Studies on the New Zealand Amphipodan Fauna

No. 7. The Family Corophiidae, including a new species of *Paracorophium**

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[*Read by title before Council of Otago Branch on December 7, 1953; received by Editor, February 9, 1954*]

Abstract

THE New Zealand species of Corophiidae are described and figured. The genera *Corophium* Latr., *Paracorophium* Stebbing, *Erichthonius* M.-Edw., and *Camacho* Stebbing are represented by a total of seven species. *Corophium sextonae* Crawford, *Corophium acutum* Chevreux, *Corophium acherusicum* Costa and *Erichthonius pugnax* Dana are either new records for New Zealand or have previously been described under other names. A new species, *Paracorophium lucasi*, is described from the freshwater Lake Rotoiti. Keys to genera and species are given.

INTRODUCTION AND ACKNOWLEDGMENTS

MANY of the species of this family are tube-dwelling amphipods, building their own tubes of sand or mud. In most of them, the body is characteristically "depressed," the urosome region being especially so. They are mostly marine, but some are brackish and even freshwater in habitat. Species of *Corophium* in particular are notable members of the fauna of wharf-piles and buoys, and wherever small algae and mud are to be found together, preferably with a somewhat more solid stratum closely underlying. They may be momentarily confused with the small wood-boring isopods of the genus *Limnoria* which they superficially resemble and which are often found together with them, but little experience is needed to tell the two genera apart. The large antennae of *Corophium* are especially distinctive.

Previous to this paper, four species of Corophiidae were known from New Zealand. This excludes specimens of two further species located in the British Museum and identified by Crawford (1937). I have here described six species and listed a seventh for which material was lacking

Work on the family has been considerably aided by Crawford's very comprehensive review of the genus *Corophium*, and by subsequent papers by Shoemaker (1947, 1949) on the American species of *Corophium* for which he gives detailed figures.

I wish to thank Professor Percival and the Canterbury University College Council and Library for the use of the Chilton collection of specimens and literature; Dr. C. R. Shoemaker of the United States National Museum for his kindly and generous help; Professor H. Damas of Liège University for his assistance with literature; and Professor L. R. Richardson of Victoria University College for advice and encouragement during the course of this work.

* This study is part of an investigation carried out at Victoria University College, Wellington, with the aid of a New Zealand University Research Fund Fellowship

Family Corophiidae Dana.

Stebbing, 1906: 662.

"Body usually more or less depressed. Pleon small. Sideplates usually small and often not in continuity. Antenna 1 and 2 of variable proportions, with or without accessory flagellum. Mouthparts generally normal, except that mandibular palp is not always 3-jointed, and the inner plate of maxilla 1 is sometimes evanescent. Gnathopods 1 and 2 variable in character and relative proportions Peraeopods 1 and 2 usually glandular. Peraeopod 5 the longest. Pleopods often with peduncle internally expanded. Uropod 1 biramous. Uropod 2 biramous or uniramous. Uropod 3 small, weakly biramous, uniramous, or even without rami. Telson simple, sometimes lobate."

Key to New Zealand Genera of Corophiidae.

1	Mandibular palp of 3 segments	2
	Mandibular palp of 2 segments	*Corophium*
2	Uropod 3, inner ramus distinct	3
	Uropod 3, inner ramus wanting	*Ericthonius*
3.	Sideplates in continuity. Freshwater	*Paracorophium*
	Sideplates not in continuity. Deep-sea	*Camacho*

Genus Corophium Latr.

Stebbing, 1906: 685.

"Body depressed throughout. Head with narrow lateral lobes. Sideplates small, discontinuous, 1st conically produced, tipped with setae. Eyes small or imperfectly developed, on lateral lobes of head Antenna 1 without accessory flagellum; flagellum slender, with several joints. Antenna 2 strong, pediform, usually much longer in male than in female; flagellum short, 3-jointed, with apical hooked spines. Upper lip broad. Lower lip normal. Mandible with 2-jointed palp, slender, each joint carrying a strong plumose seta; other parts normal. Maxilla 1, inner plate nearly obsolete, outer with 7 spines on apical margin, 2nd joint of palp long. Maxilla 2, inner plate fringed on inner margin. Maxillipeds, inner plates narrow, without apical spine-teeth, outer long, narrow, with slender spines on inner margin; finger of palp small, with apical spine. Gnathopod 1 slender, the short projecting 3rd joint and long 5th densely fringed with long setae; 6th joint narrow with short palm Gnathopod 2 rather larger, 4th joint closely attached to hind margin of 5th; its own convex hind margin fringed with very long plumose setae in 2 rows; 6th joint sublinear, without palm Peraeopods 1 and 2, 2nd and 4th joints somewhat expanded, 5th very short; finger slender Peraeopods 3 and 4, 2nd joint moderately expanded; 4th produced in front of the short 5th, which carries 2 oblique rows of spines, 6th slender, not long; finger short, reverted. Peraeopod 5 long and slender, 2nd joint fringed on both margins with long setae. No branchial vesicles on gnathopod 2. Marsupial plates narrow. Pleopods 1–3, peduncle greatly expanded on inner side, the 2 coupling spines with several teeth; inner ramus the longer, without cleft spines on 1st joint. Uropods 1 and 2, rami rather short, with strong spines on outer margin Uropod 3, peduncle short, ramus single, laminar, with some fringing setae. Telson entire, small, distinct."

KEY TO NEW ZEALAND SPECIES OF COROPHIUM.
(Based on Crawford, 1937).

1.	Segments of urosome fused; uropod 1 attached ventrally; lateral margins of urosome without notches* .	*C. acutum*
	Segments of urosome fused; uropod 1 inserted in notch in the lateral margin* .	2
2.	Antenna 2, segment 4 with a large terminal tooth and a smaller one above (male) . .	3
	Antenna 2, segment 4 armed only with spines (female) . .	4
3	Antenna 1, flagellum of 5 segments, shorter than 2nd segment of peduncle; antenna 2, segment 4 with 2–3 spines, segment 5 without processes	*C. sextonae* (male)
	Antenna 1, flagellum of 7–10 segments, longer than 2nd segment of peduncle; antenna 2, segment 4 without spines, segment 5 with 2 processes	*C. acherusicum* (male)
4.	Antenna 2, segment 4 with spines set in a single row	*C. sextonae* (female)
	Antenna 2, segment 4 with all spines, except the terminal one, set in pairs	*C. acherusicum* (female)

With the aid of Crawford's and Shoemaker's papers on the genus it is a relatively simple matter to sort out the previous confusion in the New Zealand species. Crawford (1937) established that there were in the British Museum specimens of *C acutum* from Auckland, New Zealand; and from " internal evidence " he deduced that various papers in the New Zealand literature (Chilton, 1921; Thomson and Chilton, 1886; Thomson, 1880) referred to *C. acherusicum*. Specimens of the latter from Lyttelton Harbour were also found in the British Museum. *C sextonae* is a new record from New Zealand.

Under *Corophium crassicorne* Chilton had included *C. contractum* and, with a slight query, *C. bonellii* In fact, none of these are in his material and it seems almost certain that Chilton's mis-identification was due to the fact that he had been sent specimens of *C. acherusicum* from Holland labelled *C. crassicorne*. These specimens, to which Crawford draws attention, are in the Chilton collection. In attempting to rationalise the differences between these specimens and the previous figures and descriptions of these and other species by overseas workers, Chilton concluded that the species varied extensively and that there was only one species known from New Zealand. This readiness to accept wide variability within species without further questioning is unfortunately responsible for many of the now obvious errors in his work.

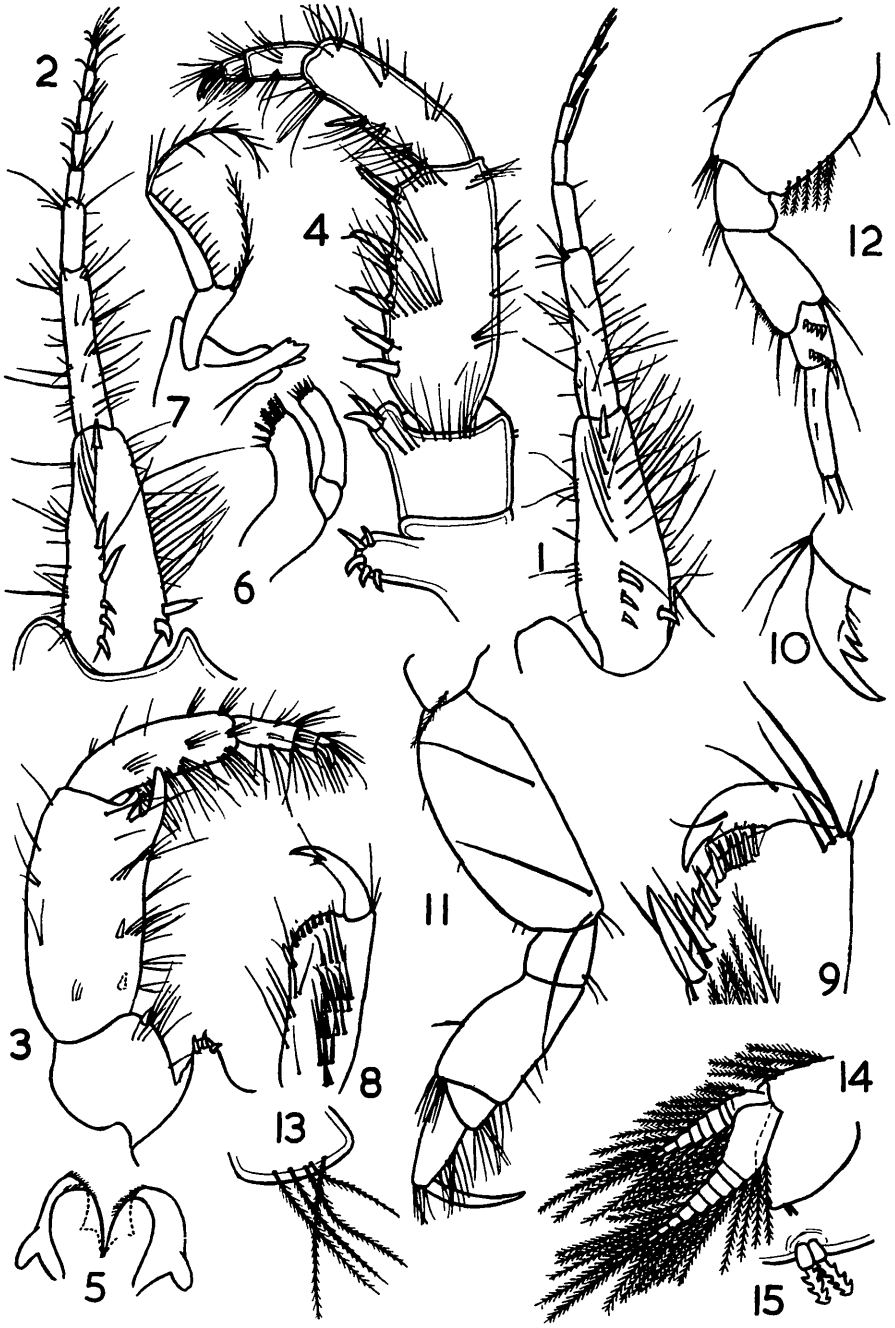
Corophium sextonae Crawford, 1937 (emend.). (Figs. 1–21.)
Crawford, 1937· 620–623, fig. 3A–H; 4G–H.

DESCRIPTION OF FEMALE.

Length 5 mm.; depth ½ mm ; width 1½ mm. Ovigerous, about 33 eggs. Colour in spirit yellowish-orange; eyes small, eye-lobes rounded; small triangular rostrum produced much less than ⅓ along 1st segment of antenna 1 peduncle.

ANTENNAE. *First*: Length 1½ mm., not reaching end of antenna 2 flagellum. Flagellum of 6 segments, about ⅓ peduncle length; segments except very small end segment longer than wide with long setae distally. Peduncle, 1st segment

(* This basic dichotomy on the attachment of the uropods is often not obvious in mounted specimens, but the difference between ventral attachment and insertion in notches in the lateral margin is immediately obvious in mounted specimens. Uropod 2 is also attached ventrally or in notches but not so strikingly and it is much more difficult to convey this difference accurately in drawings.)



TEXT-FIG. 1.

Corophium sextonae Crawford. 1—Antenna 1, ♂. 2—Antenna 1, ♀ 3—Antenna 2, ♂. 4—Antenna 2, ♀. 5—Lower Lip. 6—Maxilla 1. 7—Mandible showing palp. 8—Gnathopod 1, ♂. 9—Gnathopod 1, ♀. 10—Gnathopod 2, dactylos, ♂. 11—Peraeopod 1, ♀. 12—Peraeopod 4, ♀. 13—Epimeral plate. 14—Pleopod. 15—Pleopod coupling spines.

constricted proximally, widening quickly, then narrowing distally; greatest width nearly ½ length; 2 strong spines, one hooked, on inner margin proximally; long setae on inner and outer margins; a median marginal flange with row of about 5 strong spines, the 1st 3 hooked, on proximal ½, then long setae and a distal stout spine; 2nd segment ⅔ length 1st, linear, width ¼ length, long setae on margins and surface; 3rd segment narrower, less than ½ length 2nd, a few long setae; segment more like flagellar segments. *Second*: Length 1½ mm Peduncle, 2nd segment wide, short, with prominent gland-cone bearing 5 stout hooked spines; 3rd slightly wider than long, a few long marginal setae; inferodistal angle a little produced with 2 strong spines; 4th, greatest width less than ½ length, 5 strong spines in a single row along inferior margin; long setae on margins and surface; 5th ¾ length 4th, width ⅔ length, setae on margins and surface, 1 strong spine ½ along inferior margin. Flagellum not ⅔ length 5th segment of peduncle; 1st segment ⅔ length 5th peduncle segment; setae in distal and medial broken circlets; 2nd segment less than ½ length 1st, setae distally; 3rd segment very small, distally setose, 2 apical spines.

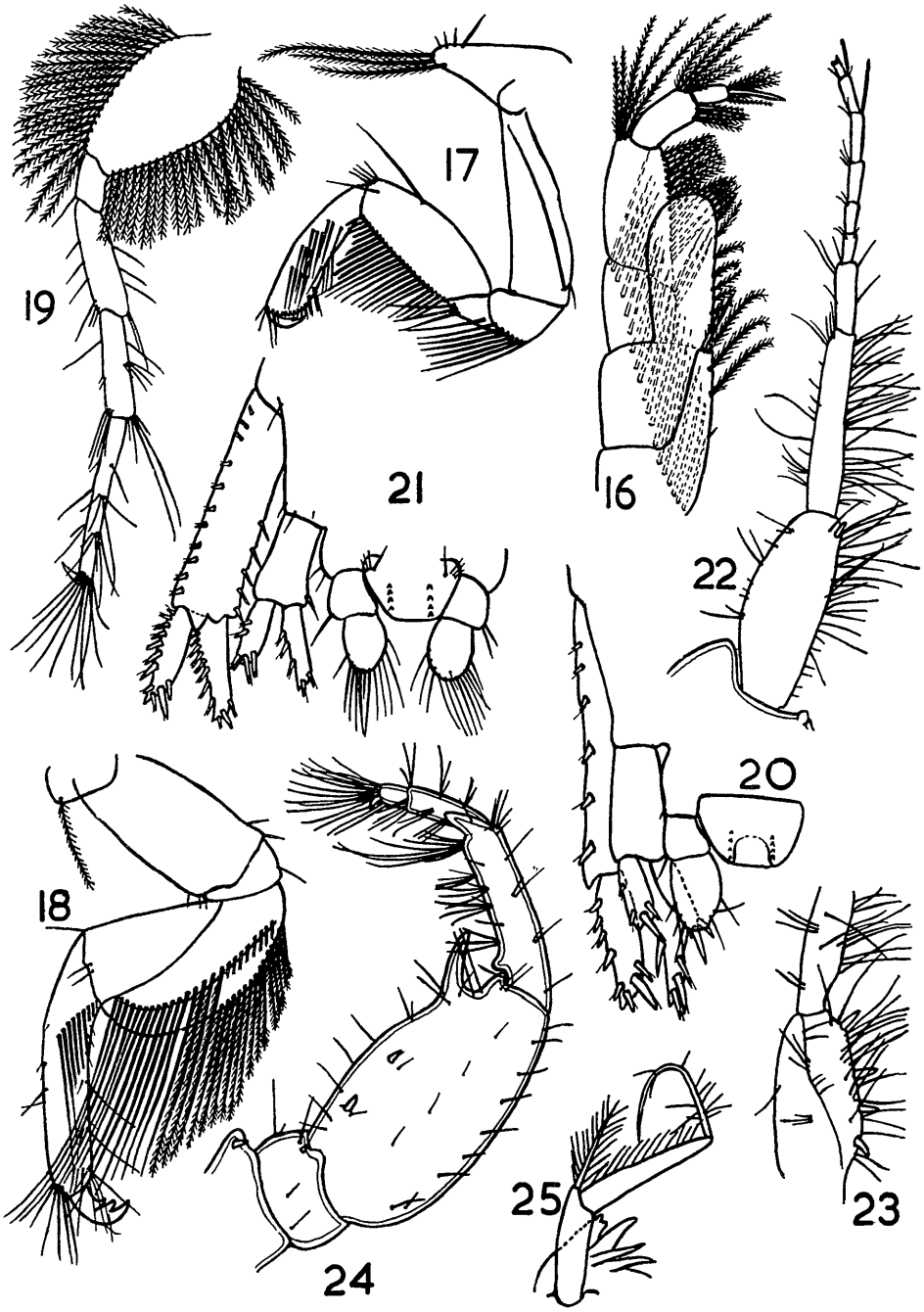
MOUTHPARTS. *Lower Lip*: Lobes distally rounded and bristled; inner almost as long as outer; inner margin of outer plate bilobed. *Mandibles*: Cutting edge of 2 long narrow plates; molar process large. Palp, 1st segment widening distally, inner distal angle a little produced with long plumose setae; 2nd segment arising from outer distal angle, about ⅓ longer than 1st, a few long bristles on inner margin, a sparsely bristled long end seta. *First Maxillae*: Palp not narrowing throughout; 1st segment subsquare; 2nd reaching a little past outer plate, about 9 sharp spines distally. *Second Maxillae*: Plates distally rounded; outer slightly the longer, with long setae distally; inner with long setae on distal and inner margins. *Maxilliped*: Inner plate just reaching past merus base; 2 long plumose spines distally, about 3 down inner margin, a small spine proximally. Outer plate arising just below end of inner plate, reaching ⅔ along carpus inner margin, not widening much, outer margin rounding distally to inner, short plumose setae along inner margin. Ischium as long as wide, slightly longer than merus outer margin; merus inner margin ⅔ length outer, slightly less than width; 3 or 4 long plumose setae on inner distal angle. Carpus inner margin ½ as long again as merus outer margin, with strong fringe of long slender plumose setae; several plumose setae on carpus outer distal angle; carpus not widening distally; on one surface a single row of long plumose setae runs from ½ down inner margin of basos obliquely across ischium to merus outer distal angle. Propod small, subrectangular, more than ½ length carpus inner margin, width ½ length, long plumose setae on distal angles. Dactylos ½ propod length and width, plumose setae distally, long slender terminal nail about ¾ propod length.

GNATHOPODS. *First*: Sideplate ovately subtriangular, anterodistally rounded, about 4 short setae anteriorly, 3 very long plumose setae ventrally. Basos proximally constricted, posterior margin convex, distal width ⅓ length, a single very long seta at posterodistal angle. Ischium subrectangular, posterior margin about ¾ width, length more than ¼ basos; row of long plumose setae posteriorly on distal margin. Merus small, subtriangular, posterior margin as long as ischium, 3 or 4 long plumose setae on posterodistal angle, 1 or 2 on surface. Carpus about ¾ basos length, greatest width ⅔ length; anterior margin slightly convex, single seta about ⅔ along, 3 or 4 short setae distally; straight posterior margin has double fringe of long plumose setae, some as long as propod. Propod as long as carpus, width

¼ length, not widening much; about 4 rows of 2 to 6 long plumose setae proximally on surface, several more setae at anterodistal angle, several midway along posterior margin; long seta-tipped spine at about ¾ marks beginning of obliquely convex and poorly defined palm, several shorter seta-tipped spines along palm. Stout curved dactylos shorter than palm, only as long as propod is wide; inner margin has single tooth medially, a few small setae on surface and margins. *Second*: Sideplate small, subrectangular, single long plumose seta anterodistally. Basos width ½ length, a few fine setae distally. Ischium very small, wedge-shaped, posterior margin ¼ basos length, a fine seta posterodistally. Merus as long as basos and ischium combined, anterior margin slightly concave, contiguous with carpus posterior margin so merus and carpus appear as single plate; row of very long plumose setae on strongly convex posterior margin, a similar row running in more or less parallel arc along surface. Carpus subtriangular; anterior margin straight, barely shorter than merus, a few very fine setae distally. Propod slender, narrowing slightly distally; ½ as long again as basos, width about ⅕ length; slightly convex anterior margin has a few very small fine setae; oblique row of long plumose setae runs almost right across surface from posteroproximal angle; several short and long setae on posterior margin; tufts of moderately long setae on distal angles. Stout dactylos about ¼ propod length, tridentate with 2 or 3 very short setae.

Peraeopods. *First*: Sideplate small, wider than deep. Basos margins slightly convex, width nearly ½ length; 3 very long single setae on posterior surface, a few very small fine setae on margins. Ischium subsquare, ¼ basos length, 2 or 3 fine setae posterodistally. Merus slightly more than ½ basos length, width ⅔ length, anterior margin constricted a little proximally, a few marginal setae posteriorly, single seta midway along anterior margin, tuft at anterodistal angle. Carpus subtriangular, wedged between merus and propod, posterior margin less than ⅓ merus length, with several long setae. Propod width less than ½ length, anterior margin ⅔ basos length, margins slightly convex, posterior margin setose, setae on anterodistal angle; distally narrowed to slender dactylos; dactylos as long as propod, width about ⅛ length *Second*: Similar. *Third*: Like Pr 4, but stouter; basos posteriorly lacks plumose setae. *Fourth*: Basos ovate, greatest width ⅔ length, margins convex, anterior with a few fine marginal setae, tuft at distal angle; posterior with 1 or 2 fine setae proximally, 4 or 5 longer plumose setae distally. Ischium subsquare, ⅓ basos length, tuft of setae anterodistally. Merus, posterior margin a little constricted proximally, length ⅔ basos, distal width ½ length, several setae on anterior margin, fringe of fine bristles distally, tuft of long setae posterodistally. Carpus subrectangular, width ¾ length, length ½ merus, oblique row of 5 stout spines across surface posteroproximally; similar arc of 7 spines across distal surface, the last and very stout spine on posterodistal angle. Propod slender, ⅔ basos length, narrowing slightly to stout short dactylos. *Fifth*: Basos ovate, narrowing distally, margins equally convex, greatest width ⅔ length. Ischium subrectangular, width ⅔ length. Merus ⅔ basos length, width ⅓ length, a few setae on each margin. Carpus similar, tuft of long setae on each distal angle, as long as merus, narrower. Propod still narrower, almost as long as basos, several groups of 1 or more long setae on margins, strong tuft posterodistally Curved simple dactylos ⅓ propod length.

Epimeral Plates. Wider than deep, subrectangular, distal angles rounded, 4 or 5 long plumose setae ventrally.



TEXT-FIG. 2.

Corophium sextonae Crawford. 16—Maxilliped, left half. 17—Gnathopod 1, ♀. 18—Gnathopod 2, ♀. 19—Peraeopod 5, ♀. 20—Urosome, ♂. 21—Urosome, ♀. *Corophium acutum* Chevreux 22—Antenna 1, ♂. 23—Antenna 1, ♂, 1st segment of peduncle. 24—Antenna 2, ♂. 25—Mandibular palp.

PLEOPODS. Biramous, rami arising from outer half of distal margin, outer ramus barely longer than peduncle; rami of about 9 segments, each with pair of long plumose setae; peduncle wider than long, inner distal angle produced downwards a little.

UROSOME. Segments coalesced, uropods arising from marginal notches.

UROPODS. *First*: Reaching a little past ends of 2nd uropods which are barely longer than 3rd; peduncle width little more than $\frac{1}{4}$ length; rami subequal, $\frac{1}{2}$ peduncle length, outer dorsal margin of peduncle has about 11 short stout seta-tipped spines, inner has about 5 sharp spines distally; distal margin medially produced to small lobe between rami; outer ramus distally acute; both rami slightly convex, outer margin has about 8 seta-tipped spines right along, 3 spines distally on inner; inner ramus similar. *Second*: Peduncle as long as inner ramus, outer slightly shorter; peduncle width $\frac{3}{4}$ length, single spine on inner distal angle; rami for most part distally rounded but with stout acute tooth terminally; outer ramus with 2 spines $\frac{1}{2}$ along outer margin, 3 at end; inner ramus with 2 or 3 along outer margin, 2 at end of inner. *Third*: Peduncle reaching end of telson. 1 or 2 setae at outer distal angle, peduncle $\frac{3}{4}$ length of rounded terminal segment which has about 12 long setae on convex end margin. *Telson*: Narrowing to straight distal margin, wider than long, 2 parallel rows each of 4 small teeth along surface; 3 or 4 setae on proximal angles.

DESCRIPTION OF MALE.

Length 4 mm.; depth $\frac{1}{3}$ mm.; width $\frac{3}{4}$ mm. Rostrum reaching no further than $\frac{1}{4}$ along 1st segment of antenna 1 peduncle.

ANTENNAE. *First*: Reaching to about end of 4th segment of antenna 2 peduncle, length $1\frac{1}{2}$ mm. Peduncle expanded somewhat proximally, then slightly narrowing; greatest width $\frac{2}{5}$ length, median row of about 3 stout spines proximally, 1 spine distally; inner margin has stout spine proximally, setae on margins and surface; 2nd segment $\frac{3}{4}$ length 1st and narrower, setae on margins and surface; 3rd $\frac{2}{5}$ length 2nd, narrower, 1 or 2 setae. Flagellum of 6 segments, all except very small end one longer than wide, each with single long flaccid sensory seta distally. *Second*: Peduncle, gland-cone has 3 stout spines; 3rd segment stout, as wide as long, inferodistal angle has setae and single stout spine; 4th segment twice length 3rd, width $\frac{1}{2}$ length; inferodistal angle has stout tooth-like process, a smaller one just above; 1 or two small stout spines proximally on inferior surface; several tufts of setae on margins and surface; 5th segment $\frac{3}{4}$ length 4th, width $\frac{1}{3}$ length; setae singly and in groups on margins and surface. Flagellum of 3 segments; as in female.

UROPODS. As in female but a little less spinose.

LOCALITIES. Lyttelton Harbour, New Zealand (Chilton Collection); on wharf structures, Portobello Marine Biological Station, Otago Harbour, 20/6/53 and 2/8/53, coll. D. E. Hurley.

HYPOTYPES. Slides C.43, male; C.44, female (Chilton Collection).

DISTRIBUTION. Plymouth and Wembury, England; " off mouth of Tagus," Portugal; New Zealand.

REMARKS. The species was first described by Crawford (1937) from Plymouth and Wembury in England. He had also a single female specimen from " off the mouth of Tagus," Portugal (Copenhagen Museum, Dana Station, 4155, 12.6.1930).

Its abundance at Plymouth, he remarks, " is the more surprising since it is not present in the rich collection of *Corophium* made from the same dredging grounds in 1895–1911. It seems possible, therefore, that it is not indigenous at Plymouth . . . I cannot guess at its original locality." Zoological records for 1950 and 1951 list references to this species from the Laguna di Venezia, Italy, in two papers by Soika (1947, 1949) which I have not seen.

C. sextonae is possibly an immigrant from New Zealand: The fact that the New Zealand *Corophium* fauna has not been worked since Chilton's 1921 paper would explain why it has not been reported before or since. It is present in his material. There is an established, well-documented precedent for such marine invasion from this country in the case of the barnacle, *Elminius modestus* Darwin (cf. Bishop, 1947). Species of *Corophium* appear very tolerant of changes in salinity; and, as Crawford states, " species which build tubes on sessile objects are clearly likely to be carried by shipping . . . *C. acherusicum* has been collected off a ship's bottom at Sheerness."

Sexton and Reid (1951: 29), discussing another tube-dwelling amphipod, *Jassa falcata*, indicate how this dispersal may take place: " It is well known that the species-habit is to attach itself to any floating object, such as buoys moored around the coast, for instance, and the bottoms of any ships anchored in harbour. On reaching such positions the animals immediately begin constructing their ' nests ' amongst the algal growth on the ship and these, soon collecting the mud and sand held in suspension by the water, afford fresh foothold for more algae and hydroids, and the dense shelter thus provided enables the *Jassa* colonies to increase in immense numbers. It can be seen how in the different ports of call, groups of the animals would swim away and establish fresh colonies."

Dr C. R. Shoemaker has kindly pointed out to me that, if this species is named in honour of Mrs. E. W. Sexton, the name *C. sextoni* should be emended to *C. sextonae.*

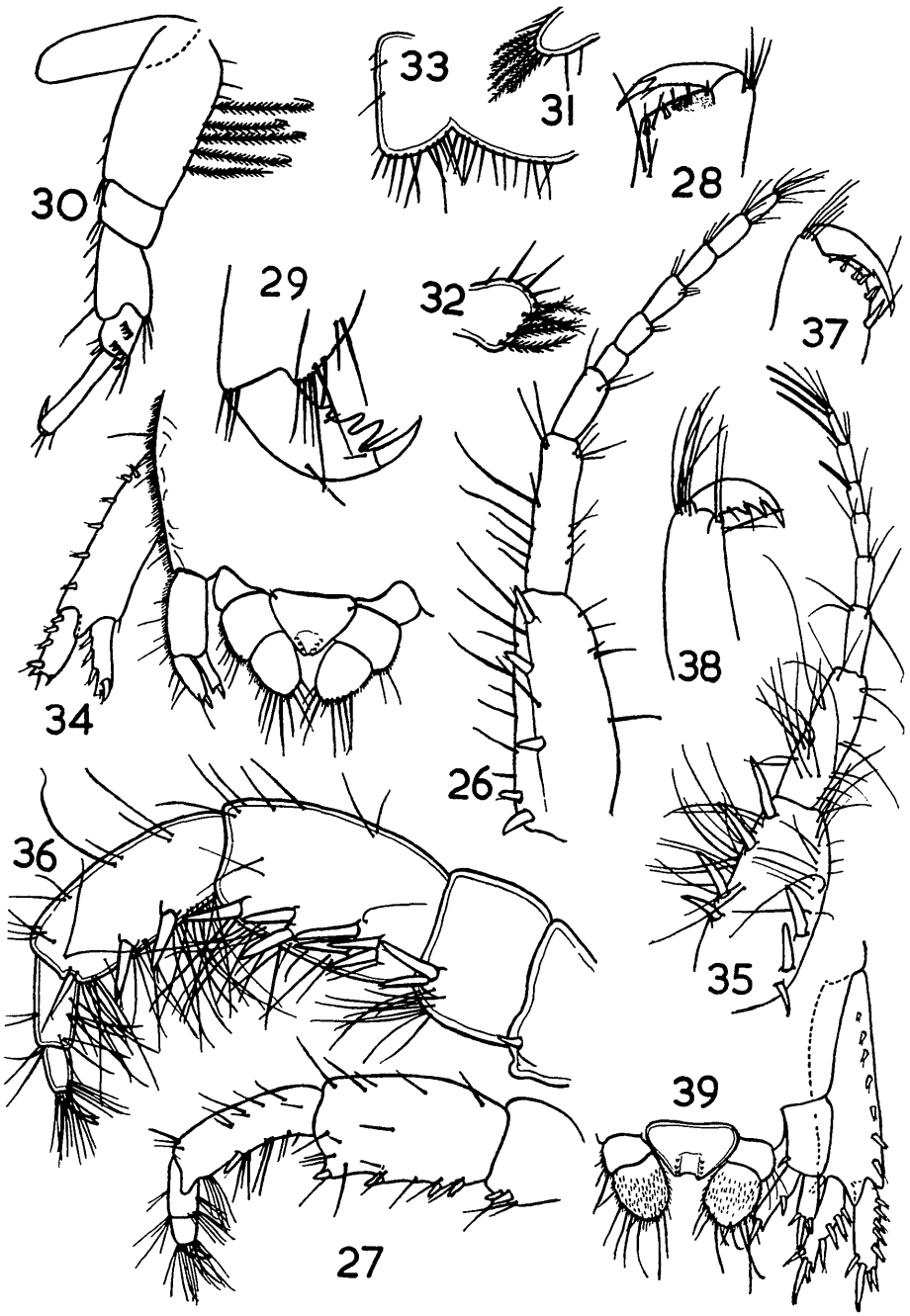
Corophium acutum Chevreux, 1908. (Figs. 22–34.)

Corophium acutum Chevreux. Chevreux, 1908: 75, fig. 6.
Crawford, 1937: 624–625.
Shoemaker, 1947: 59, fig. 9 a–m.
(non) *Corophium crassicorne* Bruz. Chilton, 1921: 229–233, fig. 5.
(non) *Corophium contractum* Stimpson. Thomson, 1880: 220, pl. 8, fig. 9.
Thomson, 1880a: 6.
Thomson & Chilton, 1886: 142.

DESCRIPTION OF MALE.

Length 3 mm ; depth $\frac{1}{2}$ mm.; width 1 mm. Eyelobes rounded, rostrum small, not extending past eyelobes.

ANTENNAE. *First*: Length $1\frac{3}{4}$ mm.; flagellum of 8 segments, a little longer than 1st segment of peduncle, minute end segment has terminal setae, other segments have a few distal setae, are longer than wide; last 2 or 3 have a long flaccid sensory seta distally. Peduncle, 1st segment width $\frac{2}{5}$ length, margins slightly convex, setose; inferior margin has 4 stout spines along length, numerous long setae; 2nd segment slightly shorter than 1st, width $\frac{1}{3}$ length; margins setose, especially superior; 3rd segment narrower, $\frac{2}{3}$ length 2nd, a few setae medially and distally. *Second*: Length $2\frac{1}{4}$ mm.; peduncle stout, spine on gland-cone; 3rd segment, width twice length, a few setae inferiorly and on surface; 4th very stout, width nearly $\frac{1}{2}$ length, length more than 4 times 3rd; inferodistal angle produced to long



TEXT-FIG. 3.

Corophium acutum Chevreux. 26—Antenna 1, ♀. 27—Antenna 2, ♀. 28—Gnathopod 1, ♂. 29—Gnathopod 2, ♀. 30—Peraeopod 4. ♀ 31—Epimeral plate 1. 32—Epimeral plate 2. 33—Epimeral plate 3. 34—Urosome, ♂. *Corophium acherusicum* Costa. 35—Antenna 1, ♀. 36—Antenna 2, ♀. 37—Gnathopod 1, ♀. 38—Gnathopod 2, ♀. 39—Urosome, ♀.

slender tooth, above it on end margin a smaller tooth; 2 small strong spines on inferior surface; single and paired setae on margins and surface; 5th segment, length ¾ 4th, width less than ¼ length, long setae in groups on margins especially inferiorly; inferior margin produced downwards proximally to small tooth; distal margin produced as strong lobe ½ along 1st flagellar segment. Flagellum 1st segment ½ length 5th peduncle segment, narrower, small tufts of setae on margins; 2nd segment ½ length 1st, strongly setose distally; 3rd segment very small, setose, 2 apical spines.

GNATHOPODS. *First*: Subchelate, much as in *C. sextonae,* fewer palmar spines, palm straighter, distal angle more clearly defined; dactylos reaching a little past end of palm. *Second*: As in *C. sextonae* but dactylos quadridentate.

PERAEOPODS. Not greatly different from *C. sextonae*; small variations in proportions and spination; Pr. 4 carpus has rows of 4 and 5 stout hooked spines.

UROSOME. Segments fused, uropods 1 and 2 attached ventrally; lateral margins of urosome without notches, with fringe of fine bristles, several marginal setae.

UROPODS. All reaching about same distance. *First*: Rami subequal, ½ peduncle length; outer distal angle produced downwards a little in blunt tooth, peduncle outer margin has about 6 stout seta-tipped spines, end margin produced medially to blunt triangular tooth more than ⅓ along between rami; rami relatively stout; outer has 4 seta-tipped spines on outer margin, 2 short end setae, outer distal angle produced to short stout sharp point; slightly convex inner margin naked; inner ramus outer margin has 3 seta-tipped spines, distal angle acute, inside it on end margin a small and a large spine; straight inner margin naked. *Second*: Length ½ 1st; inner ramus ½ peduncle length, outer ¾ peduncle length; peduncle width ½ length; outer margin like that of outer ramus with a few setae and fringe of fine bristles. Outer ramus margins slightly convex, outer distal angle acute, short stout spine on inner distal angle. Inner margins of both rami and outer margin of inner ramus naked; inner ramus margins straight, end margin truncate forming acute outer angle, strong spine on inner distal angle. *Third*: Peduncle about ¾ ramus length, slightly convex outer margin has fringe of fine bristles; ramus distally convex, about 10 long setae and fringe of fine bristles on end and outer margin. *Telson*: Subtriangular; reaching a little past uropod 3 peduncle; 2 rows each of about 3 very short spines on surface distally and almost parallel with outer margins; short seta on outer proximal surface.

DESCRIPTION OF FEMALE.

Length 4 mm.; depth ½ mm.; width 1¼ mm.

ANTENNAE. *First*: Reaching ½ along 5th segment of antenna 2 peduncle; length 1 mm. Flagellum of 6 segments, segments longer than wide with a few short distal setae, except end segment which has distal tuft of setae; flagellum as long as peduncle 1st segment Peduncle 1st segment stout, greatest width slightly less than ½ length, margins setose, 2 or 3 stout hooked spines on inner margin proximally, 3 or 4 stout seta-tipped spines along inferior margin; 2nd segment ⅗ length 1st, width less than ⅓ length, long setae on margins; 3rd segment slightly narrower, ½ length 2nd, a few setae distally. *Second*: Length 1¼ mm. Peduncle stout, 3rd segment slightly wider than long, 2 stout spines and several setae at inferodistal angle; 4th segment slightly more than twice length 3rd, twice its own width; setae on margins and surface, inferodistal angle produced a little to short

boss bearing strong spine, 3 similar spines along inferior margin; 5th segment total length barely shorter than 4th, distally produced as small triangular lobe about ⅓ way along 1st flagellar segment; width less than ⅓ length, setae on margins and surface, single stout spine ⅔ along inferior margin. Flagellum shorter and stouter than in male, otherwise similar.

MOUTHPARTS. Like *C. sextonae* except *Mandibles*: Palp in general shape similar; strong sparsely-plumose straight seta arising from one distal angle; other giving off distally narrowing second segment which is ⅓ longer, has long fine bristles on upper margin; single strong sparsely bristled seta distally at right angles to long axis of segment and in shape an inverted U.

EPIMERAL PLATES. *First and Second*: Small, ovate, deeper than wide, margins with strong, mostly plumose, setae. *Third*: Basically subrectangular, distal angles rounded, 2 or 3 setae on ventral margin, convex posterior margin has fringe of long setae continuing along posterior margin of pleon; wider than deep.

UROSOME. One or two spines more on peduncle and rami of first uropod than in male.

LOCALITIES. Lyttelton Harbour, 27/2/1913; Auckland; Kenepuru Sound, July, 1910; Chatham Islands, coll. W. R. B. Oliver, Dec., 1910; Portobello Marine Biological Station, Otago Harbour, on wharf-piles, coll. D. E. Hurley, 19/3/53; 2/8/53 (includes ovigerous female); 19/10/53.

HYPOTYPES. Slides C.45, male; C.46, female, Lyttelton (Chilton Collection).

DISTRIBUTION. New Zealand; Woods Hole, Mass., Long Island Sound, Cape May, N.J., U.S.A.; Southern England; Rio de Janeiro, Brazil; France; Monaco; Suez Canal; Algeria; Durban, Natal, South Africa.

REMARKS. Crawford (1937) gives the impression that the species which Chilton and Thomson described was *C. acherusicum*, and I agree that the mislabelled *C. acherusicum* from Holland confused Chilton. Nevertheless, I have been able to find only one specimen of *C. acherusicum* from New Zealand in the collection, and that one mounted. There are, on the other hand, numerous specimens of *C. acutum*, and Thomson's original description suggests in one detail *C. acutum*: " second gnathopod . . . dactylos four-toothed at the extremity of its lower margin."

Evidence from the body of Chilton's paper (1921) as to the species with which he was dealing is difficult to establish because he was confusing several species in his own material. However, the figures which he gives of the second uropod suggest *C. acutum*, and the presence of only the one specimen of *C. acherusicum* in his material suggests he was more familiar with *C. acutum* and it was that species he was primarily describing.

Corophium acherusicum Costa, 1857. (Figs. 35–39.)

Corophium acherusicum Costa. Costa, 1857: 232.
Crawford, 1937: 617–620, fig. 2, P.
Shoemaker, 1947: 53, figs. 2a–h; 3a–f

DESCRIPTION OF FEMALE (in part).

ANTENNAE *First*: Peduncle, 1st segment relatively stout, greatest width nearly ½ length; 3 stout spines proximally on inner margin; about 4 along outer; long setae on margins and surface. Second segment ⅔ length 1st; width ¼ length, long setae on margins and surface; 3rd less than ½ length 2nd, 4 or 5 long setae

distally, width about ½ length. Flagellum of 6 segments, as long as last 2 peduncle segments; tuft of long setae on minute end segment; segments longer than wide, a few long setae distally, last 3 or 4 with single long flaccid sensory seta each as well. *Second*: Peduncle 2nd segment has single spine inferodistally; length of 3rd ¾ width, 2 strong spines and several long setae on inferodistal angle; 4th segment as wide, margins slightly convex, length a little more than twice 3rd; a few long setae superiorly and on surface; 3 pairs of stout spines along inferior surface, 1 at inferodistal angle; numerous long setae on inferior surface; 5th segment nearly as long as 4th, long setae on superior margin, distal margin not produced along flagellum; 2 single long stout spines on inferior surface, numerous long setae on margin. Flagellum ⅔ length peduncle 5th segment; 1st segment has several long setae on margins, especially inferior, width ½ length, length ⅔ peduncle last segment; 2nd ½ length 1st, narrower, long setae distally; 3rd segment very small, setose, 2 apical spines.

GNATHOPODS. *First*: Convex palm not clearly defined, with 4 or 5 seta-tipped spines, the strongest outermost; stout dactylos longer than propod is wide, noticeable oblique tooth on inner margin; palm and inner margin of dactylos finely bristled. *Second*: Stout dactylos tridentate.

PERAEOPODS. Like *C. sextonae* except for minor details of proportion.

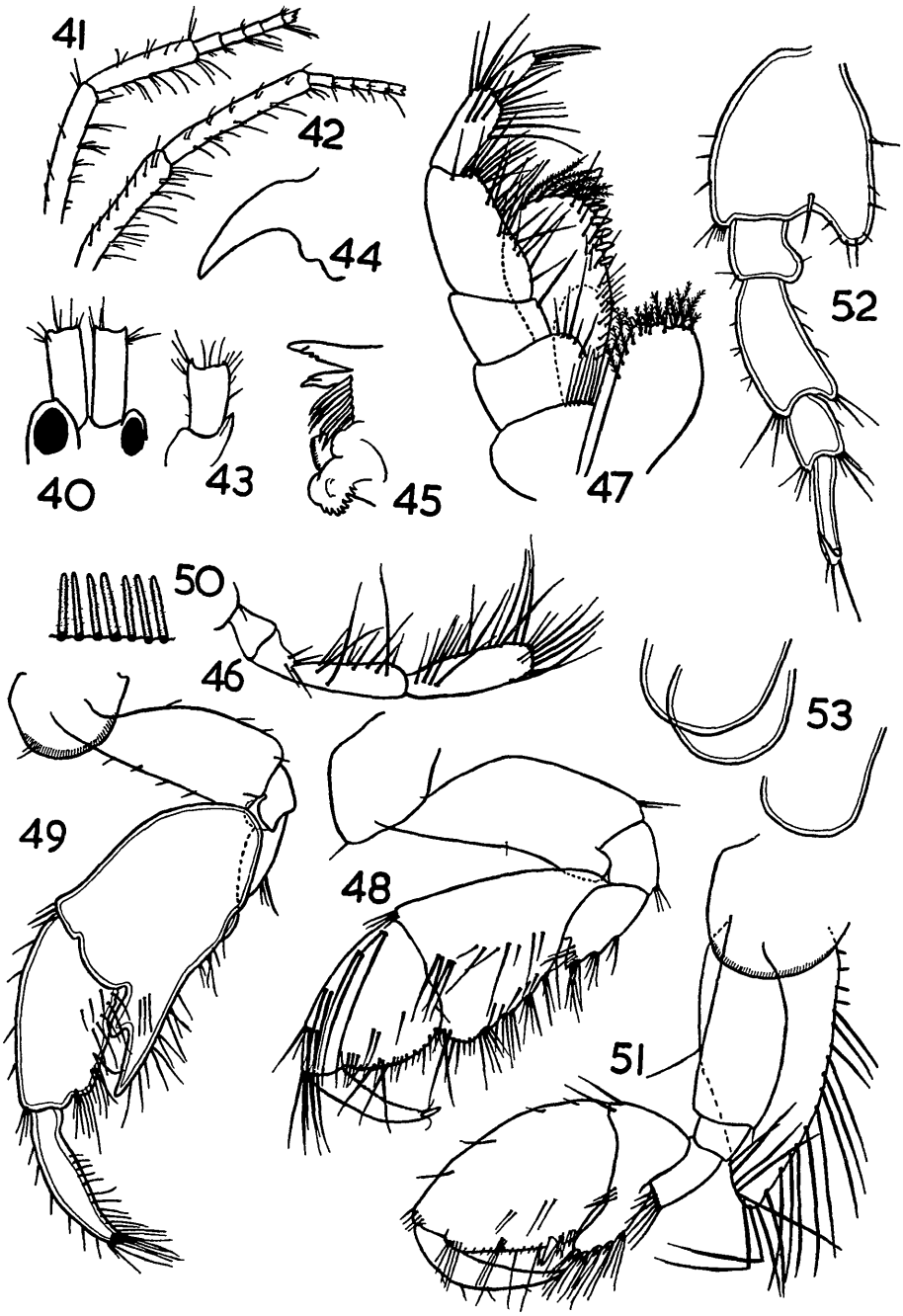
UROSOME. Segments fused, uropods 1 and 2 inserted in notches in the lateral margins. Spines on uropods seem to be all seta-tipped.

UROPODS. *First*: Reaching past rest, 2nd not reaching appreciably past 3rd. Rami of 1st subequal, ½ peduncle length; about 7 single stout spines along outer peduncle margin; distal angle slightly and bluntly produced downwards, distal margin produced on subtriangular lobe about ¼ way between rami; single strong spine on inner distal angle; 5 stout spines along outer margin of outer ramus, 4 at end; inner ramus with 4 along outer margin, distal angle acute, 3 spines on rounding distal margin, straight inner margin naked. *Second*: Inner ramus as long as peduncle, outer shorter; peduncle inner distal angle with single stout spine, width more than ½ length; outer distal angle of rami an acute tooth, outer ramus margins slightly convex, 2 stout spines along outer margin, 2 on oblique distal margin; inner ramus, spine ½ along outer margin, 1 stout end spine inside acute angle. *Third*: Peduncle wider than long, about 3 setae and a few bristles on convex outer margin. Ramus ovate, about 10 slender spinules on distal margin; surface and margin finely bristled. *Telson*: Subtriangular, but apex cut off and slightly concave; wider than long; 2 rows each of 3 teeth posteriorly on surface and parallel to length of animal.

LOCALITY. Lyttelton Harbour, New Zealand (Chilton Collection).

DISTRIBUTION. Lyttelton Harbour, N.Z.; Southern England; coasts of France and Holland; Mediterranean; northern coast of Africa from the Suez Canal to Senegal; Durban Bay; Dar-Es-Salaam; Baffin's Bay to Brazil on the east coast of America; Alaska, Vancouver and California on west coast; Oahu, Hawaiian Islands; ship's bottom at Hong Kong.

REMARKS. I have already discussed the relationship of Chilton's *C. contractum* with *C. acherusicum*. In the absence of further information as to where and how this specimen was collected, I can only draw attention to Crawford's finding of this species at Plymouth " least common on Millbay Pontoon where it was outnumbered by *C. acutum*, *C. sextoni* and *C. insidiosum*." The finding of all three



TEXT-FIG. 4.

Ericthonius pugnax Dana. 40—Rostrum and eyelobes, first antennae peduncles. 41—Antenna. 42—Antenna. 43—Peduncle of antenna 44—Epistome. 45—Right mandible. 46—Mandibular palp. 47—Maxilliped, left half and inner plate of right. 48—Gnathopod 1, ♂. 49—Gnathopod 2, ♂. 50—Gnathopod 2 sideplate, fimbriated margin, ♂. 51—Gnathopod 2, ♀. 52—Peraeopod 3. 53—Epimeral plates 1–3.

recorded New Zealand species together in the one locality suggests that this may be a specimen collected in company with one or both of the other two species.

The specimen is a female collected at Lyttelton. Crawford reports further specimens of *C. acherusicum* from Lyttelton Harbour in the British Museum. It is likely that with further investigation this species will be found more widely than yet known, outside as well as within the New Zealand region. It is noteworthy that its present known distribution traces out some of the major shipping routes, particularly that from England, through the Mediterranean and Suez Canal, to South Africa. This is one of the main shipping routes to New Zealand

Genus ERICTHONIUS Milne-Edwards.

Ericthonius Milne-Edwards, 1830: 382
Stebbing, 1906: 670.

" Sideplates small, with a tendency of 3rd and 5th to exceed the others in size. Head rather elongate; lateral lobes produced. Pleon segments 1–3 not wide or deep; postero-lateral corners rounded; segment 6 longer than segment 5. Eyes on lateral lobes Antennae 1 and 2 slender, subequal, setose; peduncle long; flagellum of several joints. Antenna 1 without accessory flagellum. Antenna 2 attached much behind antenna 1; antepenultimate joint of peduncle long. Upper lip with rounded entire margin, and acute process on surface. Lower lip with inner lobes. Mandibular palp long, 3rd joint lamellar, densely setose. Maxilla 1, inner plate with a few setae, outer with 9 apical spines; 2nd joint of palp long. Maxilla 2, inner plate with fringed inner margin Maxillipeds, palp rather narrow. Gnathopod 1 alike in male and female, subchelate, 5th joint not shorter than 6th. Gnathopod 2 larger, in male complexly subchelate, 5th joint very large, produced into a tooth; in female normal, 5th joint much smaller than 6th, produced into a narrow lobe. Peraeopods 1 and 2, 2nd joint expanded Peraeopods 3–5, 2nd joint not greatly expanded, the external expansion oblong, the inner oval; in peraeopod 3 the finger short, reverted, with denticle on convex margin. Branchial vesicles small, absent from gnathopod 2. Marsupial plates broad. Pleopods 1–3 normal. Uropods 1 and 2 biramous. Uropod 3, ramus single, small, tipped with 2 upturned spinules Telson short, broad, with the lateral lobes densely spinulose on surface."

Ericthonius pugnax (Dana), 1852. (Figs. 40–61.)

Ericthonius pugnax Dana, 1852: 218.
Pyctilus pugnax Dana, 1852: 218.
Dana, 1853 & 1855: 975, pl. 67, fig. 4a–d
Ericthonius pugnax Dana. Stebbing, 1906: 672.
Pirlot, 1938: 352.
Pirlot, 1939: 68.
(non) *Ericthonius brasiliensis* (Dana). Chilton, 1923: 242–244, fig. 1–5

DESCRIPTION OF MALE.

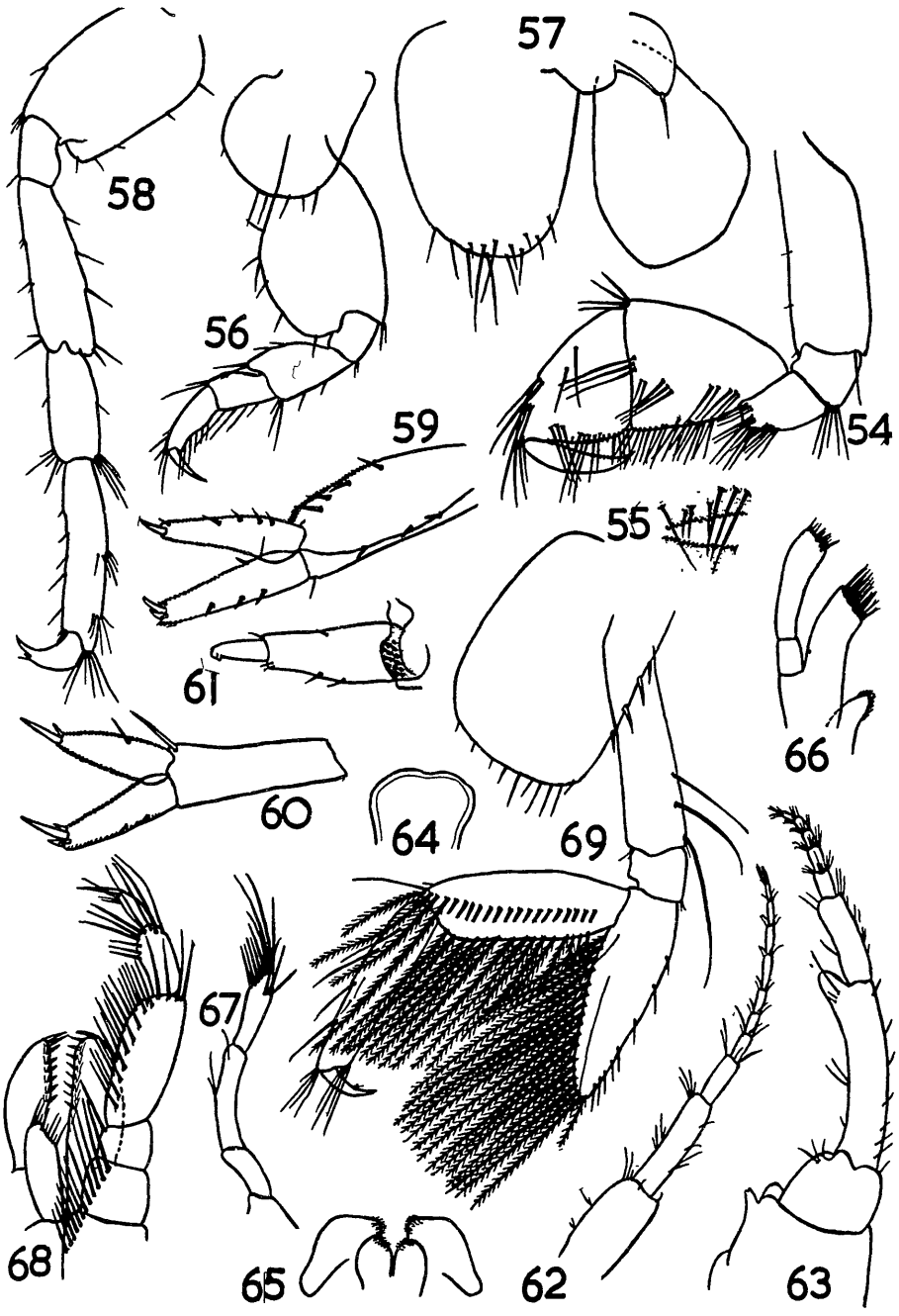
Eyes small, round. Rostrum very small. Length about 5½ mm.; depth ½ mm.; width ¾ mm.

ANTENNAE *First and Second*: Length about 2½ mm.; peduncle slender, marginal setae in tufts of 2 or 3; flagellum of 9 to 12 segments; segments longer than wide, long and short setae on alternate inferodistal angles. Antennae in almost every specimen have broken peduncle segments leaving only last 2 segments of

peduncle attached to flagellum. The incomplete antennae are difficult to identify as 1st or 2nd; proportions differ slightly but not greatly.

MOUTHPARTS. *Mandibles*: Cutting edge of 2 slender coarsely-toothed plates; spine row of 6 spines; several small coarse teeth on molar process inferiorly, a small distally-frayed plate superiorly. Palp, small 1st segment less than ⅓ length 2nd which has strong setae on superior surface; 3rd slightly shorter than 2nd, distally rounded, long setae on superior and end margins, a few on surface. *Maxilliped*: Inner plate subrectangular, reaching carpus base, end margin straight like median but rounding to convex outer margin, 4 small teeth along inner ½, a few plumose setae down cleft, several along end margin and between and below teeth. Outer plate almost reaching end of carpus, inner margin slightly convex, outer convex and rounding to distal margin which has 5 strong plumose setae; inner margin has about 6 teeth, with narrow bases but widening distally; fine setae in ones and twos along margin almost to base. Inner portion of basos distal margin fringed with several long setae; ischium wider than long, 5 or 6 long setae on rounded inner distal angle. Merus outer margin twice length of inner, slightly longer than ischium, as wide as long, single strong seta on inner distal angle. Carpus narrowing slightly distally, greatest width ¾ length, length 5/3rds merus; inner margin fringed with long setae. Propod width almost ½ length, length ¾ carpus, long setae on distal margin and distal ½ of inner margin, a few on surface. Dactylos narrowing to long slender terminal nail, length ⅔ propod, 3 or 4 setae distally on inner margin, nail as long as dactylos

GNATHOPODS. *First*: Sideplate small, as wide as deep, basically trapezoid, a single seta anterodistally. Basos proximally constricted, greatest width slightly less than ½ length, 1 or 2 small marginal setae, 2 or 3 strong setae at posterodistal angle. Ischium subrectangular, ⅓ basos length, a few setae at posterodistal angle. Merus greatest width ½ length, length ½ basos; slightly convex anterior margin contiguous with proximal ⅓ of carpus posterior margin; 3 groups of strong setae on posterior margin, a few distally on surface; posterodistal angle produced downwards a little in acute triangular process Carpus subtriangular, distal width ⅔ length, as long as basos, anterior margin slightly convex, a tuft of setae on distal angle; posterior free margin slightly convex, fringed with strong setae, several long setae down surface medially. Propod subtriangular, less than ¾ basos length, width subequal with posterior margin which corresponds to palm; margins slightly convex, about 5 groups of 2 or more long setae on anterior surface, several short setae and a few longer ones on posterior margin which is finely serrate; stout, slightly curved dactylos as long as posterior margin, inner margin finely serrate, 2 fine setae near tip. *Second*: Sideplate small, ovate, wider than deep, ventral margin frilled and crimped. Basos proximally constricted, posteriorly convex, distal width ⅓ length, a few fine setae on margins. Ischium as wide as long, ¼ basos length, Y-shaped in cross-section with arms of Y forming anterior margins and propod sitting back on concave surface between them. Merus small, ovately subtriangular, width ⅓ length, length ½ basos, tuft of setae on posterior margin. Carpus greatly expanded, widening distally, anterior margin slightly convex, as long as basos; distal width ¾ carpus length; posterior margin more or less straight, posterodistal angle produced forward below propod as strong tooth almost (but not quite) to dactylos; inner margin of tooth with smaller parasitic tooth; long slender setae on posterior margin, a few on surface. Propod, slightly convex anterior margin barely shorter than carpus, a few fine



TEXT-FIG. 5.

Ericthonius pugnax Dana. 54—Gnathopod 1, ♀. 55—Gnathopod 1, ♀, dactylos and palmar margins. 56—Peraeopod 1, ♂. 57—Peraeopod 3, ♂, sideplate. 58—Peraeopod 5, ♂. 59—Uropod 1. 60—Uropod 2. 61—Telson and uropod 3. *Paracorophium excavatum* (G. M. Thomson). 62—Antenna 1, ♂. 63—Antenna 2, ♂. 64—Upper lip. 65—Lower lip. 66—Maxilla 1. 67—Mandibular palp. 68—Maxilliped, outer and inner plates of left side, outer plate and palp of right. 69—Gnathopod 2, ♀.

setae; posterior margin more or less straight with 1 or 2 small concavities proximally, margin somewhat carinate with irregular fringe of long fine setae; proximal width ½ length, narrowing a little distally. Stout curved dactylos proximally a little constricted, ¾ basos length, apex stout, slender setae on margins, a strong transverse fringe of setae just below tip.

Peraeopods. *First*: Sideplate ovate, slightly deeper than wide, a few long setae on ventral margin. Basos ovate, glandular, greatest width ⅔ length, margins strongly convex, a few setae along anterior and at posterodistal angle. Ischium subrectangular, longer than wide, ¼ basos length, a few setae on posterodistal angle. Merus piriform, 3 or 4 strong setae on convex anterior margin; posterior straight, setose; greatest width ⅔ length, length ⅖ basos. Carpus ⅔ merus length, much narrower, a few setae on posterior margin and anterodistal angle. Propod width ⅓ length of anterior margin which is almost merus length, a few fine setae on posterior margin and on anterior distally. Strong curved dactylos ⅔ propod length. *Second*: Similar. *Third*: Sideplate very difficult to dissect out with rest of appendage—in all these specimens Pr. 3 has broken between sideplate and basos. Sideplate, anterior lobe ovate, deeper than wide, strongly convex ventrally with a number of long setae; posterior lobe extremely small, ovate, a long strong spine at ventral angle; anterior lobe much deeper than that of Gn. 2. Gill ovate, almost as large as anterior lobe. Basos expanded, margins a little convex, narrowest proximally, a few setae on anterior margin, posterior produced downwards in rounded lobe with concavity between lobe and ischium, distal width as great as length; several strong setae along posterior margin. Ischium wider than long, ⅓ basos length, posterodistally produced backwards in small lobe; a few setae on distal angles. Merus widening a little distally, almost as long as basis, width ½ length, several setae on margins, groups at distal angles. Carpus almost as wide as long, ½ merus length; slightly ovate, strong tufts of setae on distal angles Propod slender, ½ basos length and ½ carpus width, a few long strong setae distally. Strong slightly curved dactylos. *Fourth*: Like Pr. 5, shorter. *Fifth*: Basos ovate, tending to subrectangular; width ⅔ length; posterior margin more or less straight, a few setae on margins. Ischium ⅓ basos length, longer than wide, seta anterodistally. Merus barely widening distally, as long as basos, width ⅓ length, 3 or 4 groups of 1 or 2 setae along each margin. Carpus ⅔ basos length, width ½ length; 1 or 2 fine setae ½ along each margin, strong tuft at each distal angle. Propod slightly longer than basos, width ¼ length, 5 or 6 single setae on anterior margin; 3 groups of setae along posterior. Stout dactylos nearly ½ propod length, small tooth on posterior margin.

Epimeral Plates. Ovate, ventrally convex, lateral margins almost parallel; margins smooth with perhaps a single small seta on posterior margin.

Pleopods. Two coupling spines, rami of 8–9 segments, rami and peduncle almost subequal, inner ramus slightly the longer.

Uropods. *First*: Rami subequal, shorter than peduncle; peduncle inner dorsal margin slightly convex, distal ½ finely toothed, with 4 strong spines; outer dorsal margin has 3 small spines. Rami with both margins finely toothed; inner ramus has 4 spines on inner margin, 1 large and 1 small end spine; outer has 2 spines on inner margin, 3 on outer, about 3 short and 1 long spine at end. Uropod 1 reaching further than uropod 2, uropod 2 further than uropod 3. *Second*: Rami subequal, shorter than peduncle, long strong spine on peduncle inner distal angle. Rami margins finely toothed, inner ramus has single spine ½ along inner margin,

1 long and 1 short spine at end; outer ramus has 2 small spines on outer margin, 1 long and 3 or 4 small spines at end. *Third*: Peduncle more than twice length ramus, about 4 spines on peduncle outer margin, 2 on inner; ramus dactylos-shaped, with 2 small upturned teeth at end, 2 minute setae preceding them. *Telson*: Two small densely spinulose lobes, directly above uropod 3 peduncles, small concave smooth area between lobes.

DESCRIPTION OF FEMALE.

SECOND GNATHOPOD Merus width ½ length; posterodistal angle almost right-angled, with small acute tooth, free distal margin fringed with long setae. Carpus basically subtriangular, short convex anterior margin ½ basos length, 2 or 3 strong setae on anterodistal angle; posteriorly produced in long narrow distally convex lobe between propod and merus so carpus is nearly as wide as basos is long; posterior margin of lobe strongly setose with 4 or 5 strong spines. Propod ovate, almost subtriangular, a little longer than basos, a few long slender setae on convex anterior margin, a few on surface, a few long slender and several very small marginal setae on straight palm which occupies distal ⅔ of posterior margin, is defined posteriorly by an obtuse angle and about 5 stout seta-tipped spines in 2 pairs with a single spine proximally. Stout dactylos as long as palm, ¾ propod length, curved, several single marginal setae.

LOCALITY. D'Urville Rock, Auckland Harbour, New Zealand.

HYPOTYPE. Slides C.49, Chilton Collection.

DISTRIBUTION New Zealand; Sooloo Sea (Dana); Ambon, Manipa Is., Banda (Pirlot).

REMARKS. These specimens appear to differ from *E. brasiliensis* as figured by Chevreux and Fage (1925: 353, Fig. 360) and by Sars (*E. abditus*, 1895: 602, pl. 215) in the shape of the third peraeopod basos. If, as Chilton suggests, this is due to growth differences, it seems remarkable that other workers have not drawn greater attention to it—certainly Sars does not show so well developed a process and none of the other workers show it developed to the extent found in the New Zealand specimens. Both Sars and Chevreux and Fage were dealing with specimens of 6 and 7 mm whereas the process is well developed in New Zealand specimens of 5½ mm. According to Stebbing's key (1906) then, the New Zealand specimens fall into *E. pugnax* and in this they agree well with Dana's original figures Enequist (1949) has some pertinent remarks concerning the differences between *E hunteri* and *E. difformis* and concludes that " It seems by no means surprising that *Ericthonius* under entirely different climatic conditions (large annual temperature amplitude) can complete its development with quicker moults and inconspicuous growth in size " (p. 345).

On this difference alone, I am by no means sure that the species are distinct, but if they are not, then the specific name by law of priority should be *E. pugnax* (cf. Stebbing, 1906) *E. pugnax* was described by Dana in 1852, and the second description also takes page preference over *E. brasiliensis* described for the first time in the same work (1853 & 1855). Therefore I have no hesitation in claiming these New Zealand specimens to be *E. pugnax.*

I am grateful to Dr. Shoemaker for drawing my attention to Pirlot's remarks on this species. Speaking of *E pugnax* specimens taken by the " Siboga " Expedition (Pirlot, 1938) he says: " Dans cette population de soixante quatre

spécimens sont représentés des mâles adultes, des femelles ovigères et des jeunes. Ils sont bien conformes à la description et aux images de Dana, ainsi qu'aux notes aux dessins que Chilton donne relativement à des exemplaires qu'il assimile à *Ericthonius brasiliensis* Dana et qui proviennent de Nouvelle Zélande." Unfortunately, Pirlot does not figure or describe his specimens, nor does he list their differences from *E. brasiliensis,* but in a later paper (Pirlot, 1939) he is equally emphatic that, after comparing " Mercator " specimens of *E. brasiliensis* with Siboga specimens of *E. pugnax,* he cannot accept these as co-specific.

The description is based on several mounted specimens in the Chilton Collection and (mostly) on a male specimen in the same collection labelled " D'Urville Rock, Auckland Harbour, ' Hinemoa,' 28. xii. 14."

Genus PARACOROPHIUM Stebbing.

Paracorophium Stebbing, 1899a: 350.
Stebbing, 1906: 663–664.

" Body compressed. Head with produced lateral lobes. Sideplates continuous, 1st not produced forward. Eyes small, on lateral lobes of head. Antenna 1 slender, without accessory flagellum; flagellum with several joints. Antenna 2 robust; flagellum slight, of more than 3 joints. Mandible with 3-jointed palp. Gnathopod 1 as in *Corophium,* gnathopod 2 nearly as in *Corophium,* but the long process of the 4th joint fringed on its front or inner margin, while the 5th is fringed on its hind margin, the 2 joints therefore, though fitting together, having no look of coalescence; 6th joint with small palm. Peraeopod 3 the shortest, setose; 6th joint with strong spines. Peraeopods 4 and 5 successively much longer. Uropod 1, and still more uropod 2, stout, with strong spines, biramous, Uropod 3 small, outer ramus nearly as long as peduncle, inner oval, minute. Telson entire, short."

KEY TO SPECIES OF PARACOROPHIUM.

1. Outer plate of maxilliped with fringe of many fine setae along inner margin; 1st, 2nd and 3rd epimeral plates all with marginal fringes of long slender setae; peraeopods 3–5 with long fine setae marginally on most segments; antenna 2 in male, 4th peduncle segment not produced forward markedly as lobe . . . . . *P. lucasi*
2. Outer plate of maxilliped with 8 or 9 slender spines along inner margin; 1st and 3rd epimeral plates lacking marginal fringe of setae; peraeopods 3–5 with only a few marginal setae; antenna 2 in male, 4th peduncle segment inferodistally produced as distinct lobe . . . . *P. excavatum*

This genus was established by Stebbing for *Corophium excavatum,* described by G. M. Thomson (1884) from brackish water in Brighton Creek, near Dunedin, New Zealand. A fuller description of the original species was given by Chilton (1920a) in a paper recording its occurrence in brackish water from Brisbane River, Australia. In his amplified description he drew comparisons between the Australian material, Brighton material, and further specimens from a freshwater lake in the North Island of New Zealand, Lake Rotoiti. In re-examining this material, I came to the conclusion that, although most of the differences which Chilton described as existing between the Rotoiti specimens and the rest could possibly be explained away as due to immaturity or at the most, as he conceded, a distinct variety, yet there are further and more important differences to which Chilton did not draw attention or which he figured without comment.

These are listed later Because of these I consider the Rotoiti specimens deserving of specific status and have named them *P. lucasi.* The " immature Rotoiti specimens range in length up to about 5½ mm., in contrast to the " mature " specimens of Chilton's description which were about 4 mm. long.

Paracorophium excavatum (G. M. Thomson), 1884. (Figs. 62–83.)

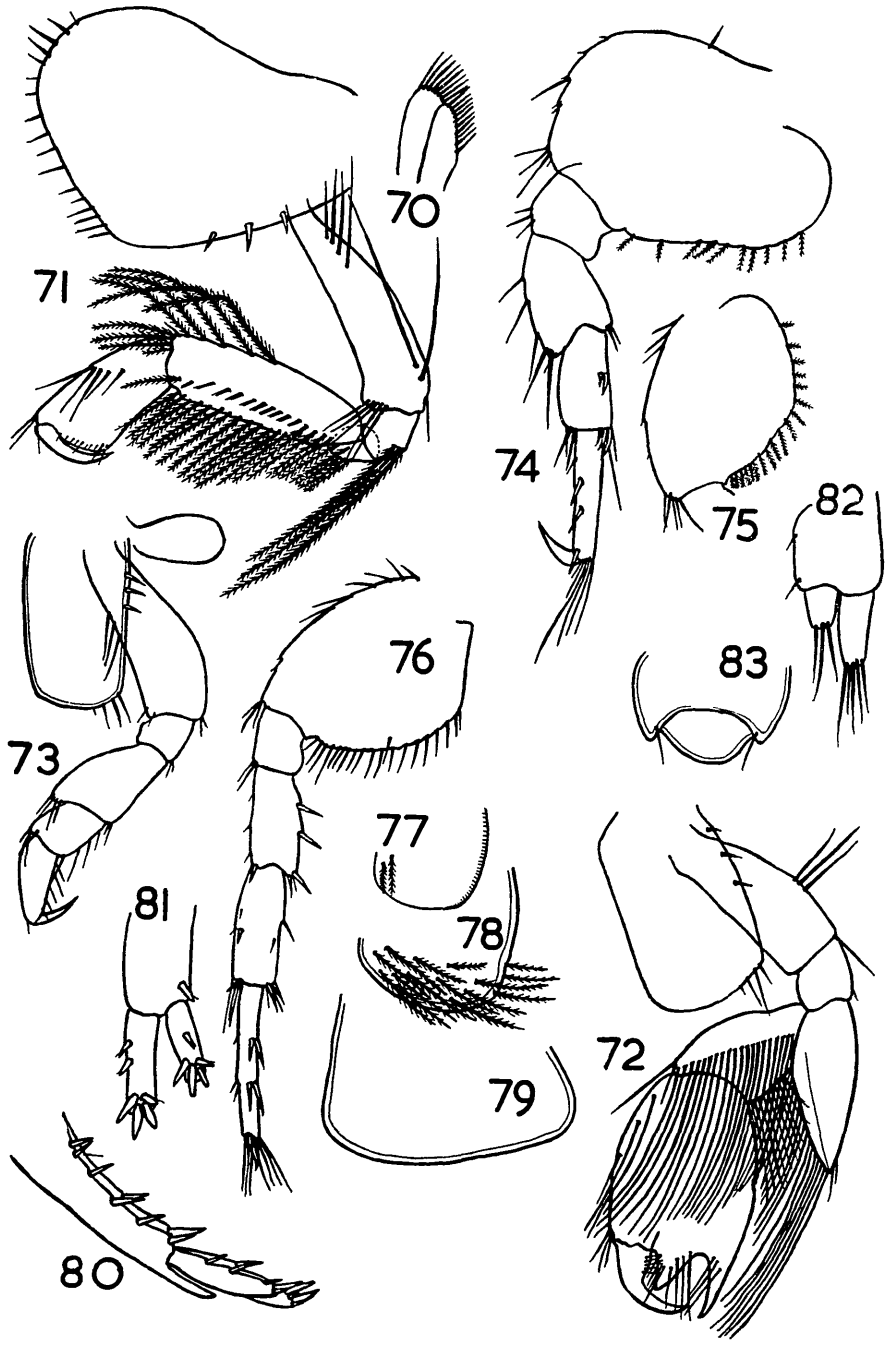
Corophium excavatum G. M. Thomson, 1884: 236, pl. 12, figs. 1–8.
Paracorophium excavatum (G M. Thomson). Stebbing, 1899: 241.
Stebbing, 1899a· 350.
Stebbing, 1906: 664.
Chilton, 1906· 704.
Chilton, 1909: 58 (partim).
Chilton, 1920: 8.
Chilton, 1920a: 1–8 (partim).

DESCRIPTION OF MALE.

Length 3 mm ; depth ¾ mm.; width ⅔ mm.

ANTENNAE. *First*: Length 1 mm. Flagellum as long as last 2 peduncle segments, of about 7 segments, segments longer than wide, a few very fine setae distally on each. Peduncle, 1st segment barely shorter than 2nd, twice as wide; 3rd ½ length 2nd, narrower; all with a few fine setae on margins and end. *Second*· Length about 1 mm. Flagellum barely longer than 5th peduncle segment; segments slightly longer than wide, very fine setae distally, of 5 segments. Peduncle, 2nd segment very stout, small but prominent gland-cone; 3rd shorter and narrower, a few setae distally; 4th segment nearly 3 times as long as 3rd, proximal width about ¼ length; inferodistally produced downwards and slightly forwards in small lobe; fine setae on margins and end; 5th segment ½ length 4th, width ⅓ length, a few fine setae on margins and end.

MOUTHPARTS. *Upper Lip*· Distal margin slightly concave. *Lower Lip*: Ovate inner lobes well developed, smaller than outer, distally bristled; distal margin of outer lobes tending to straight, median and distal margins finely bristled. *First Maxillae*: Inner plate very small, finely bristled distally. Outer plate wide, distal margin straight with 9 or so finely-toothed spines. Palp slightly longer than outer plate, of 2 segments, 1st about ⅓ length 2nd; 2nd widening slightly distally, straight end margin has about 9 very small teeth. *Second Maxillae*: Inner plates slightly the shorter, inner and distal margins of each fringed with long fine setae. *Mandibles*· Spine-row of about 4 spines (right); cutting edge and weak molar process present; palp large, 1st segment ½ length 2nd, 3 or 4 setae on inner margin of 2nd medially and distally, 3rd segment ¾ length 2nd; slightly oblique and truncate distal margin fringed with fine setae, longest outermost, row of 3 or 4 setae below these on outer margin. *Maxilliped*: Small narrow inner plate reaching carpus base, end margin and distal ½ of inner margin with several long plumose setae. Outer plate reaching ⅔ along carpus, outer margin convex, inner straight with 8 or 9 increasingly longer teeth on distal ½; single and paired fine setae inside these teeth. Merus and ischium of more or less equal length, merus narrower; stout seta on merus inner distal angle, fringe of very long finely-plumose setae running from basos inner margin across surface to ischium distal margin Carpus more than twice merus length, width ½ length, inner and distal margin and surface with double row of several long finely-plumose setae, longest at outer distal angle. Propod width ½ length, length ½



TEXT-FIG. 6.

Paracorophium excavatum (G. M. Thomson). 70—Maxilla 2. 71—Gnathopod 1, ♂. 72—Gnathopod 2, ♂. 73—Peraeopod 1, ♂. 74—Peraeopod 3, ♂. 75—Peraeopod 4, ♂. 76—Peraeopod 5, ♂. 77—Epimeral plate 1. 78—Epimeral plate 2. 79—Epimeral plate 3. 80—Uropod 1. 81—Uropod 2. 82—Uropod 3. 83—Telson.

carpus, long finely-plumose setae distally. Dactylos unguiform, ⅔ propod length and narrower, long terminal nail and several accompanying setae.

GNATHOPODS. *First*: Sideplate large, heart-shaped if posterodistal angle is regarded as distal apex; anterior margin greatly constricted proximally, plate strongly convex anterodistally; ventral margin with numerous setae; posterior with 3 strong spines medially. Basos slender, proximally constricted, distal width ⅓ length, distal margin fringed with plumose setae anteriorly, 2 or 3 very long plumose setae distally on posterior surface, almost as long as basos itself; 4 or 5 shorter setae proximally. Ischium ¼ basos length, fringe of 3 or 4 extremely long and stout plumose setae at posterodistal angle. Merus ovate, slightly smaller than ischium, long plumose setae distally on posterior margin. Carpus as long and wide as basos, not narrowing noticeably, anterior margin slightly convex, row of several long single plumose setae on distal ½ and part of distal margin; posterior fringed with long plumose setae, a parallel similar row on posterior surface. Propod ¾ carpus length, widening somewhat distally, greatest width ½ length; oblique row of 4 or so long setae medially on anterior surface, a few fine short setae distally; palm oblique, not well defined, rounding to straight posterior margin; palm very minutely combed (like proximal ½ of dactylos posterior margin), guarded by row of short setae. Curved dactylos barely longer than palm, ½ propod length. *Second*: Sideplate subrectangular, width ⅔ depth, a few setae ventrally; 3 or 4 short strong spines on straight posterior margin. Basos width ⅓ length, constricted proximally, posteriorly convex; 2 or 3 long setae medially on posterior surface, 1 at distal angle. Ischium subsquare, ⅓ basos length. Merus lanceolate, extending downwards as continuation of ischium and basos and almost at right angles to carpus which arises proximally from merus anterior margin; merus as long as basos, medial width ⅔ length, distally acute, margins convex, strong fringe of very long plumose setae on anterior, most of them reaching end of gnathopod. Carpus basically subtriangular, greatest width slightly more than ½ length, nearly as long as merus; posterior margin fringed with long plumose setae; a similar fringe running obliquely across surface from anterodistal angle almost to posteroproximal; 1 or 2 long setae anterodistally, anterior margin convex. Propod ovate, greatly expanded, margins somewhat convex, distal ½ of posterior straight; anterior with a few fine long setae and as long as basos; posterior as long as basos plus ischium, produced distally to strong but narrow defining tooth; strong median tooth on palm almost as long as defining tooth, a deep excavation between teeth, each tooth with slender setae across surface proximally, a few fine setae on inner tooth margins Stout strongly curved dactylos slightly swollen basally, fine short setae on inner margin proximally, not reaching farther than outer tooth and seldom as far as tooth.

PERAEOPODS *First*: Sideplate subrectangular, width nearly ⅔ depth, a few setae on ventral surface posteriorly; 3 short strong single spines medially along posterior margin. Basos length nearly three times width, a few fine short setae distally, 3 or so longer setae medially on anterior surface. Ischium subsquare, ¼ basos length, fine setae posterodistally. Merus ½ basos length, distal width ¾ length, narrowing proximally, anterior margin slightly convex, fine setae distally. Carpus ⅓ basos length, almost as long as wide; several fine setae distally and 4 or 5 along posterior margin Propod narrowing distally to dactylos, proximal width ½ length, length ⅔ basos, a few fine setae distally, 4 or 5 along posterior

margin. Slender dactylos ⅔ propod length. *Third*: (From slide B.2, Chilton Collection). Basos greatly expanded, ovately eccentric, greatest width (in oblique plane) more than length, anterior margin greatly convex medially with several long fine setae; posterior margin greatly convex proximally with 10 or so single short plumose setae. Ischium subsquare, about ¼ basos length, 3 or 4 setae on anterodistal angle. Merus ½ basos length, width ⅔ length, anterodistally produced downwards a little along carpus; strong spine or two on posterodistal angle, 5 or 6 long plumose setae on anterior margin. Carpus slightly more than ½ basos length, width ½ length, 2 curved spines medially on posterior margin, 3 at posterodistal angle; a few long setae on end margin. Propod width ⅕ length, length ½ basos; long fine setae, distally, about 4 single strong spines on anterior margin. Strong curved dactylos less than ½ propod length. *Fourth*: Basos ovate, margins convex, posterior more strongly so; 3 or so short setae proximally on anterior, 1 or 2 very short setae on distal ½, tuft of setae at distal angle; fringe of short plumose setae along posterior margin; greatest width about ¾ length; several long fine plumose setae on merus anterior margin; otherwise like Pr. 3 and 5. *Fifth*: Basos ovate, anterior margin slightly convex, several fine setae proximally and at distal angle, shorter setae distally; greatest width ⅔ length; distal ⅔ of posterior margin convex, proximal ⅓ more or less straight and forming obtuse angle with convex portion which is fringed with short plumose setae; posterodistal angle almost right-angled. Ischium ¼ basos length, longer than wide, setae at anterodistal angle. Merus width ⅖ length, length nearly ½ basos; a few fine setae on anterior margin, 2 large single spines on posterior margin, 2 at distal angle. Carpus as wide, slightly longer, setae and small spine medially on anterior margin, spine and several long setae distally; larger spines medially on posterior, setae and 2 spines distally. Propod ⅔ basos length, a few setae on anterior margin, 2 pairs of strong spines on posterior, tuft of long setae on end margin. Curved slender dactylos comparatively short.

Epimeral Plates. Third much larger than 2nd, 2nd larger than 1st. *First*: Subsquare, 2 plumose setae near anterior insertion; posterior margin crimped as in Gn.1. *Second*: As wide as deep, anterior margin rounding to slightly convex ventral, long plumose setae on ventral surface and distal portion of posterior margin, about 16 in all. *Third*: Very wide and shallow, ventral margin more or less straight, angles rounded to straight lateral margin; plate widest distally.

Pleopods. Normal, rami much longer than peduncle, of about 11 or 12 segments, paired plumose setae.

Uropods. *First*: Peduncle longer than rami, outer ramus slightly shorter than inner; about 6 short strong spines on peduncle outer dorsal margin, 2 distally on inner; 2 spines dorsally on outer ramus, 2 or 3 at end; 1 or 2 dorsally on inner, 4 or 5 at end; peduncle produced in ventral process under rami and ½ their length, process in side view narrow, somewhat spatulate from above. *Second*: Inner ramus as long as peduncle, outer slightly shorter; single spine on peduncle outer distal angle; 4 spines on end of inner ramus, 2 on inner margin; 4 spines on end of outer ramus, 1 on outer margin medially. *Third*: Peduncle longer than rami, outer ramus twice length inner; 2 small setae on inner margin of peduncle, 4 or 5 long setae on end of outer ramus, 3 on inner. *Telson*: Distally convex, with long single seta on each side arising from last pleon segment.

DESCRIPTION OF FEMALE.

Length 3 mm.; depth $\frac{3}{4}$ mm.; width $\frac{3}{5}$ mm. Like male except

ANTENNAE. Length about 1 mm., subequal. Fourth peduncle segment of second antennae lacking lobe.

GNATHOPODS *First*: Much like male. *Second*: Sideplate width $\frac{3}{4}$ depth, comparatively short setae on ventral margin. Basos not widening much distally, width barely more than $\frac{1}{4}$ length, about 3 very long plumose setae posterodistally. Merus and carpus as in male but differing slightly in proportions; merus greatest width $\frac{1}{3}$ length, scattered fine short setae on posterior margin; carpus as long, width $\frac{1}{3}$ length. Propod barely shorter than carpus, narrowing slightly distally, width $\frac{1}{4}$ length; margins straight, several long and short setae on anterior, long fine setae on distal angles; palm very small, ill-defined. Dactylos with 1 or 2 setae; less than $\frac{1}{4}$ propod length.

LOCALITIES. Brighton, Otago, coll. G. M. Thomson; Napier; Nelson

TOPOTYPES. Slides C.51, male; C.52, female; Brighton.

DISTRIBUTION New Zealand; Brisbane River, Australia, in brackish water.

REMARKS All definitely established localities for this species are brackish water; like many species of *Corophium* (cf. footnote, Chilton, 1920a: 2) it would appear to be a brackish water species.

Paracorophium lucasi n.sp. (Figs. 84–99.)

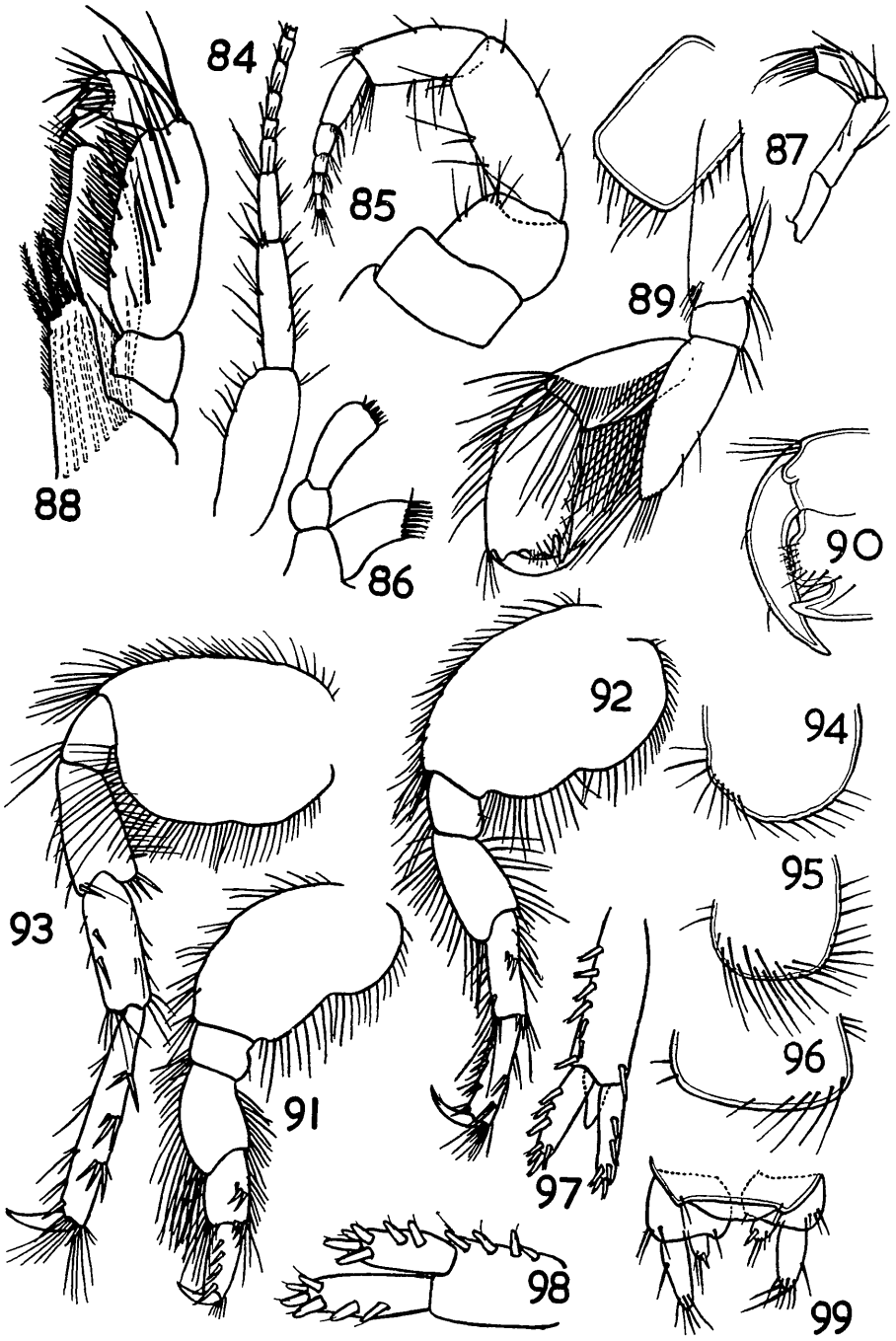
Paracorophium excavatum (partim) Chilton, 1920a: 1–8, fig. 2b, 3, 4, 5, 6, 7, 10b, 13a, 17, 17a, 18, 19.

DESCRIPTION OF MALE.

Eyes present, round, black. Rostrum very small. Eyelobes rounded. Like *P. excavatum* except for the following details.

ANTENNAE. *First*: Flagellum of about 12 segments, finely bristled distally; slightly shorter than peduncle. Peduncle, 1st segment stouter than rest, width less than $\frac{1}{2}$ length; fine setae singly and in groups inferiorly and distally; 2nd, $\frac{3}{4}$ length 1st, width less than $\frac{1}{3}$ length, fine setae on margins as in narrower 3rd segment. *Second*: As long as 1st; stout, especially peduncle. Flagellum of 5 segments, as long as 5th peduncle segment, fine setae on segments distally, 1st segment nearly $\frac{1}{2}$ flagellum length. Peduncle 2nd segment much wider than long; 3rd wider than long, longer than 2nd, setae inferodistally; 4th slightly more than twice length 3rd, as wide as 3rd is long; 5th segment width $\frac{1}{3}$ length, length nearly $\frac{3}{4}$ 4th; a few fine setae on margins of 4th and 5th.

MOUTHPARTS. Only slight proportional differences in palps of 1st maxillae and mandibles from *P. excavatum*. *Maxilliped*: Narrow subrectangular inner plate reaching a little past carpus base; 3 small sharp spines alternated with 6 long setae on slightly oblique distal margin, the inner 4 setae finely plumose. Outer plate almost reaching end of carpus, distally rounded; inner margin straight, outer convex; double fringe of short setae down inner margin to end of inner plate, not with the 6 or so distinct small sharp teeth of *P. excavatum*. Basos has oblique row of very long finely-plumose setae across surface; ischium and merus small, single long seta on inner margin of latter. Carpus about 3 times merus length, slightly more than twice its own width; margins slightly convex; double or even treble row of medium length setae on most of inner margin; longer setae distally, especially long on outer angle, a row of 6 or 7



TEXT-FIG. 7.

Paracorophium lucasi n.sp. Male. 84—Antenna 1. 85—Antenna 2 86—Maxilla 1. 87—Mandibular palp. 88—Maxilliped, right side. 89—Gnathopod 1. 90—Gnathopod 1, palm and dactylos. 91—Peraeopod 3. 92—Peraeopod 4. 93—Peraeopod 5. 94—Epimeral plate 1. 95—Epimeral plate 2. 96—Epimeral plate 3. 97—Uropod 1. 98—Uropod 2. 99—Uropod 3 and telson.

long setae longitudinally down middle of carpus. Propod margins convex, widening a little distally, nearly ½ carpus length and width ½ own length; medium-length setae distally around dactylos base, a nail-like spine outside and along dactylos; dactylos not ½ propod length, width ½ length, not narrowing greatly, a terminal group of several short strong setae

GNATHOPODS *Second*: Basos, group of fine short setae on anterodistal angle, longer ones on distal ½ of posterior margin; merus width ⅔ length; carpus width slightly less than ½ length; propod like immature *P. excavatum* male; ovately subrectangular, width ½ length, a few fine setae along lateral and palmar margins; palm transverse, anterior ½ a slightly irregular ridge, then narrowly and quite deeply excavated to a slender but very distinct defining finger barely reaching farther distally than rest of palm; strong curved dactylos noticeably over-reaching palm, length more than ½ propod; otherwise like *P. excavatum*.

PERAEOPODS. *Third*· Basos ovate, numerous fine setae on convex anterior margin; distal ½ of posterior margin more or less straight, proximal ½ strongly convex and forming distinct lobe; fringe of fairly long fine setae all along margin; greatest width a little more than ½ length. Ischium length ¾ width, less than ⅕ basos length, single seta medially on posterior margin, strong tuft of fine setae anterodistally Merus anterior margin convex, posterior nearly straight, both fringed with long slender setae, extremely long anterodistally. Carpus width ⅔ length, length nearly ⅓ basos; margins fringed with fine setae; oblique row of 3 or 4 strong curved spines medially on posterior surface, 3 similar spines on posterodistal angle Propod width not quite ½ length, slightly longer than merus; 4 strong single spines on anterior margin; tuft of fine setae posterodistally, dactylos nearly ⅓ propod length. *Fourth*: Convex anterior margin of basos fringed with short fine setae; posterior margin shallowly emarginate in middle, convex either side, anterior portion somewhat lobed; entire posterior margin fringed with single slender setae, the longest distally; greatest width about ⅔ length. Ischium slightly longer than wide, less than ¼ basos length, long setae on anterior margin. Merus width ½ length, length nearly ½ basos, a little widening distally; margins fringed with short setae, a slender spine on each distal angle. Carpus barely shorter, narrower, a few marginal setae; 2 or 3 strong curved spines medially on posterior surface, 2 on posterodistal angle, setae on margins and angles, 1 or 2 slender spines anterodistally. Propod subrectangular, as long as carpus, width ¼ length, a few setae on posterior margin, single slender spine distally, spine and tuft of long setae on angle; about 6 single (except paired 4th and 5th) spines along anterior margin, a few setae. Slender curved dactylos ⅔ propod length. *Fifth*: Like Pr. 4 but basos width more than ⅔ length; ischium width ⅓ length, length almost ½ basos, a few setae anterodistally. Merus widening a little distally, a few setae on margins, a single slender spine on anterodistal angle, 3 on posterodistal angle, 1 posteriorly near angle. Carpus width ⅖ length, as long as merus, 2 or 3 single slender spines on anterior margin. Propod about ⅚ basos length, width ⅛ length; 4 or 5 small groups of setae on anterior margin, a slender spine near distal angle; 3 groups of 2 or 3 long slender spines on posterior margin; 1 amidst strong tuft of long slender setae on angles Dactylos about ⅖ propod length.

EPIMERAL PLATES. *First*: Ovate, angles not discernible; long finely-plumose setae anteroventrally and set in a fraction from margin, similar setae on posteroventral margin; perhaps 16–18 in all; slightly wider than deep. *Second*: More

nearly subrectangular, angles broadly rounded, perhaps 15–16 long finely-plumose setae on ventral margin, 2 or 3 short setae proximally on anterior; 7 or 8 long setae on posterior. *Third*: Wider than 2nd, much wider than deep; subrectangular, angles rounded; 2 or 3 short setae anteroproximally, row of 5 or 6 long setae anteriorly on ventral surface, 2 short setae posteriorly.

PLEOPODS. Rami of about 14 segments, inner the longer.

UROPODS. *First*: Subequal rami much shorter than peduncle; slender spine on peduncle inner distal angle; about 7 seta-tipped spines on outer dorsal margin; spatulate triangular process below and $\frac{1}{2}$ along rami; 2 spines on inner ramus inner margin, 4 on end; 3 on outer ramus outer margin, 4 on end. *Second*: Four stout seta-tipped spines on peduncle outer dorsal margin; outer ramus has 2 spines on outer margin. *Third*: Peduncle subrectangular, length about $\frac{3}{4}$ width, 3 short setae on outer distal angle, 1 on inner. Outer ramus, width less than $\frac{1}{2}$ length, margins slightly convex, 1 seta on outer margin medially, tuft of about 7 strong setae at end. About 3 strong setae and 1 short spine on end of inner ramus. *Telson*: Pair of setae on outer distal angles.

DESCRIPTION OF FEMALE.

Like *P. excavatum* female in gnathopods; flagellum of superior antennae with 11 segments, inferior with 5; otherwise as above.

LOCALITIES. Lake Rotoiti, North Island, New Zealand; ? Lake Waikare, N.Z

TYPES. Slides C.53, male (Chilton Collection).

REMARKS. This species is described from specimens obtained by Messrs. Keith Lucas and Hodgkin from Lake Rotoiti, a freshwater lake in the Rotorua district. The specimens differ from the type specimens of *P. excavatum* in a number of features, notably the spination of both inner and outer plates of maxilliped; the male second antennae which lack the lobe characteristic of *P. excavatum* males; the male second gnathopod which resembles that of immature *P. excavatum* males; the shape and setose nature of peraeopods 3–5 and especially the 1st and 3rd epimeral plates which are distinctly setose in *P. lucasi;* the second uropods which have four or more spines on the peduncle instead of 1 as in *P. excavatum*. These differences are constant and, where the characteristic is not a secondary sexual one, they are the same for both sexes. Likewise, *P. excavatum* specimens do not vary sufficiently to embrace all of these differences; and as far as I can see the Brisbane specimens referred to in Chilton's (1920a) paper are in close agreement with *P. excavatum* types. The constancy of characteristics of *P excavatum* from the South Island of New Zealand and from Australia, and the aparently equal constancy of *P. lucasi*, associated with their distribution, suggests that *P. lucasi* is an endemic freshwater species derived from the somewhat more cosmopolitan brackish *P. excavatum*

The shape of the male second gnathopod is interesting since this would seem to be a species where the adult male characteristics of the " parent " species are retarded, and the adult form of the " derived " species corresponds closely to the juvenile form of the " parent " species. This appears to be a relatively common occurrence in amphipod species formation, especially in the Family Talitridae. It is known, for instance, in the Genus *Talitrus* where the feebly subchelate adult male second gnathopod resembles the female and juvenile male second gnathopod of other genera.

The Lake Rotoiti specimens described range up to $5\frac{1}{2}$ mm. in length.

Genus CAMACHO Stebbing.

Stebbing, 1888: 1178.
1906: 664.

" Head, mouthparts, peraeon with its sideplates and gnathopods 1 and 2 (female) nearly as in *Xenodice,* but differing as follows. Mandible with spines in spine-row numerous. Maxilla 1, inner plate with a single apical seta. Maxillipeds with finger of palp as long as 3rd joint. Antenna 1 with elongate 1st joint (the rest unknown) Pleon segment 4 not especially elongate. Pleopods, peduncle distally widened. Uropods 1–3 biramous. Uropod 3 with short broad peduncle and small rami, the outer longer than the peduncle, the inner minute. Telson simple."

One species, *Camacho bathyplous.*

Camacho bathyplous Stebbing, 1888

Stebbing, 1888: 1179, pl. 117.
Coutière, 1904: 8.
Stebbing, 1906: 664.
1908: 87–88.
Schellenberg, 1925: 197.

Most of the above references are by name only. Coutière draws attention to the relationship of *C bathyplous* to his *Grandidierella mahafalensis* from Madagascar; Schellenberg lists it in a distributional table of the West African fauna as being from " Kapland O -Kuste " and " Tiefsee." Stebbing (1908) is the only paper to add new information. Two female specimens have been taken. The Challenger specimen was taken in the New Zealand faunal area at Station 168. Details of this station as given by Stebbing (1888) are " July 8. 1874. 40°28′S. 177°43′E. 1100 fathoms, bottom blue mud. Bottom temperature 37 2°." The South African specimen was taken at a depth of 47 fathoms, bottom " sand, shell and rock "; latitude 33°9′30″S , longitude 28°3′0″E. Sizes 11 mm. (S.Af.) and 16 mm. (N.Z.).

Dr. K. H. Barnard has advised me by private communication of the following additional South African localities: Off Cape St. Blaize (Agulhas Bank), 42 fathoms; Lion's Head (i.e., Cape Town) S.E. ¼ E. distant 50 miles, 230 fathoms.

LITERATURE CITED

BISHOP, M. W. H., 1947. Establishment of an immigrant barnacle in British Coastal Waters. *Nature.* CLXI: 501.

CHEVREUX, Ed., 1908. Sur trois nouveaux amphipodes Mediterraneens appartenant au genre *Corophium* Latreille. *Bull. Soc. Zool. France.* vol. 33 (3 & 4): 69–76, figs. 1–6.

CHEVREUX, Ed. & FAGE, L., 1925. Amphipodes. 9. *Faune de France*: 1–488, text-figs.

CHILTON, *C.*, 1906. Note on some Crustacea from the fresh-water lakes of New Zealand. *P. Zool. Soc.*: 702–705.

——— 1909. The Fresh-water Amphipoda of New Zealand, *Trans. N.Z. Inst.* vol. 41: 54–58.

——— 1920. Some New Zealand Amphipoda: No 1. *Trans. N Z. Inst.* vol. 52: 1–8, figs. 1–5.

——— 1920a The Occurrence in Brisbane River of the New Zealand Amphipod, *Paracorophium excavatum* (G. M Thomson). *Mem. Queensland Museum.* vol. 7 (1): 1–8, text-figs. 1–19.

——— 1921. Some New Zealand Amphipoda: No. 2. *Trans N.Z. Inst.* vol. 53: 220–234, figs 1–5

——— 1923. Some New Zealand Amphipoda: No. 3 *Trans. N.Z. Inst.* vol. 54: 240–245, figs. 1–5.

COSTA, A., 1857. Ricerche sui Crostacei Amphipodi del regno di Napoli. *Memm. Accad Sci. Napoli.* vol. 1 (2): 232.

COUTIERE, H., 1904. Sur un type nouveau d'amphipode *Grandidieria mahafalensis* provenant de Madagascar. *Bull. Soc. philomath.* ser. 9 (6): 1–11, figs. 1–2.

CRAWFORD, G. I., 1937. A Review of the Genus *Corophium* with notes on the British Species. *J. Mar. Biol. Assoc. U.K.* vol. 21 (2): 589–630, figs 1–4.

DANA, J. D., 1852. Conspectus Crustaceorum quae in Orbis Terrarum circumnavigatione, Carole Wilkes e Classe Reipublicae Foederatae Duce, lexit et descripsit Jacobus D. Dana. Pars. III Amphipoda. No. 1. *Proc. Am. Acad. Arts. Sci.* vol 2: 201–220.

——— 1853 & 1855. The Crustacea; *United States Exploring Expedition* during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N. vol. XIII. Part 2. Amphipoda. pl. 54–69.

ENEQUIST, PAUL, 1949. Studies on the Soft-Bottom Amphipods of the Skagerak *Zool bidrag fran Uppsala* Bd 28: 299–492, figs. 1–67, and 5 charts

MILNE-EDWARDS, H. 1830 Recherches pour servir a l'histoire naturelle des Crustaces Amphipodes. *Anns. des. Sci. nat.* vol. 20: 385

PIRLOT, J M., 1938. *Les Amphipodes de L'Expédition du Siboga.* Les Amphipodes Gammarides III. Les Amphipodes Littoraux 2. vol. 33 f

——— 1939 Amphipoda dans: Résultats Scientifiques des Croisières du Navire-école Belge "Mercator." *Mem. Mus Hist nat. Belg* vol. 2 (15) 47–80, 7 figs.

SARS, G O., 1895. *An Account of the Crustacea of Norway.* 1. Amphipoda. Text and plates.

SCHELLENBERG, A. 1925 *Beitrage zur Kenntnis der Meeresfauna Westafrikas* Bd III Lief. 4. Crustacea VIII: Amphipoda. Text-figs. 1–27: 113–204.

SEXTON, E. W., and REID. D. M, 1951. The Life-History of the Multiform Species *Jassa falcata* (Montagu) (Crustacea Amphipoda) with a Review of the Bibliography of the Species. *J Linn. Soc.* vol xlii (283): 29–91, pl 1–30.

SHOEMAKER. C. R., 1947. Further Notes on the Amphipod Genus *Corophium* from the East Coast of America. *J. Wash. Acad Sci.* vol. 37 (2). 47–63, figs 1–12.

——— 1949. The Amphipod Genus *Corophium* on the West Coast of America *J. Wash Acad. Sci.* vol. 39 (2): 66–82, figs. 1–6.

SOIKA, A G., 1947. Sull'etologia del *Corophium sextoni* Crawf nella Laguna di Venezia (Crust. Amphip.). *Atti Soc. Nat Mat Modena* 78 204-205

——— 1949 Gli Anfipodi Gammarini della Laguna di Venezia *Arch Oceanogr Limnol Roma.* 6 (2-3): 165-212. 3 maps. 7 figs

STEBBING, T. R. R., 1888. Amphipoda. *Report "Challenger" Expedition.* vol. 29.

——— 1899. On the True *Podocerus* and some new Genera of Amphipods. *Ann Mag Nat Hist.* ser. 7 (3): 237–241

——— 1899a. Revision of Amphipoda. *Ann. Mag. Nat. Hist.* ser. 7 (3): 350

——— 1906. Amphipoda Gammaridea. *Das Tierreich* Lief 21 pp i–xxxix, 1–806, text-figs

——— 1908 South African Crustacea pt. IV. *Ann S Afr Mus.* vol 6 (1): 1–96, pl. 27–40.

THOMSON, G M., 1880. Recent Additions to and Notes on New Zealand Crustacea *Trans. N.Z. Inst.* vol. 13: 204–221, pl 7–8

——— 1880a. New Species of Crustacea from New Zealand *Ann Mag Nat Hist.* ser. 5 (6): 1–6, pl 1

——— 1884 Descriptions of New Crustaceans *Trans N Z. Inst.* vol 16 234–240, pl 12–13

THOMSON, G. M, and CHILTON, C., 1886 Critical List of the Crustacea Malacostraca of New Zealand *Trans N Z Inst* vol 18. 141–159.