THE OCCURRENCE IN BRISBANE RIVER OF THE NEW ZEALAND AMPHIPOD, *PARACOROPHIUM EXCAVATUM* (G. M. THOMSON).

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(With Text-figures Nos. I to XIX.)

Towards the end of 1918, I received from Professor T. Harvey Johnston, of the University of Queensland, and honorary Zoologist to the Queensland Museum, a few Crustacea from Brisbane River, sent chiefly because of the boring Isopod, *Sphæroma terebrans* Bate, which was doing considerable destruction in timber immersed in the water. Among the specimens, however, were numerous examples of a small amphipod evidently belonging to *Corophium* or some allied genus. The male of this species first attracted my attention because of the character of the second gnathopod and the possession of a lobe on the inner side of the end of the penultimate joint of the peduncle of the lower antenna. Later on when I came to examine the females, which differed in the structure of the second gnathopod and in having no lobe on the antenna, I was struck by their resemblance to the descriptions of *Paracorophium excavatum* (G. M. Thomson), an amphipod found in brackish waters of New Zealand. In that species no sexual differences had hitherto been described. However, I found on closely examining specimens in my collection that there were some males among them having the characters of the second gnathopod and the lobe on the lower antenna quite similar to those of the Brisbane specimens, and careful comparison shows conclusively that the Brisbane specimens belong to the same species as the New Zealand. I take this opportunity of giving a fuller account of the species than has hitherto been published and of describing the differences between the male and the female.

Paracorophium excavatum was described by Mr. G. M. Thomson in 1884, under the name *Corophium excavatum*, from specimens obtained in Brighton Creek, near Dunedin, the water of which he described as being salt. A little later I received some specimens from Napier, and in January, 1890, I collected a number at Brighton itself at a time when the water in the estuary was nearly fresh or only slightly brackish; in 1894 I obtained a few specimens from Nelson, also in brackish water. In 1902 Messrs. Lucas[1] and Hodgkin obtained specimens

[1] Keith Lucas, A Bathymetrical Survey of the Lakes of New Zealand, Geographical Journal for May and June, 1904.

from Lake Roto-iti (fresh water) in Auckland which I afterwards identified as belonging to the same species.[2] The Brisbane specimens now to be described also come from brackish water, and the occurrence of this species, which is apparently confined to brackish and fresh waters, in Australia as well as in New Zealand, is of some importance in connection with the general question of the geographical distribution of New Zealand and Australian Amphipoda.[3]

In 1899 Stebbing established the genus *Paracorophium* for the reception of the species now under consideration, which is the only one of the genus at present known.

PARACOROPHIUM Stebbing, 1899.

Paracorophium Stebbing, 1899, Ann. Nat. Hist., ser. 7, vol. 3, p. 350; 1906, Das Tierreich Amphipoda, p. 663.

In general appearance and in most of the appendages *Paracorophium* comes close to *Corophium*, the chief points of difference being—(1) The mandible has the palp well developed and three-jointed, (2) the second gnathopod of the male is markedly different from that of the female and in both sexes has the merus produced into a scoop-like process different from that in *Corophium*, (3) the third uropoda are two-branched.

PARACOROPHIUM EXCAVATUM (G. M. Thomson).

Corophium excavatum G. M. Thomson, 1884, Trans. N. Z. Inst., vol. 16, p. 236, pl. 12, fig. 1 to 8.
Paracorophium excavatum, Stebbing, 1906, Das Tierreich Amphipoda, p. 664.
Paracorophium excavatum, Chilton, 1906, P.Z.S., p. 704.

As this is the only species of the genus it is unnecessary to give a separate specific diagnosis. Thomson's original description and figures, on which that in Das Tierreich Amphipoda appears to be based, apply to an immature male. A detailed description is given below.

Size.—About 4 mm. in length.

Colour.—Greyish.

Localities.—New Zealand—Brighton, Napier, Nelson (brackish water), and Lake Roto-iti (fresh water); Australia—Brisbane River (brackish).

Antenna 1 (fig. 1) has the second joint of the peduncle longer than the first but much more slender; the third about half the length of the second;

[2] P.Z.S. 1906, p. 704.

[3] Several of the Corophiidæ appear to be able to live in brackish or fresh water. Speaking of the whole family Stebbing says (1906, p. 662), "Marine, but extending into brackish or even almost fresh water"; and of *Corophium crassicorne* Bruz. he says, "Found in Norfolk in almost fresh water." *C. volutator* is recorded as "forming tubular galleries in the mud of tidal swamps." I have specimens of this species obtained for me by Mrs. Sexton, of Plymouth, labelled "Mouth of Issel, near Kampen. Quite fresh water"; and Mr. Robert Gurney, speaking of this species under the name "*C. grossipes* (Linn.)," says "it seems to thrive well in fresh water" (Trans. Norfolk and Norwich Naturalists' Soc., vol. viii, p. 435, 1907). Later on he recorded it as found in the Oued Tindja at its outflow from Lake Garaa Achkel in Tunisia (Jour. Roy. Micr. Soc. 1909, p. 283).

flagellum shorter than the peduncle, containing about 10 joints. This appendage appears to be the same in the male and in the female.

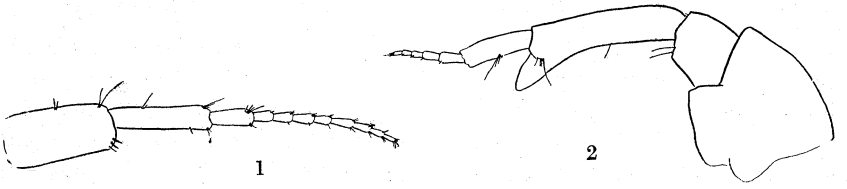

Fig. 1.—First antenna of male (Brisbane specimen).
Fig. 2.—Second antenna of male (Brisbane specimen).

Antenna 2 appears to vary considerably according to age and development, becoming stouter, especially at the base, in older specimens. In a fully developed male (fig. 2) the first three basal joints of the peduncle are short and very broad; the fourth joint is fully as long as all the preceding though much more slender, and is produced at the apex on the inner side into an oval lobe which when fully developed reaches nearly halfway along the fifth joint of the peduncle; the fifth is only half as long as the preceding; the flagellum is shorter than the last joint of the peduncle and consists of about 5 or 6 joints. The lobe at the end of the fourth joint of the peduncle varies in size in different specimens according to their development; in one specimen from Brighton, the second gnathopod of which is shown in figure 10*a*, the antennal lobe is quite short, the basal joints of the peduncle are not so broad and the fourth joint scarcely so long as in more mature specimens (fig. 2*a*). In a specimen from Lake Roto-iti which, judging by the second gnathopod, is an undeveloped male, the second antenna (fig. 2*b*)

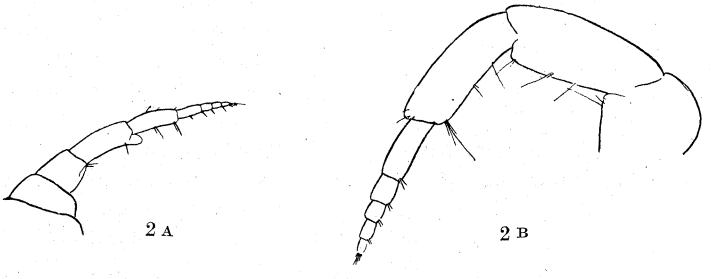

Fig. 2*a*.—Second antenna of male, immature (Brighton specimen).
Fig. 2*b*.—Second antenna of male, immature (Roto-iti specimen).

is very stout, the fourth joint being almost as stout as the preceding but without any trace of the apical lobe, while the fifth joint is larger in proportion than in the mature males from Brighton and from Brisbane. In some of the specimens the proximal joints of the flagellum appear to be partially fused though the line of junction is clearly visible; like the peduncle they bear a few fine setæ. In the females the second antenna remains much more slender and without the lobe on the fourth joint.

The antennal lobe being found only in the male probably has some sexual function, but being flat on the inner side it perhaps also facilitates the holding together of the right and left antennae as the animal swims backwards.

The *mandible* (fig. 3) is of normal structure with large molar tubercle, the cutting edge consisting in the left mandible (fig. 3) of 3 or 4 teeth, the accessory process being similar and of approximately the same size; the spine row contains about 5 spines. In the right mandible (fig. 4) the accessory process is narrower. The palp is large, second joint the longest with a small tuft of setæ at the distal end, third joint widens distally and bears numerous long setæ at the apex with a small tuft at a little distance from the apex which is obliquely truncate.

The *first maxilla* (fig. 5) has the inner lobe very small and delicate, triangular, and bearing a minute setule at the end. The outer lobe ends in about 7 to 9 dentate spines; the palp has the first joint slightly swollen, the second joint widens distally and bears at the apex 7 or 8 short setules.

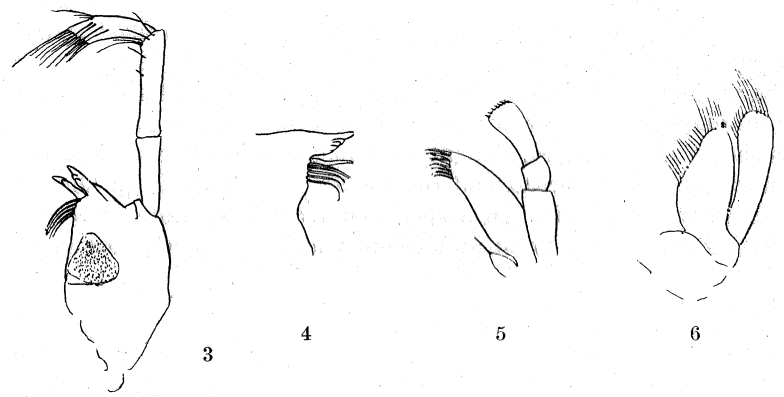

Fig. 3.—Left mandible, male (Roto-iti specimen).
Fig. 4.—Cutting edge of right mandible, male (Roto-iti specimen).
Fig. 5.—First maxilla, male (Roto-iti specimen).
Fig. 6.—Second maxilla, male (Roto-iti specimen).

The *second maxilla* (fig. 6) has the inner lobe shorter and broader than the outer and is fringed along its inner margin as well as at the rounded apex, in the outer lobe the long setæ are mainly confined to the apex.

The *maxillipeds* (fig. 7) have the inner lobe bearing at the apex 4 long setæ and several shorter ones, the outer lobe is somewhat narrow and reaches nearly to the end of the second joint of the palp, the inner margin is thickly fringed with setæ. In the palp the second joint is much the longest; the propod is oval, produced at the outer apex slightly beyond the base of the finger; the finger is about half as long as the propod; all the joints bear long setules as shown in the figure.

The *first gnathopod* (figs. 8 and 9) has the side plate large and subtriangular, projecting forwards, its anterior angle rounded and bearing a fringe of long setæ which extends also along the lower margin; the basal joint widens considerably distally and bears a few long setæ towards the apex; the ischium

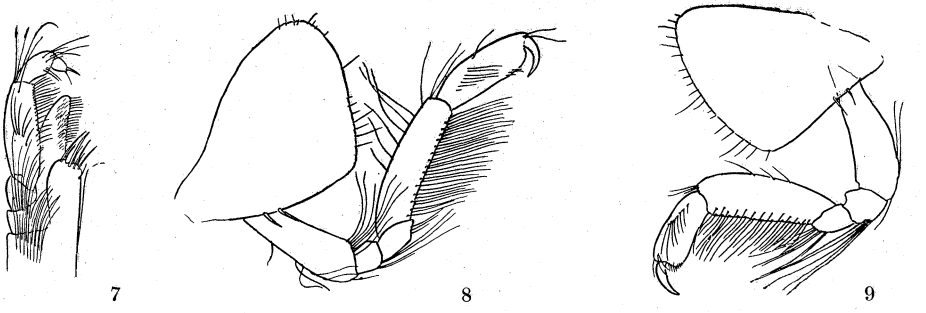

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Fig. 7.—Maxilliped, male (Roto-iti specimen).
Fig. 8.—First gnathopod, male (Brisbane specimen).
Fig. 9.—First gnathopod, female (Brisbane specimen).

and merus are both short, their posterior margins bearing long setæ, those on the ischium reaching nearly to the middle of the carpus; the carpus is greatly elongated, being narrowly oblong in shape, its posterior margin densely fringed with a double row of long setæ, a few scattered ones being also found on the anterior margin; the propod is much shorter than the carpus, about the same width throughout, its palm nearly transverse, not defined, being closely overlapped by the dactyl; near the base of the propod is an oblique row or tuft of about 6 or 7 long setæ. This appendage seems to be the same in both sexes.

The *second gnathopod* in the fully developed male (fig. 10) is much stouter than in the female, the side plate is oblong with the inferior angles rounded, its inferior margin with a few long setæ; the merus is produced into a long scoop-like process reaching considerably beyond the end of the carpus which, together with the basal portion of the propod, appears to fit into the hollow of the scoop, one margin of which is fringed with very long setæ most of which

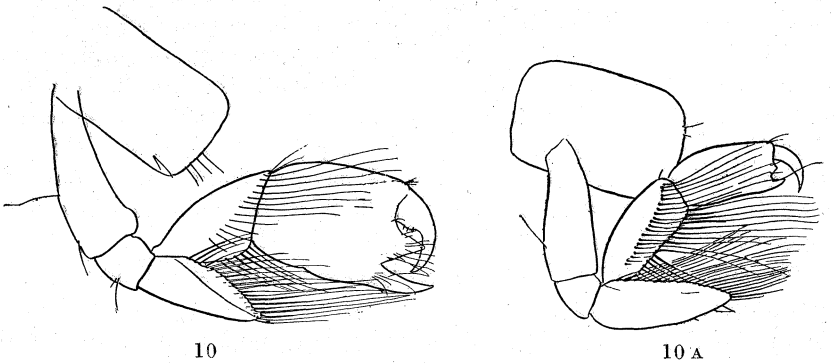

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Fig. 10.—Second gnathopod, male (Brisbane specimen).
Fig. 10*a*.—Second gnathopod, male, immature (Brighton specimen).

reach quite to the end of the propod, the other (inner) margin being apparently free from setæ; the carpus is short, triangular in shape, widening greatly distally, its posterior border bears long hairs and there is an oblique row on the outer surface; the propod is oblong-oval, as wide at the base as the carpus, but becoming slightly wider distally; both anterior and posterior margins are convex, the posterior one being produced into a long slender curved tooth, separated by a deep depression from a similar but shorter tooth arising from the middle of the palm; the finger is short, not reaching quite to the end of the palm.

In the female the *second gnathopod* (fig. 11) has the scoop-like process on the merus as in the male, but differs greatly in the carpus and propod, both of which are much longer and more slender, as shown in the figure; the carpus is longer than the propod and has the posterior margin fringed with two widely separated rows of long setæ; the propod is slender and ends simply, being almost entirely without palm. In some cases the end of the propod is narrower than is shown in figure 11.

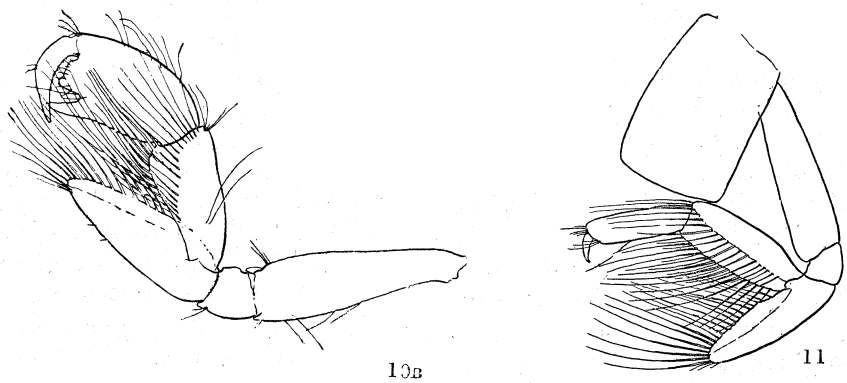

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Fig. 10*b*.—Second gnathopod, male, immature (Roto-iti specimen).
Fig. 11.—Second gnathopod, female (Brisbane specimen).

In the young male the second gnathopod appears to be at first similar to that of the female, the adult male characters being gradually developed. Figure 10*b* shows an intermediate stage in which the carpus and propod, though broader than in the female, are still somewhat narrow; the propod has the posterior margin produced into a tooth only half the length it afterwards becomes, while the tooth in the centre of the palm is hardly yet apparent; the dactyl reaches slightly beyond the end of the palm in this case. This figure is drawn from a Lake Roto-iti specimen. I have a similar one mounted from Brighton (fig. 10*a*) in which the defining tooth of the palm is still shorter and the finger overlaps the palm as it does in the female.

The *first* (fig. 12) and *second peræopoda* are of normal shape and do not call for special description.

In the *third peræopod* (fig. 13) of fully developed animals the basal joint is very large and much produced posteriorly, the posterior margin being fringed with long setæ. The carpus bears at its postero-distal angle 4 strong curved

spines with a similar tuft of 3 placed more proximally. Similar curved spines are found also on the propod and appear quite similar to those in several species of *Corophium*. In more immature specimens the basal joint is much narrower

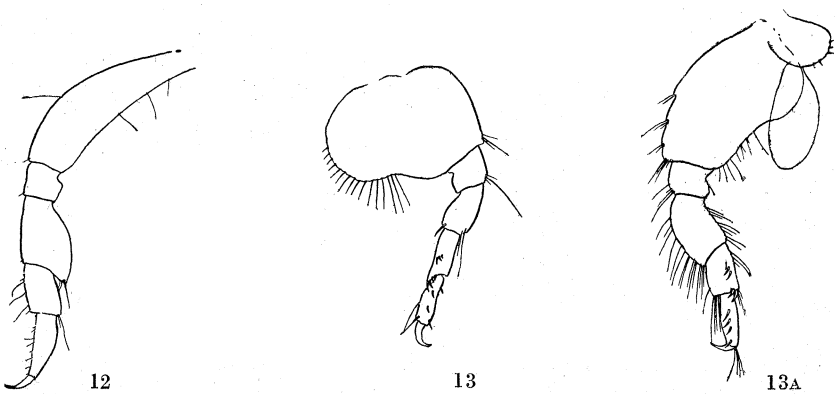

Fig. 12.—First peræopod, male (Brisbane specimen).
Fig. 13.—Third peræopod, male (Brisbane specimen).
Fig. 13*a*.—Third peræopod, male, immature (Roto-iti specimen).

and only slightly produced posteriorly. That of the Roto-iti specimen whose second gnathopod is shown in figure 10*b* is represented in figure 13*a*. The third peræopod of an ovigerous female from Brisbane River is represented in fig. 14, which shows that it is very nearly the same as in the adult male.

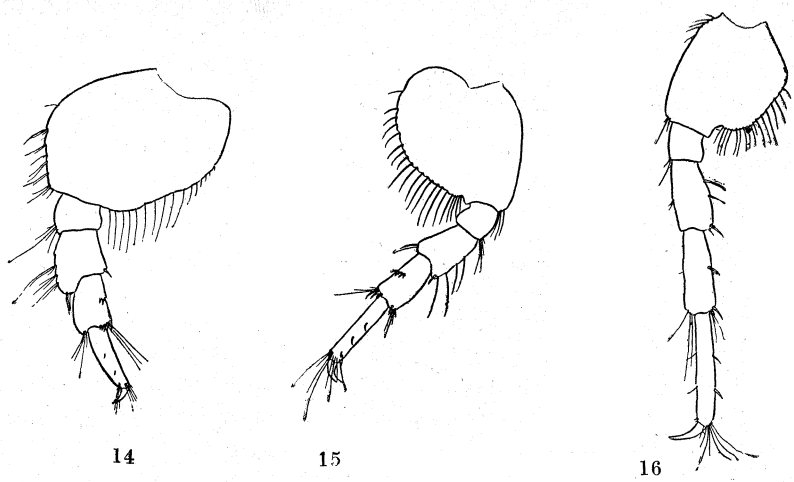

Fig. 14.—Third peræopod, female (Brisbane specimen).
Fig. 15.—Fourth peræopod, male (Brisbane specimen).
Fig. 16.—Fifth peræopod, male (Brisbane specimen).

The *fourth peræopod* (fig. 15) is longer than the third, and has the basal joint broad but less produced posteriorly than in the third, its posterior margin fringed with long spinules; strong curved spines are found on the carpus and propod as in the third peræopod.

The *fifth peræopod* (fig. 16) is longer than the fourth, the basal joint is somewhat narrower, the merus, carpus and propod longer; the various joints bear stout setæ and some long hairs, but not the special groups of curved spines that are present in the third and fourth.

The *first uropod* (fig. 17 and 17*a*) has the peduncle considerably longer than the rami, its lower margin being produced between them into a flattened process, which when fully developed reaches nearly halfway to the end of the rami; this is shown in side-view in figure 17; in figure 17*a* it is shown as seen from above with a broadish base and the extremity forming a narrow vertical knife-edge; numerous short spines are present on the upper margins of the peduncle and of the rami.

The *second uropod* (fig. 18) is shorter, the outer ramus shorter than the inner, both rami and the peduncle bearing a few short stout spines on the upper margin.

The *third uropod* (fig. 19) has the outer ramus about twice as long as the inner, which bears a sharp spine on its inner margin and three long hairs at the apex; similar long hairs are found at the end of the outer ramus and at the end of the peduncle.

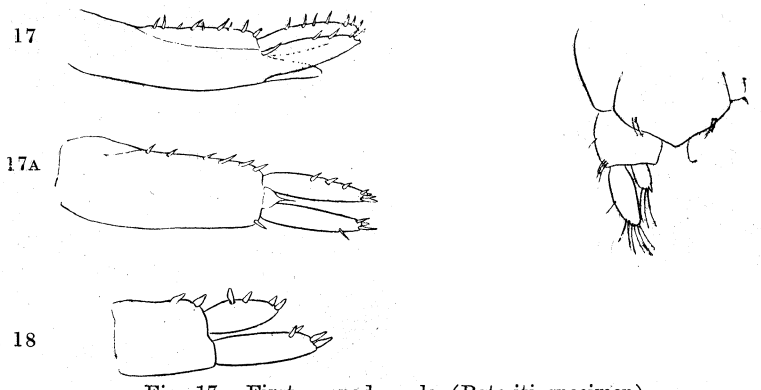

Fig. 17.—First uropod, male (Roto-iti specimen).
Fig. 17*a*.—First uropod, female (Roto-iti specimen).
Fig. 18.—Second uropod, female (Roto-iti specimen).
Fig. 19.—Third uropod and telson, female (Roto-iti specimen).

The *telson* (*see* fig. 19) has the posterior margin somewhat produced to a blunt triangular point, a pair of spinules being situated at each side at some distance from the extremity.

The specimens from Lake Roto-iti are larger than those from Brighton and Brisbane River and, as stated above, they differ in a few points, *e.g.* in the second antennæ of the male. It is possible that they may constitute a distinct variety, but I have not found among them a male as fully developed as those examined from the other localities, and in the meantime I consider the differences as being due to immaturity. In any case the differences are slight and do not seem to be of specific importance.