as a lateral ridge on each side through the middle of the rostrum to the base, where it is strengthened and supported by two teeth, one above the other, on the inner angle of the orbit. The lower margin of the rostrum descends from the apex perpendicularly, and forms a broad, compressed plate, the anterior edge of which is furnished with several minute teeth and a larger one, and still more distantly with another separated from the rest, behind which the margin ascends, apparently to afford space for the freer movement of the ophthalmopoda.

The ophthalmopoda are uniarticulate, short, and pyriform (Pl. CVII. fig. *a*).

The first pair of antennæ is furnished with a broad and sharp pointed stylocerite, and supports two short, unequal flagella, that reach but little beyond the rostrum.

The second pair is furnished with a broad scaphocerite, armed on the outer distal extremity with a strong tooth.

¹ *Loc. cit.*

The second pair of gnathopoda has the terminal joint about three times the length of the penultimate, it is spatuliform and has the distal margin fringed with small spines.

The first pair of pereopoda is short, robust and chelate; the carpos being as long as the palm of the propodos and subequal with the meros. The second pair is long and slender, minutely chelate, and has a carpos that is half as long again as the meros, and is divided into seven unequal articuli. The posterior three pairs of pereopoda are short and robust, and have the propodal extremity of the carpos projecting over the articulation; the propodos is fringed with spines on the flexor margin, and the dactylos serrate and biunguiculate.

The rhipidura has the outer plates bisected by a diæresis, and the external margin armed with a minute spine. The telson is longer than the lateral plates, and is furnished with four dorso-lateral spinules, and terminally with two spines and a few hairs.

Bell's description and figure were evidently taken from the animal which is preserved in the collection of the British Museum.

Milne-Edwards' description was probably drawn from an Arctic specimen. It differs from the figure given by Leach in certain minute details; for instance, he says that the extremity of the rostrum is truncated ("tronqué au bout"), armed on the upper surface with four or five teeth on the carapace and seven or eight very small teeth on the rostrum, and on the lower with two teeth, the anterior of which is separated from the apex by some little teeth.

The third somite of the pleon posteriorly projects as a great hooked tooth, and the telson is furnished with four pairs of little spines.

Milne-Edwards' specimens are recorded from Greenland and Iceland. Sowerby obtained his from Scotland, Leach's came from the Firth of Forth, and Bell received two that were dredged by Mr. MacAndrew off the coast of Shetland.

Professor Owen figures and describes¹ this species as having the carapace armed with teeth from the posterior margin to the apex of the rostrum (Pl. CVI. fig. 2), they decrease gradually in importance anteriorly, and on the under margin there are two teeth without the small series shown in Leach's figure, and he remarks that the general form of the rostrum agrees with that figured by Leach, but that many have it simply emarginate at the apex and not serrulate. The third somite of the pleon in Professor Owen's figure has the dorsal surface projecting posteriorly in the median line as a strong and elevated tooth. This peculiar feature is made a specific character in the description of this species under the name of *Hippolyte sowerbyi* by Milne-Edwards,² and also in the description and figure of *Hippolyte spinus* by Bell,³ who states that it is carinated, while Owen figures it as an elevated and prominent tooth, and Milne-Edwards says that it is prolonged in the form of a great hooked tooth which resembles "un bec de seiche" advancing above the following somite.

¹ *Loc. cit.*

² *Loc. cit.*

³ *Loc. cit.*

Leach's original figure in the Malacostraca Podophthalma Britannica does not so represent it, but it is given in Sowerby's figure, and also in Adam White's, Professor Bell's, and Sir Richard Owen's.

The specimens in the Challenger collection have not this feature developed beyond that shown in Leach's figure, in which the central portion of the third somite is posteriorly produced above and lies closely in contact with the dorsal surface of the next succeeding somite. Many specimens were taken at the same station, which exhibit variations that are interesting and perhaps important in the value they may have in regard to the formation of specific character. A brief description of each variety is given below.

Spirontocaris spinus, var. α (Pl. CVI. fig. 1).

Carapace dorsally carinated and armed with four or five large teeth, and seven or eight very small ones on the rostrum, and with two teeth, sometimes a serrature, on the lower margin. Pleon having the third somite arcuate and posteriorly produced to a sharp point (Leach).

Spirontocaris spinus, var. β (Pl. CVI. fig. 2).

Carapace dorsally carinated and armed with six large teeth which begin nearly at the posterior margin of the carapace, and seven or eight small ones on the rostrum, and with three teeth and no serrature on the lower margin. Pleon having the third somite arcuate, and posteriorly produced and elevated to a large tooth (Owen, Milne-Edwards, Bell, Adam White).

Spirontocaris spinus, var. γ (Pl. CVI. fig. 3).

Carapace dorsally carinated and armed with teeth that commence about one-third the length of the carapace from the posterior margin, and continue in a regular and horizontal succession of eight to a short distance from the extremity of the rostrum, when they gradually and rapidly decrease in size, in a series of four, to a sharp pointed apex. The lower margin is armed with two or three teeth. The lower of the supra-orbital teeth is smaller than the upper. Antennal tooth well developed. Fronto-lateral tooth reduced to a point. Third somite of the pleon arcuate, and posteriorly produced to a point in the median line.

Spirontocaris spinus, var. δ (Pl. CVII.).

Carapace dorsally carinated and armed with five teeth, commencing rather more than one-third its length from the centre of the posterior margin, and the rostrum with seven or

eight smaller ones, of which the anterior four or five form a small serrature; the lower margin is armed with three teeth. Pleon having the third somite dorsally arcuate, and only slightly produced posteriorly in the median line and not elevated into a tooth.

Spirontocaris spinus, var. ϵ (Pl. CVI. figs. 4, 5, 6).

Carapace dorsally carinated and armed with five large teeth that commence about halfway between the orbital and posterior margins, and the rostrum with several smaller teeth, of which the anterior four form an abruptly descending serrature posterior to the sharp apex; the lower margin is armed with four teeth. The upper of the supraorbital teeth is larger than the lower.

The antennal tooth as well as that at the fronto-lateral angle is moderately produced. Pleon having the third somite arcuate, posteriorly produced in the median line, but not elevated to a tooth.

Spirontocaris spinus, var. ζ (Pl. CVI. fig. 7).

Carapace slightly carinated and elevated on the dorsum as well as on the rostrum, armed with fourteen teeth of equal proportions, the anterior being the smallest; under margin armed with six of equal size; supraorbital teeth well defined but small, as are also the antennal and fronto-lateral teeth. Pleon having the third somite arcuate and posteriorly produced in the median line, but not elevated to a tooth.

Spirontocaris spinus, var. η (Pl. CVI. fig. 8).

Carapace anteriorly carinated and armed with six or seven large teeth, the posterior four of which are smooth, the two anterior serrate, which character of teeth is persistent to the apex of the rostrum. Under margin armed with three smooth teeth. Supra-orbital teeth large.

The variety δ (Pl. CVII.) is the nearest approach in this collection to the form of the type.

The carina on the dorsal surface of the carapace commences on the cardiac region, and is furnished with five strong teeth, of which the most anterior is on a level with the orbital margin; beyond this point the rostrum is furnished with seven teeth, gradually decreasing in size anteriorly, the last four form an oblique serrature terminating within the extremity of the rostrum, which is produced to a strong, oblique, upwardly directed, rounded, sharp tooth, which is continued posteriorly as a ridge on each side of the rostrum to the orbital margin, where it is supported by two small teeth, one above the other. The lower

margin of the rostrum is deep and laterally compressed, and armed with three teeth, of which the anterior is the largest; between it and the apical tooth the margin is smooth, there being no small teeth, as shown and described in the type specimen.

The ophthalmopoda (Pl. CVII., *a*) are pyriform, gradually increasing in diameter from the articulation to the ophthalmus, which is connected with a small, well-defined ocellus at its upper and inner margin, and halfway between the latter and the articulation there is a prominent lobe or tubercle.

The first pair of antennæ (*b*) has the peduncle shorter than the rostrum, the first joint horizontally depressed and laterally expanded, the outer margin being increased by a wide stylocerite, the point of which reaches nearly to a level with the distal articulation of the second joint. The second joint is armed on the upper and outer angle with a slender sharp tooth; the third joint is short and carries two very unequal flagella, the upper and outer is short, thick and flattened, about half the length of the peduncle, to which it is attached by a very small pedicle, and suddenly terminates at the apex in a small, slender, and short extremity; the inner flagellum is short, slender, and thread-like, and is subequal with the upper and reaches a little beyond the apex of the rostrum.

The second pair of antennæ (*c*) carries a scaphocerite that is subequal with the length of the rostrum; it is broad at the apex, having the inner margin subparallel with the outer and densely fringed with long ciliated hairs, and the outer strengthened by a ridge that terminates in a subapical tooth.

The mandibles (*d*) have the molar process obliquely truncate, and bent at right angles to the apophysis; the psalistoma is reduced to a small tooth-like process of considerable tenuity that terminates in an oblique serrate extremity; the synphipod originates close to the base of the psalistoma, and is small, feeble, and two-jointed, the terminal joint being fringed with hairs.

The first pair of siagnopoda (*e*) differs from that of *Hippolyte* in having the outer branch bilobed, and armed on one lobe with a single, sharp, robust spine, and with two on the other. The second pair of siagnopoda has the posterior portion of the large mastigobranchial plate larger than in *Hippolyte*, but is otherwise developed in the same form. The third pair (*g*) as well as the two pairs of gnathopoda (*h*, *i*) also resemble those of *Hippolyte* in form.

The first pair of pereiopoda (*k*) is robust, but the propodos is not much broader or longer than the carpos; it is ovate, and terminates in a chela in which the pollex is more slender than the dactylos. The carpos is about the same length as the propodos; it is narrower at the meral articulation than at the distal extremity, where the upper angle is cupped and produced slightly over the propodos. The meros is long; the ischium short and subequal with the basis; and the coxa carries a rudimentary mastigobranchia (*mb*), which terminates in a strong hook and is posteriorly fringed with a few simple hairs. The second pair of pereiopoda (*l*) is slender and chelate; it has the carpos nearly