

5. The Systematics of the Crustacean Genus *Callianassa*.

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(Text-figures 1-19.)

Our knowledge of the larvæ of this genus is still very unsatisfactory, and likely to remain so, since the habits of the adult make it difficult to obtain egg-bearing females. Some species, such as *C. laticauda* at Naples, live in shallow water and do not burrow deeply (Lutze, 1938), whereas others, such as *C. subterranea*, live in deeper water and burrow deeper, so that the egg-bearing females are rarely obtained. My own experience is limited to the two species *C. gravieri* and *C. branneri*, and in both cases only small specimens without eggs could be got by digging at low tide. Larvæ of the following species have, however, been positively identified:—

<i>C. (Cheramus) subterranea</i>	Miss Webb.
<i>C. (Trypæa) truncata</i>	Caroli.
<i>C. (Trypæa) californiensis</i>	Miss Hart.
<i>C. (Trypæa) affinis</i>	Miss Lebour.
<i>C. (Trypæa) australiensis</i>	Dakin and Colefax.
<i>C. (Callichirus) laticauda (=stebbingi)</i> .	Caroli.

Other species have been described, but have not been identified.

Six adult species are known from the Mediterranean:—*Cheramus subterranea*, *C. subterranea minor*, *Callichirus laticauda*, *Callichirus pestæ*, *Callichirus algerica*, *Trypæa truncata*, *Trypæa italica*. The larva described by Claus (1876) may perhaps be that of *C. pestæ*, while I have myself seen two other forms, one from Tunisia which may belong to *C. algerica* and the other from Alexandria which is distinguishable from *C. subterranea* only by size, and may belong either to *C. subterranea minor* or to *C. italica*. It has been supposed that it was an error on the part of G. O. Sars to show four pairs of pleopods in his figures of Norwegian *Callianassa* larvæ. I have examined some hundreds of larvæ from the North Sea without finding one with four pairs of pleopods; but Lutze has recently described a new northern species, *C. helgolandica*, and it is not impossible that Sars' larva was correctly described; and that it belonged to this species.

The larvæ known belong to two very distinct types (Gurney, 1937). Those of *C. subterranea* and the four species of the subgenus *Trypæa* belong to type I., whereas the only species definitely known to have a larva of type II. is *C. laticauda*. Speculation as to which species larvæ from the plankton can be assigned to is unprofitable; but it happens that there are two unidentified larvæ from the Mediterranean to correspond to the two species of *Callichirus*, and one of type I. which could belong to one of the two species of *Cheramus* and *Trypæa*, of which the larva is not known.

The larvæ, then, support the separation of a subgenus *Callichirus*, but they indicate equally clearly that no separation can be made between *Cheramus* and *Trypæa*.

Nothing is known of the larvæ of *Calliactites*, nor of *Scallasis*, nor of the genus *Callanidea*, and until we do have some knowledge of them, and of more species of *Callichirus*, criticism of the existing system cannot go far. At the same time it seems worth while to see how far this system is really valid in respect of the adult characters.

The subgenera established by Borradaile (1903) have been generally accepted, and his definitions have been amended as follows by De Man (1928)*:—

CALLIACTITES Borradaile.

“Propod of third legs without a lobe on the hinder edge. External maxillipedes narrow or more or less broadened. Telson of different form, squarish, or trapeziform, with the sides convergent or rounded posteriorly; uropods not much or much longer than telson.”

Type, *C. secura* Lancheester.

CHERAMUS Bate.

“Propod of third legs with a lobe on the hinder edge. Ischium of external maxillipedes longer than broad, with the lateral margins parallel, never converging backwards; ischium, therefore, not triangular. Telson and inner uropod either longer than broad, with the inner uropod rounded posteriorly, or telson a little broader than long, with the inner uropod square-ended, nearly as long as broad; telson about as long as or slightly longer than the inner uropod, rarely much shorter than it, in which case the telson is longer than broad.”

Type, *C. subterranea* Montagu.

TRYPÆA Dana.

“Propod of third legs with a lobe on the hinder edge. External maxillipedes very broad, operculiform, lateral margins of ischium converging backwards, so that this joint appears triangular, presenting its greatest width anteriorly; ischium usually shorter than the greatest width, rarely longer than it. Telson more or less distinctly longer than broad, rarely as long as broad. Inner uropod as long, or nearly as long, as telson, rounded posteriorly, rarely square-ended.”

Type, *C. australiensis* Dana.

CALLICHIRUS Stimpson.

“Propod of third legs with a lobe on the hinder margin. Ischium of external maxillipedes usually longer than broad, with the lateral borders nearly parallel, rarely the ischium appears broader than long, with the lateral borders slightly convergent. Telson short, broader than long. Inner uropods much longer than telson, usually more or less distinctly pointed, rarely rounded.”

Type, *C. major* Say.

SCALLASIS Bate.

“Species of *Callianassa* with the eyes rounded, bearing the cornea at the end, the maxillipedes of the third pair fairly broad, the endopodites of the last pair of limbs narrow, rounded at the end, and the telson about as broad as long, almost as long as the last pair of limbs.”

Type, *C. amboinæ* Bate.

(Definition from Borradaile, 1903, p. 547.)

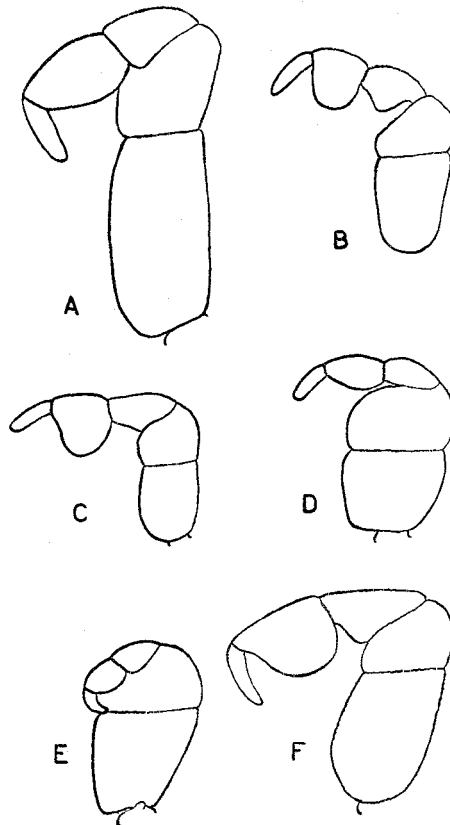
De Man (1928, p. 91) has noted that the subgenera are not clearly defined, and the differences seem to be generally very trivial. For instance, in Borradaile's key *Callichirus* is separated from *Cheramus* and *Trypæa* by the relative length of the telson. The shape of the eyes might be regarded as a point of serious subgeneric value, but the cylindrical form of the eye with terminal cornea is not confined to the subgenus *Scallasis*, since the same form of eye is found in *C. secura*, which is the type of the subgenus *Calliactites*, and in *C. hartmeyeri*, which is referred by Balss to *Glypturus* (which is synonymous with *Callichirus*?).

* De Man, p. 95, gives a key to the subgenera.

The subgenus *Calliactites* is separated only by the form of the propod of leg 3, which has no posterior lobe; but this lobe is not always distinct in species which are referred to other subgenera, and it is quite absent in *Cheramus pygmaea*. In *Calliactites* maxillipede 3 may be very broad and operculiform (De Man, 1928, p. 116), or it may be narrow and pediform, as it is in *Cheramus*, although such a difference is considered sufficient by Borradaile to separate *Cheramus* from *Trypæa*.

De Man accepts *Glypturus* as a distinct genus, although he points out (1918, p. 19) that it has no character separating it from *Callianassa*, and it is certainly not distinct (Schmitt, 1935, p. 1). Schmitt places its type, *G. acanthochirus*, in *Callichirus*.

Text-figure 1.



Maxillipede 3. A. *Cheramus subterranea*; B. *Cheramus indica* (after De Man); C. *Callichirus longiventris*; D. *Callichirus laticauda*; E. *Trypæa truncata*; F. *Trypæa mauritiana*.

The subgenera *Cheramus*, *Trypæa* and *Callichirus* are so insecurely founded that in some cases the same species has been placed in different subgenera by different authors, or by the same author at different times.

In Borradaile's key these three subgenera are separated primarily by the shape of the telson, *Cheramus* having it "long"; but several species included in *Cheramus* by De Man have the telson broader than long (e. g., *joculatrix*, *prædatrix*, *pygmaea*, *moluccensis*, *mauritiana*). De Man himself notes that *C. joculatrix* might equally well be placed in *Callichirus*.

As regards the form of maxillipede 3, Borradaile's original description of

“ narrow ” (*Cheramus*) and “ very broad ” (*Trypæa*) is far from being adequate. De Man has tried to give some precision to the distinction by defining the shape of the ischium as parallel-sided or tapering proximally; but there are so many exceptions to which the distinction does not apply that it is almost useless. It can be said that in *Cheramus* the merus is usually longer than wide, while in *Trypæa* and *Callichirus* it is usually wider than long, and the whole appendage is on the whole more slender in species referred to *Cheramus*.

It seems possible that a more satisfactory character to take would be the form of the propod in maxillipede 3. In some species this is dilated, as it is in leg 3, while in others it is slender; but there are species in which it is intermediate (text-fig. 1). In thirteen species of *Cheramus* eleven have the propod slender and two with a distinct lobe. In twenty species of *Callichirus* fourteen have a lobe, and in most of these the segment is wider than long. In nine species of *Trypæa* the segment is slender and without a lobe, as in *Cheramus*.

In *C. novæbritanniæ* Borradaile's figure of maxillipede 3 shows what is apparently an exopod. If there really is an exopod the species would be unique; but the point is not mentioned in the description, and the species is included in *Callichirus*.

It seems to be certain that the subgenera at present recognized are not valid in any phylogenetic sense. With so large a number of species to deal with there may be some convenience in separating them into artificial groups, but the species included in them are certainly not necessarily related to each other.

In these circumstances some advance to a natural grouping might be made if other characters could be brought into account. Unfortunately many species have been inadequately described, and of some nothing is known beyond, perhaps, the shape of the cheliped.

I have myself been able to examine only ten* species, and some of them too incompletely. I find among them the following differences:—

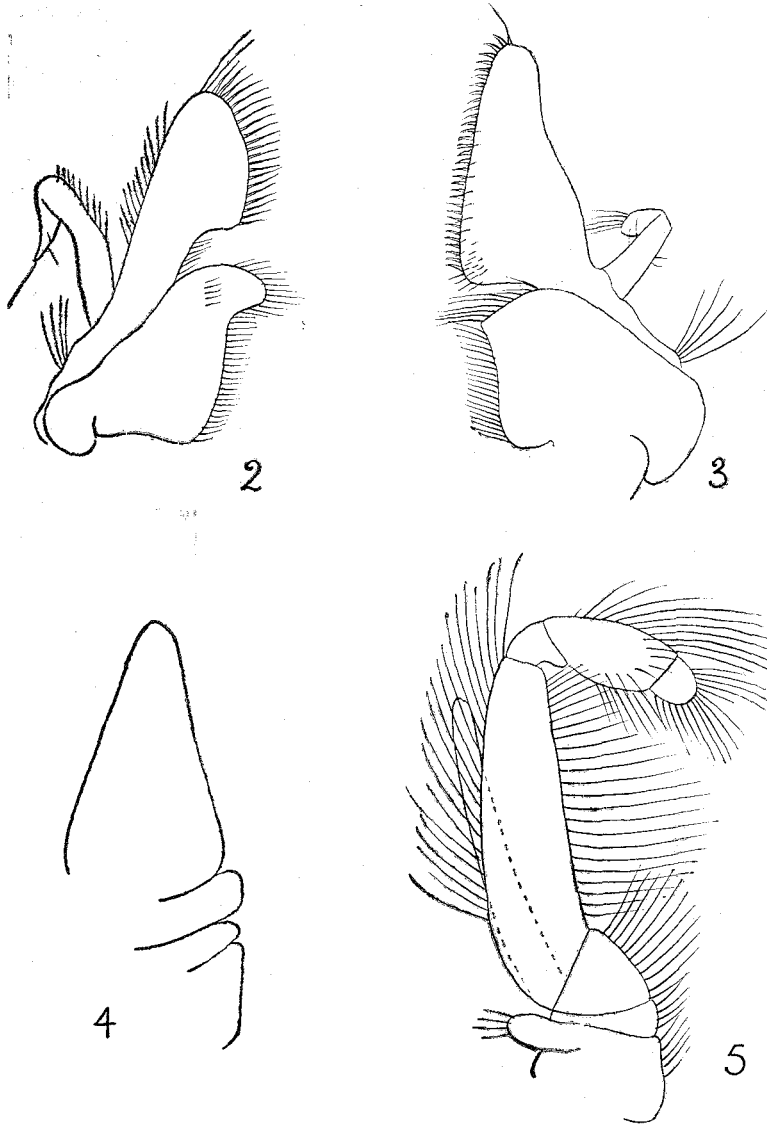
(1) *Gills*.—In all species there are two arthrobranches on each leg, and in most cases two small gills on maxillipede 3; but in *Callichirus longiventris* and *C. californiensis* I find only one gill. As it has been possible to examine only one side of one specimen the observation requires confirmation. The gills are very close together, and it is not always easy to see if there are two. On maxillipede 2 there is usually a rudimentary epipod and an arthrobranch reduced to a vesicle without gill lamellæ. In *Callichirus laticauda* alone do I find the gill well developed (text-fig. 10). It is, no doubt, of this species, and not of *C. subterranea*, that Claus gives the gill formula (1885, p. 62). Boas (1880, p. 162) found a rudimentary gill in *C. (Trypæa) gigas*. In *Trypæa gravieri*, *T. truncata*, *Cheramus subterranea*, *Callichirus californiensis* and *C. australiensis* I have not found any trace of a gill on this appendage. In *C. (Glypturus) branneri* a vestigial gill is present in some specimens, but not in others.

(2) *Pleopods*.—While pleopods are apparently present in all adult females on somites 1 and 2, they may not be present in the male. Kishinouye (1926) gives as the chief character of the Callianassid genus *Ctenocheles* the similarity of these pleopods to the following pairs in the female. In *C. turnerana* pleopod 2 may have large flat rami very much like the following pairs. In the photograph of *C. gigas* female given by Stevens (1928) pleopod 2 is shown nearly as large as the following pairs. These pleopods in the male, when present at all, are generally so small that they may have been overlooked in some species. In *C. subterranea*, and presumably in all species, pleopods 1 and 2 are absent in the first post-larval stage, but it is not known at what stage they appear. Certainly in the male they develop very late, and pleopod 2 later

* I am indebted to Dr. I. Gordon for the loan of some of these from the British Museum collection.

than pleopod 1. I have seen a specimen of *C. subterranea* of 35 mm. which has no trace of either pair, and one of 31 mm. in which pleopod 2 is quite rudimentary (text-fig. 14). The largest male which I have seen is 43 mm., and in this one both pairs are very small filamentous appendages, pleopod 2

Text-figures 2-5.

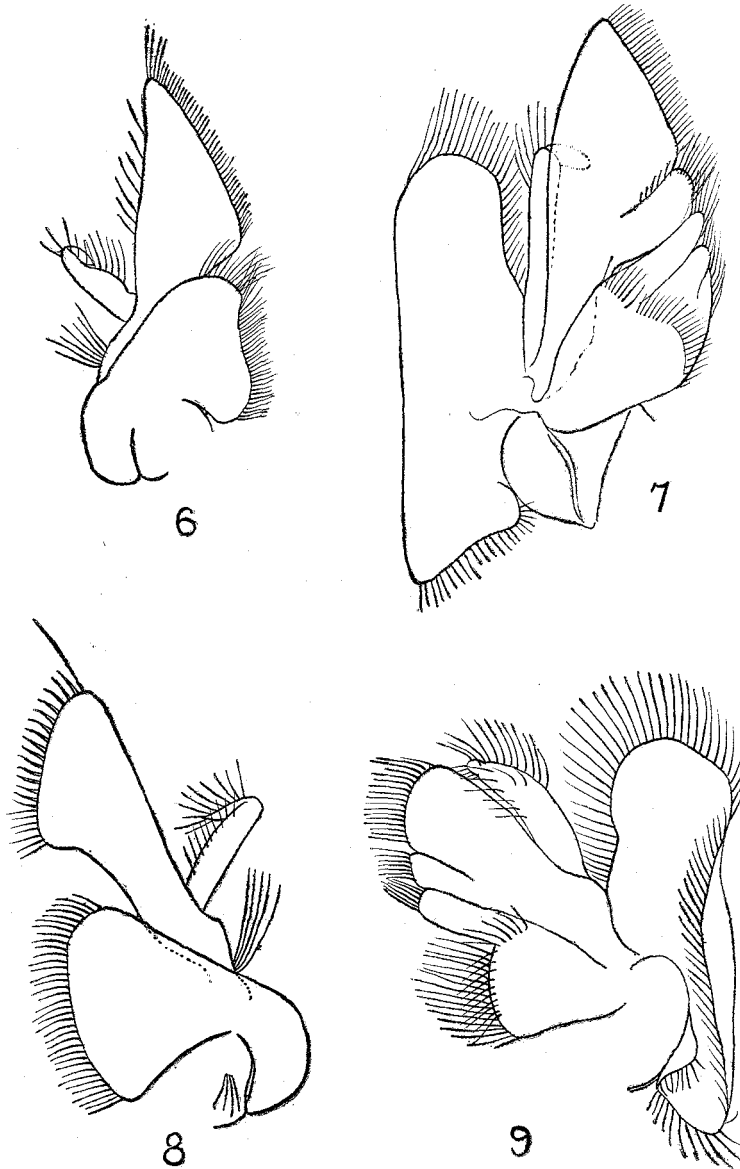


2. *Callichirus longiventris*, maxillule ; 3. *Trypæa truncata*, maxillule ;
4. *Trypæa truncata*, maxilla, endites only ; 5. *Trypæa truncata*, maxillipede, 2.

being the smaller. In a female of 32 mm. they are comparatively large, and pleopod 2 is the larger, and biramous. In the partial suppression of pleopod 2 in the male *C. subterranea* approaches *Trypæa*, in which (so far as is at present known) pleopod 2 is always absent, and sometimes pleopod 1 also.

When present, these pleopods are smaller than those of the female, and the second pair may be uniramous and smaller than the first. In some species they are relatively large, and the second pair biramous and larger than the

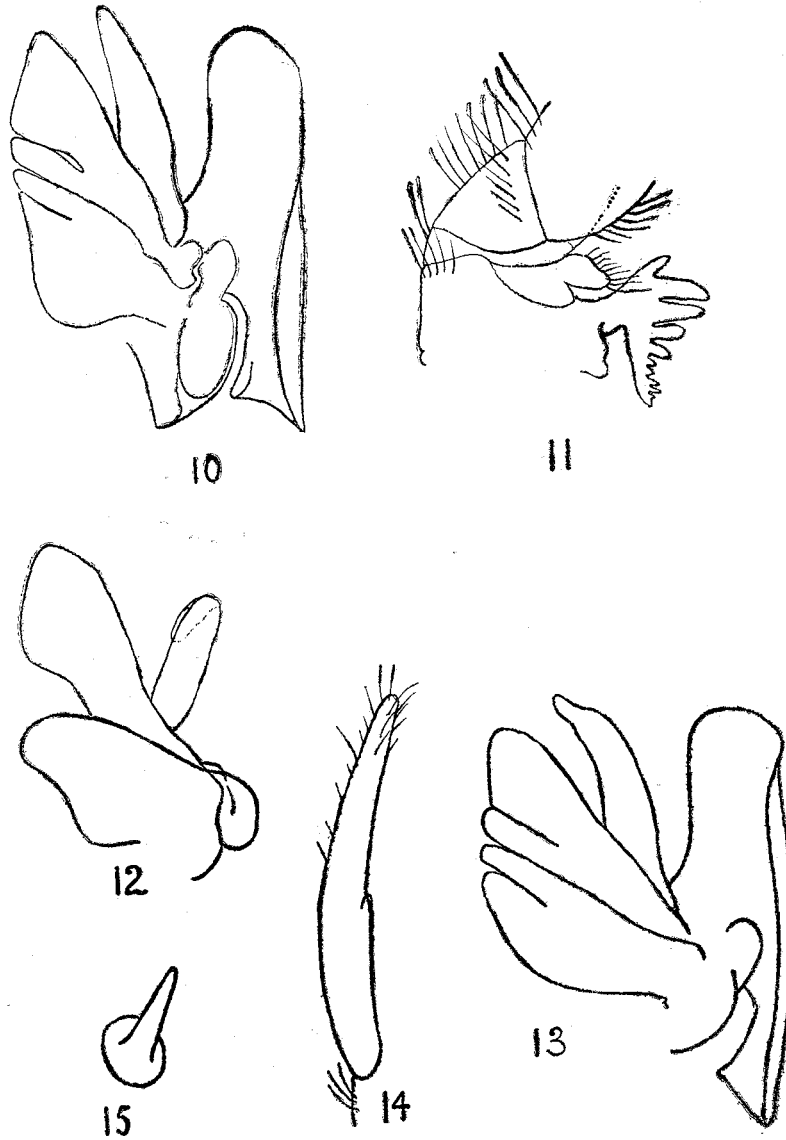
Text-figures 6-9.



6. *Trypæa californiensis*, maxillule ; 7. *Trypæa californiensis*, maxilla ;
8. *Trypæa australiensis*, maxillule ; 9. *Trypæa australiensis*, maxilla.

first. These are *Glypturus acanthochirus* (according to Stimpson), *G. branneri*, *Cheramus turnerana* and *Callichirus mauritiana*. In *G. branneri* it is difficult to find any difference between male and female, and the second pleopod even has an appendix interna in both.

Text-figures 10-15.



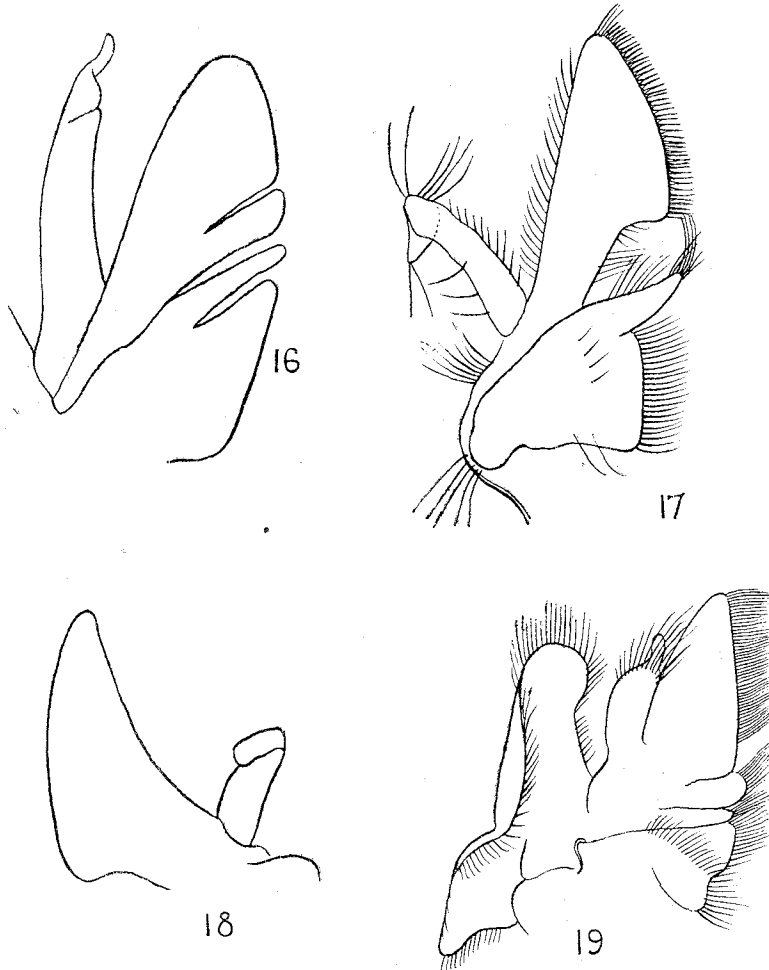
10. *Callichirus laticauda*, maxilla; 11. *Callichirus laticauda*, maxillipe 2, basal segments; 12. *Cheramus subterranea*, maxillule; 13. *Cheramus subterranea*, maxilla; 14. *Cheramus subterranea*, male 31 mm., pleopod 1; 15. *Cheramus subterranea*, male 31 mm., pleopod 2.

Both are present in the male of:—

Calliactites modesta.
Cheramus moluccensis.
 „ *indica*.
 „ *subterranea*.
 „ *mauritiana*.
Callichirus placida.

Callichirus mucronata.
 „ *longiventris*.
 „ *turnerana*.
Glypturus acanthochirus.
 „ *branneri*.

Text-figures 16-19.



16. *Glypturus branneri*, maxillule ; 17. *Glypturus branneri*, maxilla ;
18. *Trypæa gravieri*, maxillule ; 19. *Trypæa gravieri*, maxilla.

Both are absent in :—

Cheramus jocularia.
Trypæa californiensis
" *gravieri**.

Callichirus laticauda.
" *atlantica*.

Pleopod 1 is present, though rudimentary, and pleopod 2 is absent in :—

Trypæa truncata.
" *australiensis*.
" *italica*.

Trypæa filholi.
" *japonica*.
" *gigas*?

(3) *Mouth-parts*.—There is practically no information available as to the structure of the mouth-parts, but from my own very limited experience it would seem possible that some evidence of systematic value could be obtained from them.

* One specimen had vestigial pleopods on somites 1 and 2.

Maxillule.—In most species the distal lacinia is rather slender at the base, and simply rounded at its dilated end; but in certain species it has a different form. Thus in *T. truncata* and *T. californiensis* it is so much widened distally that the inner margin is considerably longer than that of the proximal lacinia.

Maxilla.—There is much the same modification of the distal lacinia in these two species, and in *T. truncata* its width is greater than that of the three proximal laciniae taken together.

Maxillipede 1.—There may be marked differences in the shape of the exopod, as, for instance, between *T. australiensis* and *T. truncata*. Also in some species there is a distinct vestige of the endopod, whereas in others no trace of it can be found.

SUMMARY.

Beyond the somewhat obvious deduction that the present subdivision of the genus is ill-founded, it must be admitted that no clear conclusion can be drawn from the facts adduced. All that is claimed is that they justify an appeal to those to whom specimens are available of species not adequately described to re-examine them and provide the information upon which a revision of the genus may be founded.

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