

very desirable that more should be ascertained of the structure of the polypides, as a study of their anatomy is necessary before the structural relations of the animal can be made out.

EXPLANATION OF PLATE I.

- Fig. 1.* View of *Ascorhiza* (entire). *a*, foreign body, to which the stem of *Ascorhiza* is attached; *b*, capitulum or club-shaped zoarium; *d*, brown bodies seen through the external walls of the capitulum; *s*, stem or stalk, showing its joints.
- Fig. 2.* Polypide of *Ascorhiza* (very much magnified).
- Fig. 3.* Two neighbouring polypides (young) with tentacles retracted.
- Fig. 4.* Single polypide with retracted tentacles, showing the network of tubes on the external surface of the capitulum.
- Fig. 5.* Distal end of the stalk adjoining the capitulum.
- Fig. 6.* Portion of the stalk, showing longitudinal muscles of two joints.

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II.—*Contributions to our Knowledge of the Crustacea of Dominica.* By R. I. POCK, of the British Museum (Natural History).

[Plate II.]

THE Crustacea forming the subject-matter of the present paper were collected by Mr. G. A. Ramage, who has been engaged in the investigation of the fauna and flora of the Lesser Antilles for the West-Indies Exploration Committee.

In addition to the land and freshwater forms, which constitute the greater part of the collection, specimens of the following wide-spread Antillean and Central-American littoral species were sent home:—

Mithrax spinosissimus, Lamarck.
Carpilius corallinus, Herbst.
Grapsus maculatus, Catesby.
Cenobita diogenes, Latreille.

BRACHYURA.

Gecarcinus lateralis, Freminville.

Gecarcinus lateralis, Freminville, Milne-Edwards, Hist. nat. Crust. ii. p. 27, pl. xviii. fig. 1.

Eight specimens, collected near the sea on Point Michelle.

Gecarcinus ruricola, Linn.

Gecarcinus ruricola, Linn., Milne-Edwards, *loc. cit.* p. 26.

One specimen.

Sesarma americana, de Saussure.

Sesarma americana, de Saussure, Mém. Crust. nouv. du Mexique et des Antilles, p. 25.

Ten specimens from Laiou (freshwater).

Pseudotelphusa tenuipes, sp. n.

Carapace wide and moderately flat, very finely but not closely punctured; gastric region slightly convex from before backwards and from side to side, furnished in front with two faint, low, slightly roughened epigastric lobes, between which runs forward a shallow median sulcus which divides into two halves the superior frontal crest. Anterior portion of the front almost vertical and bounded above and below by conspicuous bluntly denticulated crests, of which the inferior is less conspicuous; the superior and inferior crests nearly straight and parallel, the distance between them being equal to one eighth of the greatest width of the area that they define. Orbits large, their length being nearly equal to two thirds of their width and to half the width of the frontal area, with bluntly denticulated margins. Antero-lateral borders of the carapace evenly rounded and conspicuously dentate, the dentations becoming smaller in front and gradually disappearing behind. Cervical groove well marked and straight, but not quite reaching the margin of the carapace; the gastro-branchial sulci very shallow; the branchial region evenly convex, the cardiac region nearly flat, and the cardio-branchial sulci not or scarcely visible; margin of the carapace between the posterior legs very slightly concave. The subhepatic and anterior pleural regions of the carapace smooth.

Chelipedes sparsely granular or tubercular, unequal in size, and differing in shape.

Merus triangular, superior surface slightly concave proximally, anterior surface nearly flat, inferior surface convex; anterior surface bordered below by a conspicuous series of rounded tubercles and above by a series of nine or ten large conical teeth, which distally increase in size; posterior edge of the superior surface bluntly toothed proximally, the teeth distally passing into ridges.

Carpus rounded above and behind, furnished anteriorly (inwardly) with one strong tooth, behind which are three or four much smaller teeth.

Small hand with straight superior and inferior surfaces and gently convex anterior (inner) and posterior (outer) surfaces; fingers curved gently forwards (inwards) distally, but otherwise tolerably straight; almost in contact when closed.

The *larger hand* is relatively thicker from above downwards, the inferior surface is slightly convex distally, and the dactylus convex from base to point. In the adult male the difference between the two hands is more pronounced than in the female and the space between the fingers much larger.

Legs long and slender, feebly dentate or spinous above, propodus sparsely spinous below; dactylus slender, arched, furnished with five rows of spines which distally increase in size, as long as the propodus and half the carpus; propodus with a row of distal marginal spines.

Abdomen in the female covering the entire sternum as far as the space between the chelipedes, and touching the coxæ of the legs on each side; fringed with hairs on each side. The appendages decrease in length from before backwards, and are long and feather-like, being fringed with hairs. The endopodites of all are alike, being slender proximally for two thirds of their length, foliaceous and ovate for the distal third; the exopodite of the first resembles the endopodites, but those of the second, third, and fourth gradually alter in shape from before backwards, the fourth being broad and laminate. The lateral angular portions of the sternum which project between the coxæ are fringed with hairs, and there is a single patch of hair on each side opposite the coxa of the chelipede. The generative apertures are almost in contact in the middle line. In the male the sides of the sternum and of the abdomen are furnished with very short hairs, and there is no anterior patch of hair on each side; but the triangular hollow which contains the abdominal appendages when the abdomen is closed over it is covered with longish hairs. The abdominal appendages, though apparently more complex, closely resemble those of *P. dentata* as figured by Brocchi (Ann. Sci. Nat. (6) ii. p. 86, pl. xvii. figs. 119-121), consisting of a posterior, slender, styliform process, and an anterior stouter process which is completely twisted at its distal end.

In both sexes the pterygostomial region is covered thickly with short hairs.

Measurement in millimetres of largest (♂) specimen.

| | Length. | Breadth. | Height. |
|--------------------|---------|----------|---------|
| Carapace | 57 | 95 | |
| Orbit | 10 | 15 | |
| Frontal area | 2½ | 20 | |

Smaller chelipede (measured along upper surface) :—

| | | | |
|----------------|-----|-----|-----|
| Merus | 42 | 27½ | 16 |
| Carpus | 24 | 15½ | 18 |
| Propodus | 31½ | 16 | 24½ |
| Dactylus | 42½ | | |

Hand of larger chelipede :—

| | | | |
|----------------|-----|-----|----|
| Propodus | 44 | 25½ | 39 |
| Dactylus | 54½ | | |

First leg along upper surface :—

| | | | |
|----------------|-----|----|-----|
| Merus | 37½ | 7½ | 10½ |
| Carpus | 20½ | 8 | 9 |
| Propodus | 20 | 5½ | 9 |
| Dactylus | 30 | 2½ | 3 |

I am very much inclined to think that these specimens may be referable to *P. dentata* of Milne-Edwards, but I have never seen either a specimen or a full description of that species, and have been consequently compelled to rely upon the figure of it on pl. xviii. of Milne-Edwards's Hist. nat. Crust. This figure represents the dactyli as not longer than the propodal segments of the appendages, and the length of each is not more than five times as great as the height.

Twelve specimens were obtained, four of which were taken on the land at Laudat, at an altitude of about 1000 feet; for the rest no special locality was mentioned.

The following is, I believe, a complete list of the remaining species of the genus *Pseudotelphusa* :—

P. dentata (Latr.), Edwards, Hist. nat. Crust. ii. p. 15, pl. xviii. fig. 14.—The long and slender dactyli of *tenuipes* serve to separate it from this species. In other respects the two seem to be closely allied.

P. latifrons (Randall).—Mr. Kingsley (Proc. Acad. Nat. Sci. Phil. 1880, p. 34) asserts that this species may be recognized at once by its reflexed front and large antero-lateral teeth.

P. chilensis, Edwards, Crust. du voyage d'Orbigny, p. 22, pl. x. fig. 1.—The inferior frontal crest is smooth and the

regions of the carapace are much more sharply defined than in *tenuipes*.

P. macropa, Edwards, Arch. du Mus. vii. p. 175, pl. xii. fig. 3.—Closely allied to *tenuipes*, but has the lateral margins of the carapace not denticulated.

P. denticulata, Edwards, Ann. Sci. Nat. Zool. (3) xx. p. 208.—The superior frontal crest is not bilobed and the merus of the chelipedes is feebly dentate.

P. americana, Saussure, Mém. Crust. Nouv. des Ant. et du Mex. p. 20, pl. ii. fig. 12.—In this species there is no superior frontal crest and the orbits and margins of the carapace are without denticulations.

P. Bocourti, A. Edwards, Ann. Soc. Ent. Fr. (4) vi. p. 203.—The frontal crests are smooth.

P. gracilipes, id. ibid. p. 204.—This species apparently resembles *tenuipes* in the form of the legs, but there is scarcely a trace of the superior frontal crest.

P. sinuatifrons, id. ibid. p. 205.—The inferior frontal crest is sinuous and the inferior surface of the carapace is furnished with a series of granules.

P. plana, S. I. Smith, Trans. Conn. Acad. ii. p. 146.—Apparently allied to *tenuipes*, but differing in the form of the merus, which is said to be short and *slightly* dentate.

MACRURA.

Palæmonidæ.

Bithynis jamaicensis, Herbst.

Palæmon jamaicensis, Herbst, Naturg. der Krabben, ii. p. 57, pl. xxvii. fig. 2; Milne-Edwards, Crust. ii. p. 398; v. Martens, Arch. f. Naturg. 1869, p. 22.

Thirteen small specimens taken at Laiou.

Bithynis spinimanus, M.-Edwards.

Palæmon spinimanus, M.-Edwards, Crust. ii. p. 399; von Martens, Arch. f. Naturg. 1869, p. 26.

A single specimen from Laiou.

? *Bithynis appuni*, von Martens.

Palæmon appuni, von Martens, Arch. f. Naturg. xxxv. p. 31, pl. ii. fig. 5.

A single specimen of a prawn taken at Laiou I refer with hesitation to the species described by Dr. von Martens from Porto Cabello, Venezuela.

In the Dominica individual the rostrum appears to be somewhat longer, inasmuch as it projects beyond the peduncle of the antennæ, and it is armed with thirteen teeth above, six of which are situated behind the orbit, and four beneath. Furthermore, the second pair of legs are considerably shorter; but although the segments are somewhat thicker, their relative length is almost the same as in *P. appuni*.

Atyidæ.

Atya occidentalis (Newport).

Atya occidentalis (Newport), Ann. & Mag. Nat. Hist. xix. p. 158 (1847).

Mr. Ramage sent home no less than thirty-two specimens of a species of *Atya*, all of which I believe to be referable to *A. occidentalis* (Newport). Twelve of these are from Laiou (freshwater) and the rest from Laudat, at an altitude of about 1000 feet. I take the opportunity afforded by the possession of a number of specimens to recharacterize a species which appears to be but little known, and I do this the more gladly since the specimens in question exemplify in a marked degree the value for the determination of species of the examination of a long series of forms, and show no less clearly how unsafe is the application of new names to isolated individuals which are obviously closely allied to species that have been previously described, when in the case of these species nothing, or next to nothing, is known respecting the variation which accompanies individuality or age. For it is certainly the case that from this series, by the careful selection of specimens exhibiting extremes of structural modifications and by the judicious elimination of those presenting features which fill up the interval between the extremes, material might be obtained amply sufficient to justify the establishment of no less than four species. But inasmuch as I can in no case detect a character which, owing to its constancy in some individuals and to its total absence in others, falls outside the probable limits of individual variation, I am compelled to consider the whole series to belong to one species. That this should be named *occidentalis* is shown by the close similarity between the medium-sized specimens obtained and the type of *occidentalis* which is preserved in the British Museum.

Body compressed, narrowed considerably behind, less so in front, widest across the anterior abdominal somite.

Carapace in the smallest specimens entirely smooth, naked or clothed more or less thickly at the sides with short close-set hairs, which are very easily removed by rubbing; in half-sized specimens showing faint shallow punctures at the sides, deeper punctures above; as the specimens increase in size so do the punctures increase in clearness, until in some of the largest the sides of the carapace are adorned with a reticulated pattern of smooth ridges, and its dorsal surface, where the confluence of the punctures is carried to an extreme, with isolated simple or branched ridges. In these specimens and some others where the pattern is of less complexity various smooth, symmetrically arranged tracts may be noticed on the dorsal surface. When clearly expressed these tracts present on each side the following arrangement:—one above, almost continuous in front with the lateral rostral groove, runs directly backwards and terminates in front of the middle of the carapace in a more conspicuous, circular, smooth area; behind and a little above this, sometimes confluent with it, sometimes separated from it by the interposition of one or more than one smooth ridge, there is a similar but less conspicuous area; beneath this superior, longitudinal, smooth tract, but separated from it by a row of ridges, is a second similar tract, which at about the middle of the carapace gradually breaks up into the interstices which separate the ridges; below this again, but taking its rise behind the anterior third of the carapace in a more conspicuous, vertically elongated, smooth area, there is a third tract, which runs backwards, at first upwards, then downwards, ultimately to disappear, in the same manner as the tract next above it, near the hind margin of the lateral portion of the carapace; this tract is separated below by a conspicuous arched ridge from the more thickly punctate or reticulated inferior lateral surface of the carapace. Laterally the carapace is smooth, where it is overlapped by the first abdominal somite; inferior edge of the carapace raised; anterior edge produced on each side into two sharp angular processes—one shorter immediately beneath the eye, the other, beneath the antennal peduncle, stretches as far or almost as far forwards as the apex of the rostrum.

Rostrum projecting slightly downwards beyond or not so far as the anterior margin of the proximal segment of the peduncle of the antennula, medianly keeled above and below; the superior keel separated by a depression from the supra-orbital portion, beyond which the rostrum is more or less sharply constricted and narrows rapidly to the apex; inferior keel usually feebly bidenticulate in front.

Ophthalmopods short, cylindrical, not narrowed at the base, separated from each other below by a small vertical plate.

Antennula.—Basal segment of peduncle more or less hairy, hollowed above at its proximal end, furnished externally with a large tooth which does not reach so far as its anterior margin; anterior margin armed with a series of strong spines interspersed with hairs; inferior surface flat, its inner edge forming a ridge, which terminates in front in a small tooth. Second segment about equal in length to the first, armed above with more or fewer small scattered spines and in front with a marginal series of spines interspersed with hairs; outer, inner, and under surfaces smooth, except for a series of hairs along the inner inferior edge. Third segment the shortest, armed above like the second with scattered spines and a marginal series, its inferior edge furnished with hairs, which are conspicuously long in front. The superior spines on the two segments which have been just described may in small specimens be wholly absent. The inner *flagellum* longer than the outer, slightly longer than the carapace, the outer slightly shorter.

Antenna.—Distal segment of peduncle cylindrical, not projecting quite so far forwards as the peduncle of the antennula, with a marginal series of hairs and small spines on its inner surface; externally beneath the scale there is a pointed process which projects about as far as the apex of the antennular spine. *Scale* with parallel edges, ovate in front, fringed on the inner edge and on the outer edge distally with long hairs, projecting beyond the antennular peduncle, bearing a small spine on the outer side. *Flagellum* when stretched backwards reaching about as far as the end of the body.

Pereiopods.—*First* and *second pairs* almost alike in form and size. Ischium running considerably forwards beneath the proximal half of the merus and with it constituting almost one segment; merus furnished externally above with a conspicuous, long, smooth sulcus; this ischio-meral segment externally hairy or smooth and in the larger specimens tubercular, the second pereiopod being more tubercular than the first; carpus, propodus, and dactylus also slightly tubercular or smooth; propodus and dactylus terminated with long tufts of hairs. *Third pereiopod* the largest, the ischio-meral segment longer than the three segments which succeed it taken together, flatter on the inner surface, rounded externally from above downwards. In the largest specimens covered externally more or less thickly with rounded or conical smooth tubercles, exhibiting a tendency to arrangement in longitudinal series; the inner surface is much more scantily beset

with smaller, more squamiform tubercles. In small specimens the tubercles are scarcely perceptible. The relative thickness of the segment varies much; in one large specimen its upper surface is very convex from behind forwards, and the thickness is almost equal to a third of its length. From this extreme there is every intermediate step until the thickness becomes less than one fifth of the length. The carpus is a little shorter than the propodus when measured along their external surfaces; both are covered with smooth, rounded or flattened, scattered or close-set tubercles, the inferior flattened surface of the carpus alone being without tubercles. Upper surface of the carpus produced distally into an evenly rounded process which overhangs the proximal end of the propodus; inferior half of propodus somewhat compressed. In small specimens the tubercles may be completely spiniform, and some of them show a remarkable development of these spines at the end of the propodus. Dactylus short, less than a third the length of the propodus, spined beneath, bearing a sharp claw. The carpus and propodus are more cylindrical and relatively more slender in small individuals.

The two succeeding pereopods much resemble that which has been just described, except that they are smaller and differ with regard to the relative length of their segments.

The ischio-merus of the fifth is shorter than that of the fourth, and the fourth shorter than that of the third. The carpal segments, however, vary considerably in length; thus, they may present in larger forms the same relative size as the ischio-meral segments, or they may in smaller forms be equal in the three pairs of appendages. The propodus, on the contrary, of the fifth pair is always longer than those of the other two, and the propodus of the fourth may be either equal to, less than, or greater than that of the third. The external surface of each of the ischio-meral segments is furnished distally with a small rounded prominence, which may or may not be armed with two or three small spines; the under surface of this segment in the fourth and fifth pairs is armed with an oblique series of three or four larger spines, which are naturally more visible in smaller specimens in which the tubercles are inconspicuous or absent, but more or fewer of them may have entirely disappeared in the largest specimens, probably having been converted by wear into tubercles. That the squamiform or tuberculiform armature of the largest specimens has been derived from the spiniform armature of the smaller specimens during the growth of the individual by some such process as rubbing seems certain from the frequent occurrence side by side in the same segment in larger

specimens of tubercles either tipped with spines or with smooth vertices. The interstices between the spines or tubercles of these three pereopods are more or less thickly clothed with short fine hair, and in some individuals there is a distinct series of long hairs running on the outside from the proximal to the distal end of the appendage.

Branchial Formula.

| Appendages. | Pleuro- branchia. | Mastigo- branchia. | Arthro- branchia. | Podo- branchia. | | | | |
|--------------------|----------------------|-----------------------|----------------------|--------------------|-------|---|---|-----|
| 2nd maxillipede .. | 0 | 0 | 0 | 1 | = 1 | | | |
| 3rd " .. | 0 | 1 | 2 | 0 | = 3 | | | |
| 1st pereiopod | 1 | 1 | 1 | 0 | = 3 | | | |
| 2nd " | 1 | 1 | 0 | 0 | = 2 | | | |
| 3rd " | 1 | 1 | 0 | 0 | = 2 | | | |
| 4th " | 1 | 1 | 0 | 0 | = 2 | | | |
| 5th " | 1 | 0 | 0 | 0 | = 1 | | | |
| | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | | | |
| | 5 | + | 5 | + | 3 | + | 1 | =14 |

The ornamentation of the *pleon* resembles that of the carapace, inasmuch as it varies from being feebly punctate to coarsely reticulate. Inferior lateral margins from the first to the fifth inclusive raised. Posterior lateral border of the second rounded, of the third, fourth, and fifth becoming progressively more angulated from before backwards.

First *pleopod* in the female terminating in two slender pointed processes, above which the appendage is lamelliform and furnished with a fringe of hairs; in the male the endopodite and exopodite are well developed and subequal. The second, third, fourth, and fifth pleopoda in the female are alike, with ovate, foliaceous, hairy exopodites and similar but smaller endopodites, from the base of which on the inner side of each appendage springs a short styliform process, which, joining with that of the opposite side, yokes the appendages together in the middle line. The third, fourth, and fifth pleopoda of the male resemble those just described, but the second differs in that the endopodite bears on its inner side a widened, hairy, not to say spinous lamina. Between the pleopoda of the fifth abdominal somite there may be a larger or smaller median spine, and between those of the sixth there is a larger hooked process. In the sixth pleopoda the exopodites are broad, foliaceous, and fringed with hairs; the external half of the distal edge of the proximal segment finely spined; the endopodite resembles the exopodite, does not project beyond it, but consists of one lamina, has no spines, and is slightly narrower; the basal segment is furnished

externally with a short process which terminates in a sharp point.

Telson much shorter than lateral portions of tail-fin; lateral margins converging; posterior margin slightly convex, furnished with a fringe of hairs and three spines, two lateral and one median, and often some smaller minute spines. Upper surface behind longitudinally scooped out on each side of the middle line, leaving a carina between. The external margins of the grooves are adorned with a curved series of six or seven spines.

Measurement in millimetres of largest specimen.—Total length (from apex of rostrum to end of telson) 117, of carapace (from orbit to posterior margin) 41; width of carapace 24, height 27; length of rostrum (from hinder edge of orbit to apex) $8\frac{1}{4}$, width 5; length of antennular peduncle 15, of antennal scale 18, of peduncle 15; 1st pereopod: length of ischio-merus 15, carpus 4, propodus and dactylus 11; 3rd, 4th, and 5th pereopoda (measured along external margin): merus 34, 26, 17, carpus $13\frac{1}{2}$, 11, $10\frac{1}{4}$, propodus 16, 15, 17; length of telson 15, of exopodite of tail-fin 20, endopodite 18.

Atya scabra (Leach) is the only American species with which, owing to my having seen specimens of it, I can compare *occidentalis*. In *scabra*, apart from other less noticeable differences, the third pereopods are stouter, more sparsely tuberculated, and the ischio-merus is more sharply angulated above and entirely smooth on the inner surface.

The following species I know only from descriptions:—

Atya rivalis, S. I. Smith, Rep. Peabody Acad. Sci. 1871, p. 94.—Nicaragua.

—— *tenella*, id. ibid —Nicaragua.

—— *punctata*, J. S. Kingsley, Proc. Acad. Nat. Sci. Phil. 1878, p. 94.—Hayti.

But the features pointed out by Mr. Kingsley to distinguish his *punctata* from *occidentalis*, *rivalis*, and *tenella*, not to mention *scabra*, are merely such as in the present paper have been regarded as due either to individual variation or to difference of age.

? *Caridina americana*, Guérin.

Caridina americana, Guérin, Ramon de la Sagra, Cuba Crust. p. 52, pl. ii. fig. 13; von Martens, Arch. f. Naturg. 1872, p. 135.

Two females, with ova, taken at Laiou.

These specimens appear to differ from Guérin's figure in exactly the same respects as did the Cuban specimens referred to this species by Dr. von Martens. The femora of the third and fourth pairs of pereopoda, although not conspicuously dilated, are spined beneath, but not so strongly as is represented in the aforesaid figure. Further, in one specimen the rostrum is armed beneath with two spines, in the other with but one. Guérin's specimens appear to have been provided with three.

Family Miersiidæ.

Genus XIPHOCARIS.

Xiphocaris, von Martens, Arch. f. Naturg. 1872, p. 139.

As Mr. Kingsley has pointed out (Bull. Essex Inst. xiv. p. 127) the mandible of this genus bears much greater resemblance to that of *Atya* than to that of *Hoplophorus* (or *Acanthephyra*); furthermore, since the definition of the group Ephyrinæ (= Miersiinæ) of this author applies in all respects to the specimens of *Xiphocaris* that I have seen, I have without hesitation referred the genus to this family, although the species of *Miersia* are unknown to me.

The family appears to occupy a position between some such forms as *Caridina* and *Acanthephyra*.

Xiphocaris elongata (Guérin).

Hippolyte elongata, Guérin, Ramon de la Sagra, Cuba Crust. p. 20, pl. ii. fig. 10.

Hoplophorus americanus, Saussure, Crust. nouv. des Antilles et du Mexique, p. 56, pl. iv. fig. 31.

Xiphocaris elongata, v. Martens, loc. cit. p. 140.

Ten specimens (females, without ova) were taken at Laiou. Average length from base of ophthalmopod to apex of telson about 28 millim. The rostrum of this species, as might be expected from its thinness and length, appears to be very liable to damage, seeing that in four specimens out of the ten this weapon is imperfect—in two cases the apex being broken off, in another the anterior half, and in a fourth the anterior two thirds. The teeth vary from 13 to 9 above at the base, 6 to 3 above at the apex, and from 41 to 29 below. In many instances isolated teeth are missing, particularly from the lower series.

Xiphocaris gladiator, sp. n.

Carapace wider behind than in front, slightly carinated above in front, the carina being continued on to the rostrum; proximal half of rostrum bent gradually slightly downwards, distal half bent gradually upwards, but not beyond the plane of the dorsum of the cephalothorax; rostrum extending slightly beyond the antennular peduncle, but not so far as the apex of the antennal scale; armed above proximally with from 12 to 18 minute close-set teeth and with from 2 to 5 also minute and close-set teeth immediately before the apex, and below distally with from 18 to 30 minute close-set teeth. Eyes prominent and pyriform. Basal segment of antennular peduncle furnished with a spine, which is about equal to it in length; second segment about equal to the first in length and distinctly longer than the third; the two flagella smooth, slender, long (but imperfect); peduncle varying in length, in one specimen reaching as far forwards as the front edge of the antennal scale, in two others falling considerably short of it. Antennal peduncle unarmed beneath; scale furnished in front and behind with a fringe of hairs, ovate at the tip, armed with a spine externally. All the pereiopods, sparsely hirsute, are furnished with slender exopods. The first pair shorter but somewhat stouter than the second; ischium stouter but shorter than merus; merus cylindrical; carpus very short, narrower behind; propodus slightly compressed, the stoutest segment in the appendage, its dactylar prolongation armed apically with two or three teeth, which meet with similar teeth on the apex of the curved dactylus. Second pereiopod resembling the first, except that all the segments are longer and more slender; it is longer than the first by its three distal segments. Remaining pereiopods almost alike, being composed of long, slender, cylindrical segments; the merus of each is furnished distally and behind with a single strong spine, the carpus with a few small spines and a distal tooth-like prolongation above, the propodus with two rows of small spines beneath; the dactylus with a strong claw, and, except in the last, three or four strongish spines beneath; the dactylus of the last is furnished with a series of plume-like hairs beneath on its posterior margin. In these appendages the carpus is equal in length to about two thirds of the merus and to half of the propodus and dactylus taken together; the dactylus is about half the length of the carpus.

Branchiæ sixteen on each side, the appendages from the external maxillipede to the fourth pereiopod inclusive being

furnished with one mastigobranch, one arthrobranch, and one pleurobranch, and, in addition, there is one pleurobranch corresponding with the last pereopod.

Pleon hairy at the margins, compressed, rounded and smooth, and neither carinate nor spiny above; sides of the three anterior somites evenly rounded; lateral portion of the fourth somite angularly produced behind, of the fifth likewise produced, but more angularly and more sharply; the sixth somite long, narrower behind, furnished beneath, behind, with a minute median spine; telson shorter than sixth somite, with smooth converging sides and a truncate bifid apex.

Appendages of the pleon hairy, exopodite longer than endopodite, both foliaceous; the exopodites of the first pair long and slender; in the male the endopodite is large and foliaceous, in the female it is small; in the sixth somite the appendages are ovate, large, and foliaceous; the exopodite considerably longer than the endopodite, armed externally with a spine, fringed with hair internally and externally at the distal end; endopodite like the exopodite, but smaller and without a spine.

Three specimens (two females, one with ova, one male) from Laiou.

Measurement in millimetres of largest female specimen:—Length from base of ophthalmopod to apex of telson 45, of carapace (above) 12; width of carapace 7; length of rostrum $6\frac{1}{2}$, of eye $3\frac{1}{4}$, of peduncle of antennula $6\frac{3}{4}$, of peduncle of antenna $6\frac{1}{4}$, of antennal scale 9, of external maxillipede 12, of first pereopod $11\frac{1}{2}$, of second 17, of third and fourth 18, of fifth 19, of pleon (including telson) 33; width of pleon $6\frac{1}{2}$; length of sixth somite $7\frac{1}{2}$, width $3\frac{1}{4}$, height $4\frac{1}{2}$; length of telson $6\frac{1}{2}$, of exopodite of tail-fin $9\frac{1}{4}$, of endopodite $2\frac{1}{4}$.

This species may be distinguished from *X. elongata* by its stouter build, smaller eyes, and shorter rostrum.

Var. intermedia, n. var.

Taken with the above was one female specimen which is like them in every respect except as regards the rostrum. This organ is considerably longer, being almost as long as the upper surface of the carapace, projecting upwards at the apex above the plane of the carapace and forwards beyond the anterior margin of the antennal scale. So far as the rostrum is concerned this variety is intermediate between *gladiator* and *elongata*.

Xiphocaris brevirostris, sp. n.

Rostrum bent slightly downwards, projecting anteriorly only as far as the middle of the second segment of the peduncle of the antennula; armed above with nineteen teeth, three of which are just above the apex, and below in its proximal half with sixteen teeth.

Length from base of ophthalmopod to apex of telson 49 millim.

In other respects this species is very like *X. gladiator*, differing from it, however, in being stouter and in possessing relatively smaller eyes; in fact, in exactly the characters which serve to separate *X. gladiator* from *X. elongata*.

Two specimens (one male, one female with ova).

Synopsis of the Species.

- a.* Rostrum longer than the cephalothorax *elongata* (Guérin).
- b.* Rostrum shorter than the cephalothorax.
 - a*¹. Rostrum projecting beyond antennal scale . . } *gladiator*, var. *intermedia*, var. n.
 - b*¹. Rostrum not projecting beyond antennal scale.
 - a*². Rostrum projecting beyond the proximal end of the distal segment of antennular peduncle *gladiator*, sp. n.
 - b*². Rostrum projecting as far as the middle of the second segment of antennular peduncle. *brevirostris*, sp. n.

Whilst examining the above-mentioned specimens of *Xiphocaris* it occurred to me as possible that those that I have regarded as distinct may in reality merely represent stages in the growth of one species.

Apart from the characters presented by the rostrum I think that the differences between the so-called species might be easily explained on the hypothesis of variation with age; for *gladiator*, which is intermediate in size between *brevirostris* and *elongata*, is also intermediate between them in the other respects pointed out, namely the stoutness of the body and the size of ophthalmopods; further, the assumption that the specimens of *elongata* may be young is rendered justifiable by the fact that none of the females are with spawn, whilst some of those of *brevirostris* and *gladiator*, which inhabit the same fresh waters, are laden with it.

I should therefore, were it not for the difference in the

length of the rostrum in the three forms, unhesitatingly regard them as belonging to one species, in which, while passing from the young to the adult condition, the body increases in thickness more than it does in length, and the eye-stalks grow less rapidly than do the other appendages.

But when the rostrum is taken into consideration the problem becomes far more complex. It must be borne in mind, however, that there is a gradation, though not a perfect one, from the long rostrum of the young *elongata*, through *intermedia* and *gladiator*, to the short rostrum of the adult *brevirostris*; but, to the best of my belief, it is contrary to all experience that this organ should progressively decrease in length as the body increases in bulk. Consequently I do not for a moment imagine it likely that the differences are due directly to age. But it seems to me quite possible that in the specimens named *brevirostris*, *gladiator*, and *intermedia* the rostrum at first resembled that of *elongata*, but has been broken off and is reacquiring the form characteristic of that species. In support of this hypothesis may be urged the following considerations:—(1) It may be inferred *à priori* (a) from the armature and length of the rostrum that it is a weapon of offence, and (b) that as such, owing to its thinness, it is exceedingly liable to breakage; (2) from the fact that in 40 per cent. of the specimens of *elongata* obtained this organ is imperfect we know that it is subject to damage, be the cause what it may; (3) the power possessed by the Crustacea of reproducing lost parts is well known; and (4) if the rostrum of the above-mentioned species is undergoing a process of regrowth its present form in each case is exactly what might have been predicted for it; for the shorter rostra are copies in miniature of the longer, the only important difference being the difference of absolute thickness and length. And, further, assuming the specimens to be different species, I would point out that it is a thing of no common occurrence in the Caridea for the teeth to be so constant in position as they are in the present instance, when the rostrum is so variable in size; for in all the specimens of *Xiphocaris*, whether the rostrum be long or short, provided only that its form be perfect, there is a series of teeth in the proximal half above separated by a space from a few teeth at the apex and a series of teeth below running from the apex to the orbit; so that the position presented by these teeth becomes a character of generic significance.

But supposing a specimen of *elongata* had lost the anterior third or anterior half of its rostrum, I presume that when growth set in, this organ would present the appearance seen

in *intermedia* or *gladiator*, and if fractured near the base we should get the short thick rostrum characteristic of *brevirostris*.

However, I by no means wish it to be understood that I bind myself to the theory here propounded; for when attempting to estimate the probabilities of the truth or falsity of it I am compelled to admit that there are many difficulties in the way of its adoption, and that the facts of the case, so far as they are known, are rather in favour of the view of the distinctness of the species named. This view I have consequently chosen, and have put forward the other hypothesis as a possibly plausible explanation of the phenomena presented with the full knowledge that it can only be satisfactorily tested by the careful examination of far more material than is contained in the present collection.

EXPLANATION OF PLATE II.

Fig. 1. Front of *Pseudotelphusa tenuipes*, sp. n. (nat. size, small specimen).

Fig. 1 a. Fourth pereopod of *Pseudotelphusa tenuipes* (nat. size, small specimen).

Fig. 2. Rostrum of *Bithynis appuni* (v. Martens), nat. size.

Fig. 3. *Atya occidentalis* (Newp.), two thirds nat. size of largest specimen.

Fig. 3 a. *Atya occidentalis* (Newp.). Third pereopod of half-sized specimen, nat. size.

Fig. 4. *Caridina americana* (Guér.), $\times 2$.

Fig. 5. *Xiphocaris brevirostris*, sp. n., nat. size.

Fig. 5 a. *Xiphocaris brevirostris*, sp. n. Rostrum.

Fig. 6. *Xiphocaris gladiator*, sp. n. Rostrum.

Fig. 7. *Xiphocaris gladiator*, var. *intermedia*. Rostrum.

Fig. 8. *Xiphocaris elongata* (Guér.). Rostrum.

Note.—In the figures representing the rostra of the several species of *Xiphocaris* the ophthalmopod has been taken as of the same length in each case.

III.—Observations on *Noctiluca miliaris*, Suriray, and the Sea-luminosity produced by it. By Dr. L. PLATE*.

DURING a stay of several weeks upon the island of Borkum in the autumn of 1886 I subjected *Noctiluca miliaris* to a thorough investigation. As, however, our knowledge of this

* 'Zoologische Jahrbucher,' Abtheilung für Anatomie und Ontogenie der Thiere, Band iii. pp. 174–180.

