

[From Proc. Biol. Soc., L'pool. Vol. II. Read 13th April, 1888.]

REPORT on the COPEPODA collected in MALTESE SEAS by David Bruce, M.B., during 1886-7-8.

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With Plates VI., VII., VIII. and IX.

THE collection which furnished the material from which this report is drawn up was summarized by Professor Herdman in Vol. I. Proceedings, of this Society. The material was obtained by means of the tow-net by Dr. Bruce, while stationed as Surgeon (a post which he still holds) at Valetta, Malta, the mass being kindly placed by him at the disposal of this Society.

In addition to the fifty-seven bottles referred to by Prof. Herdman, I have received from Dr. Bruce during the present year two bottles containing Copepoda exclusively. All the animals were transferred immediately after capture into a fluid composed of equal parts of alcohol, water, and glycerine, with one per cent of carbolic acid added.

As each bottle represents a separate gathering, and the operation of collecting extends throughout an entire year, the collection may be considered thoroughly representative of the marine surface fauna of Malta; and as might be expected the Copepoda contained therein vary considerably according to temperature and other causes; some species being found abundantly in one or more bottles and altogether absent from the rest.

The task of examining and sorting out under the microscope very many thousands of these minute crustacea has been necessarily somewhat slow and tedious, and in

this I have received valuable co-operation from my friend Mr. W. S. McMillan, F.L.S., of Maghull, who has made the Copepoda a special study.

We have made out in all sixty-eight species, belonging to the various families as follows:—

Calanidæ	41	species.
Cyclopidæ.....	3	„
Harpacticidæ	4	„
Corycæidæ	18	„
Cymbasomatidæ	1	„
Caligidæ	1	„

Of these species, three are new to science, viz. *Acartia verrucosa*, *Zosime rubra*, and *Copilia brucii* (Pls. VI. to IX.)

Eleven out of the sixty-eight species are found in British seas, viz.:—

- Calanus finmarchicus*, Günner.
- Pseudocalanus elongatus*, Boeck.
- Pleuromma abdominale*, Claus.
- Candace pectinata*, Brady.
- Dias longiremis*, Lilljeborg.
- Centropages typicus*, Kroyer.
- Isias clavipes*, Boeck.
- Oithona spinifrons*, Boeck.
- Peltidium purpureum*, Phillipi.
- Porcellidium viride*, Phillipi.
- Caligus mulleri*, Leach.

It is to be noted that all the tow-netting was done at or near the surface, and it is more than probable other forms may yet be met with if sought for at greater depths, for it has recently been strikingly shown by Dr. John Murray, of Edinburgh, that at great depths in some of the Scotch lochs remarkable forms of Copepoda exist which are

hitherto unknown as occurring near the surface. Probably Dr. Bruce will find opportunity for some deep tow-netting about Malta during the present year.

DESCRIPTION OF THE SPECIES COLLECTED.

Family CALANIDÆ.

Calanus finmarchicus, Günner.

C. valgus, Brady.

C. propinquus, Brady.

C. pavo, Dana.

C. gracilis, Dana.

All these species of *Calanus* were found in moderate quantity, and appear to be little affected by temperature. The elegant peacock-tail plumes, figured by Dana* as terminating the caudal appendages of *C. pavo*, were not present in any of the specimens obtained, although it is evident they had become detached, a fact I noted when describing the Copepoda of the Canary Islands. †

Eucalanus attenuatus, Dana.

Very large specimens of males and females occur sparingly.

E. setiger, Brady.

E. mastigophorus, Claus.

A few specimens only were found of each species.

Hemicalanus longicornis, Claus.

A considerable number of this striking species were found.

* Dana, Crust. U. S. Expl. Exped. (1852).

† Paper on "Copepoda of Madeira and the Canary Islands," read before the Linnean Society, 17th November, 1887.

Pseudocalanus elongatus, Boeck.

This ubiquitous species seems plentiful at all seasons.

Mecynocera clausii, Thompson.

Frequently met with.

Pleuromma abdominale, Claus.

Occurs very sparingly.

Heterochæta spinifrons, Claus.

Fairly abundant.

Leucartia flavicornis, Claus.

Found in considerable abundance.

Scolecithrix dana, Lubbock.

Occurs sparingly.

Euchæta prestandreæ, Phillipi.

This is by far the most numerous of the species obtained, and forms the chief proportion of all the gatherings. Males and females occur in about equal quantities, the latter being usually provided with ovisacs.

E. barbata, Brady.

This species was found very sparingly, though from the close resemblance between *E. prestandreæ* and *E. barbata* it is probable that some of the latter may have been overlooked.

Candace pectinata, Brady.

C. pachydactyla, Dana.

C. truncata, Dana.

C. bispinosa, Claus.

C. nigrocincta, Thompson.

The three first named species of *Candace* were very common; the two latter were rare.

Dias longiremis, Lilljeborg.

Found sparingly.

Acartia laxa, Dana.

Found in considerable numbers.

A. denticornis, Brady.

Less common than *A. laxa*.

Acartia verrucosa, n. sp. (Pl. VI., figs. 1 to 9).

Length 1-20th of an inch. Cephalothorax elongated, tapering anteriorly and posteriorly; the posterior angles being produced into rounded leafy projections. Anterior antennæ (fig. 2) about the length of the body, and bearing a number of long setæ, which like those of the swimming feet are strongly verrucose throughout the middle part of their length, having the appearance of being formed of minute joints. Posterior antennæ (fig. 3) have several setæ on the outer side of the main branch, in addition to those at the apex of both branches. The first four pairs of swimming feet (fig. 6) are similar to those of *A. laxa*, but their setæ are verrucose as before mentioned. The fifth feet of the male (fig. 7) are prehensile, and are large and powerful; one side is extended into a long spinous claw, jointed near the apex and terminated by a fine seta; the other is three jointed and terminated obtusely. The fifth feet of the female (fig. 8) are each composed of one short basal joint terminated by a long spine, which is finely ciliated from near the base to the apex. The abdomen of the female (fig. 9) is two jointed, the second joint having on each side three or four long plumose setæ; the stylets in the female are two long lance-like projections without terminal setæ.

Only two specimens, a male and a female, of this very remarkable species were found, the male being

considerably mutilated. Although clearly an *Acartia*, it differs strikingly from the other known species of that genus, and may be at once distinguished by the verrucosity or roughened appearance of the setæ, and by the fifth swimming feet of both sexes, and the abdominal stylets of the female.

Ætidius armatus, Brady.

Several specimens of this easily distinguished species occur at different periods. It appears to be a species of wide geographical distribution, but has not I believe been previously recorded as occurring in the Mediterranean.

Temora dubia, Lubbock.

Common throughout the gatherings.

Centropages brachiatus, Dana.

C. typicus, Kroyer.

C. violaceus, Claus.

Of these three species *C. violaceus* was much the most plentiful, occurring in fair abundance during all seasons. The richness of the violet colouring in the plumose setæ is very striking.

Isias clavipes, Boeck.

A few specimens only were found.

Phaëna spinifera, Claus.

A few specimens only, male and female, were found of this species; it has not I believe been recorded away from the Mediterranean, Messina being the habitat of Dr. Claus's specimens.

Lucillus acuspes, Giesbrecht.

Occurs very sparingly.

Pontellopsis villosa, Brady.

Two or three only of this rare species were found, and as was the case with the "Challenger" specimens, all were females.

Pontella strenua, Dana.

P. inermis, Brady.

P. kroyeri, Brady.

P. securifer, Brady.

Only a few of each of these species were found, but they were generally distributed throughout the seasons of the year.

P. plumata, Dana.

Found in abundance. The setæ of some specimens have a violet tinge, in that respect somewhat resembling *Centropages violaceus*.

Pontella mediterranea, Claus (Pl. VII., figs. 1 to 7).

Length 1-10th of an inch. Cephalothorax elongated, ovate six jointed; posterior angles in the male terminated by minute spine; those in the female produced into rounded leafy expansions. Rostrum broad and furcate; superior eye large, situated immediately above the rostrum; inferior eyes, two in number, conspicuously placed immediately behind the base of the rostrum. Anterior antennæ about as long as the cephalothorax, twenty-four jointed, clothed with short setæ throughout entire length; three of the central joints of the right antenna in the male are very much swollen, the first bearing a strong spine; the three following are finely denticulated, the three terminal joints being of about equal length and are of uniform width. Posterior antennæ (fig. 2) have long inner branch. Mandible (fig. 3) biting segment broad, and provided with large irregular teeth. Terminal spines of swimming feet

(fig. 4) long and narrow, with finely serrated edge. The fifth feet in the male (fig. 5) are unbranched; the right one (fig. 5 *a*) is two jointed, the second being a large and powerful claw usually doubled back upon the first and very muscular. The inner edge of the hinged claw is provided with about twenty long teeth placed longitudinally, with a rounded projection at lower end, the outer edge of the claw forming a protection to the row of teeth. The left fifth foot of male (fig. 5 *b*) is long, three jointed, muscular, and terminated by four strong curved spines. The fifth feet in the female (fig. 6) are nearly alike on each side, two branched; the outer branch having two short spines on each side and trifold at the apex; the inner branch is rudimentary, in some specimens being a single pointed spine with broad base; in others it is a rounded protuberance. The abdomen of the male is four jointed; that of the female two jointed. The caudal segments (fig. 7) are two jointed in both sexes; in the female the two terminal segments are different, that of the right side being somewhat larger than the left and rounded on the inner side; each side is terminated by five strong plumose setæ.

This species, easily distinguished by the fifth feet in the male and the caudal segments in the female, occurs plentifully in several of the tow-net gatherings from Malta. For some time I believed that the specimens represented a new species, and for confirmation, I sent specimens to both Sir John Lubbock and Dr. G. S. Brady, F.R.S., who were unable to refer it to any known species. Consequently the above description and the accompanying figures were prepared; but fortunately, while they were still in proof, I discovered that Claus's *Pontellina mediterranea* (figs. 11 and 12, Taf. xxxvi., "Die frei lebenden Copepoden der fauna Deutschlands, der Nordsee und des Mittelmeeres"), male specimens of which he found at Messina, undoubtedly

represents the same species as the Maltese specimens. There does not now seem sufficient reason for separating the species from *Pontella*, as proposed by Claus.

The variety and abundance of the genus *Pontella* found about Malta form a striking contrast to the waters about the Canary Islands, where during a series of tow-netting operations which I undertook last spring* not a single species of *Pontella* was found.

Family CYCLOPIDÆ, Baird (in part).

Oithona spinifrons, Boeck.

O. challengerii, Brady.

O. plumifera.

A number of specimens of each species were found, but all appear to have been collected during the summer months, a fact which I have observed to be general in regard to *O. spinifrons* occurring in British waters, although very occasionally taken in winter.

Family HARPACTICIDÆ, Claus.

Goniopsyllus rostratus, Brady.

One specimen only, a male, of this striking species was found, being taken by the tow-net at the close of last year (1887). Dr. Brady records the only other instance in which it was found, also a male, by the "Challenger" expedition in the Atlantic Ocean, near South America.

Peltidium purpureum, Phillipi.

Several specimens of this species of a brilliant red colour occur in the gatherings both of July and October of last year; the Mediterranean being its original habitat. It has

* Described in a paper read before the Linnean Society, 17th November, 1887.

been recently well described and figured by Dr. Brady,* from specimens dredged in Loch Fyne.

Porcellidium viride, Phillipi.

Found very sparingly.

Zosime rubra, n. sp. (Pl. VIII., figs. 1 to 8).

Length 1-30th of an inch. Rostrum prominent; short, thick, and pointed at apex, which bears two small hairs. Cephalothorax broadly ovate, broader towards base and apparently composed of one unsegmented carapace. Anterior antennæ (fig. 2) six jointed, broad at base, gradually narrowing towards apex. Posterior antennæ (fig. 3) have the appearance of doubled arms, and appear to be six jointed (?). Mandible palp (fig. 4) on long stem and broadly toothed, basal portion undetermined. Maxilla not made out. First footjaw (fig. 5) short and wide, bearing several long spinous setæ. Second footjaw (fig. 6) two jointed and terminated by a long and short spine. Second, third and fourth swimming feet (fig. 7) have outer and inner branch, each three jointed, the setæ having long plumose hairs on each side and the spines bearing short hairs. Fifth feet of female rudimentary or wanting. Abdomen (fig. 8) four jointed, distinctly separated from cephalothorax, the two lower joints rather longer but narrower than the upper, and all are fringed with cilia. Caudal segments about twice as long as broad and terminated by two setæ; the outer one short and plumose; the inner very long and non-plumose. Colour, brilliant red.

One specimen only, a female, of this beautiful little species was found, and it was partially covered and obscured by a parasitical alga. Its extreme minuteness made dissection very difficult, and some parts must remain

* Appendix to Fifth Annual Report of the Fishery Board of Scotland.

doubtful. Although very different in appearance from *Zosime typica* or any described species, it has the generic characters of *Zosime*, and I have therefore placed it in that genus.

Family CORYCÆIDÆ, Dana.

Corycæus varius, Dana.

C. pellucidus, Dana.

C. limbatus, Brady.

C. venustus, Dana.

C. speciosus, Dana.

C. obtusus, Dana.

One or other species of *Corycæus* was generally present in the gatherings, but none in any abundance.

Copilia mirabilis, Dana.

This species was exceedingly abundant in a few of the gatherings, notably those of March and October, but entirely absent from nearly all. In only one specimen out of a large number examined were the caudal terminal setæ at all retained, the tendency being for them to break off at the base close to the stylets.

Copilia brucii, n. sp. (Pl. IX., figs. 1 to 7).

Length 1-4th of an inch. The first cephalothoracic segment is nearly quadrangular, narrower than the rest of the body and nearly equal to the united length of the other segments; the frontal portion is roundly indented between the eyes (fig. 1). The abdomen is five jointed, the second joint in what appears to be the male having its posterior angles on each side terminated by one strong and one slender spine with a long seta above (fig. 7); the next joint terminates partially in two short spines. The two last abdominal segments are denticulated on the ventral side only (fig. 6). The caudal stylets are long and slender,

bearing two spines and a seta on each side (fig. 7) near the termination, and one spine and seta still lower down; very short terminal setæ. Anterior antennæ (fig. 2) six jointed, about as long as first body segment, and densely clothed with long wiry setæ. Posterior antennæ (fig. 1) very large, three jointed, and terminating in a strong curved claw; the three joints each bearing a strong marginal spine, the third also having three apical spines. The three first pair of swimming feet (fig. 4) are three jointed in both external and internal branches, the inner branch of fourth pair (fig. 5) having only one joint. The three first pairs (fig. 4) are remarkably spined throughout, and have two long terminal spines with the outer branch each doubly serrated; the segments of inner border of the outer branch and those of the outer border of inner branch have their edges clothed with fine short cilia. Fifth feet are wanting.

Two specimens only of this remarkably distinct species were found both being together. It appears to differ from *C. mirabilis*, Dana, in several particulars. Its general appearance is more graceful and less angular than that of *C. mirabilis*, chiefly through the comparative smallness and frontal curving of first body segment; and both the antennæ and also the swimming feet differ very considerably, those of *C. brucei* being more highly organised; the dorsal median spines of last two thoracic segments, so conspicuous in *C. mirabilis*, are in this species entirely wanting.

I have named the species after Dr. Bruce, of Malta, to whom we are indebted for the mass of material upon which this report is drawn up.

Oncæa obtusa, Dana.

This variable species, found in abundance further south,

has not been observed north of the Mediterranean, and occurs but sparingly in the Maltese gatherings. The specimens found here have not the rich colours so characteristic of those of more southern habitats.

Saphirina ovalis, Dana.

S. inæqualis, Dana.

S. reticulata, Brady.

S. serrata, Brady.

S. opalina, Dana.

S. opaca, Lubbock.

S. splendens, Dana.

S. gemma, Dana.

S. sinuicaudata, Brady.

These species of *Saphirina*, which include most of the known forms, were generally distributed throughout the gatherings, but all very sparingly. Some retain their brilliant appearance even when mounted.

Family CYMBASOMATIDÆ, I. C. Thompson.

Cymbasoma rigidum, I. C. Thompson.

Two specimens, both females, of this well defined species, first recorded from the Canary Islands, were found in separate gatherings.

Family CALIGIDÆ, M. Edwards.

Caligus mülleri, Leach.

One specimen of this well known parasitic species was taken by the tow-net.

EXPLANATION OF THE PLATES.

PLATE VI.

Fig. 1.	<i>Acartia verrucosa</i> , n. sp., female,	× 60 diams.
Fig. 2.	Anterior antenna of do.	250 „
Fig. 3.	Posterior antenna of do.	250 „
Fig. 4.	Maxilla of do.	250 „
Fig. 5.	Posterior footjaw of do.	250 „
Fig. 6.	One of swimming feet of do.	250 „
Fig. 7.	Fifth pair of swimming feet of male,	250 „
Fig. 8.	Do. do. female,	250 „
Fig. 9.	Ventral posterior of cephalothorax, showing leafy projections and fifth feet, also abdomen and caudal stylets, female,	250 „

PLATE VII.

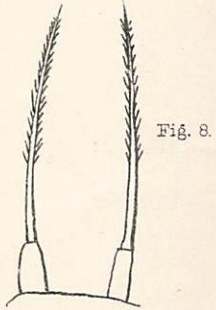
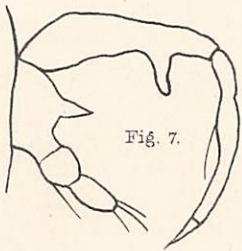
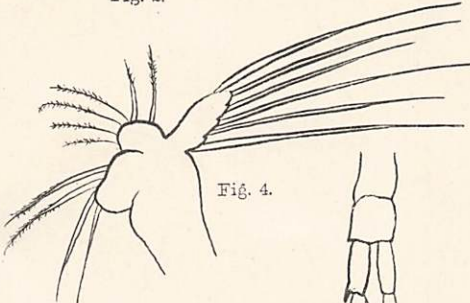
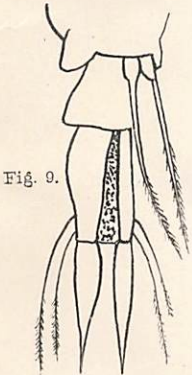
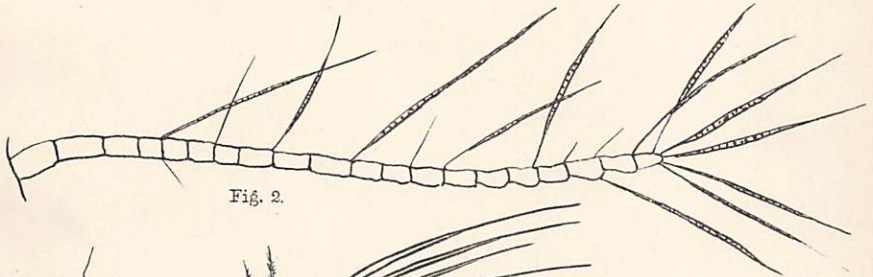
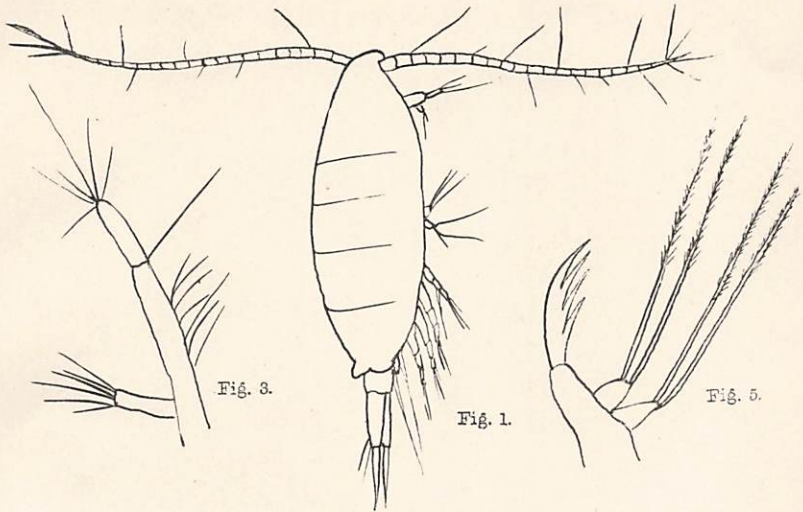
Fig. 1.	<i>Pontella mediterranea</i> , Claus, male,	× 60 diams.
Fig. 2.	Posterior antenna of do.	250 „
Fig. 3.	Mandible and palp of do.	250 „
Fig. 4.	Terminal spine of one of swimming feet,	250 „
Fig. 5.	Fifth pair of swimming feet of male,	250 „
Fig. 6.	Do. do. female,	250 „
Fig. 7.	Abdomen and caudal stylets of do.	250 „

PLATE VIII.

Fig. 1.	<i>Zosime rubra</i> , n. sp., female,	× 250 diams.
Fig. 2.	Anterior antenna of do.	500 „
Fig. 3.	Posterior antenna of do.	500 „
Fig. 4.	Biting part of Mandible of do.	500 „
Fig. 5.	Anterior footjaw of do.	500 „
Fig. 6.	Posterior footjaw of do.	500 „
Fig. 7.	One of swimming feet of do.	500 „
Fig. 8.	Abdomen of do.	500 „

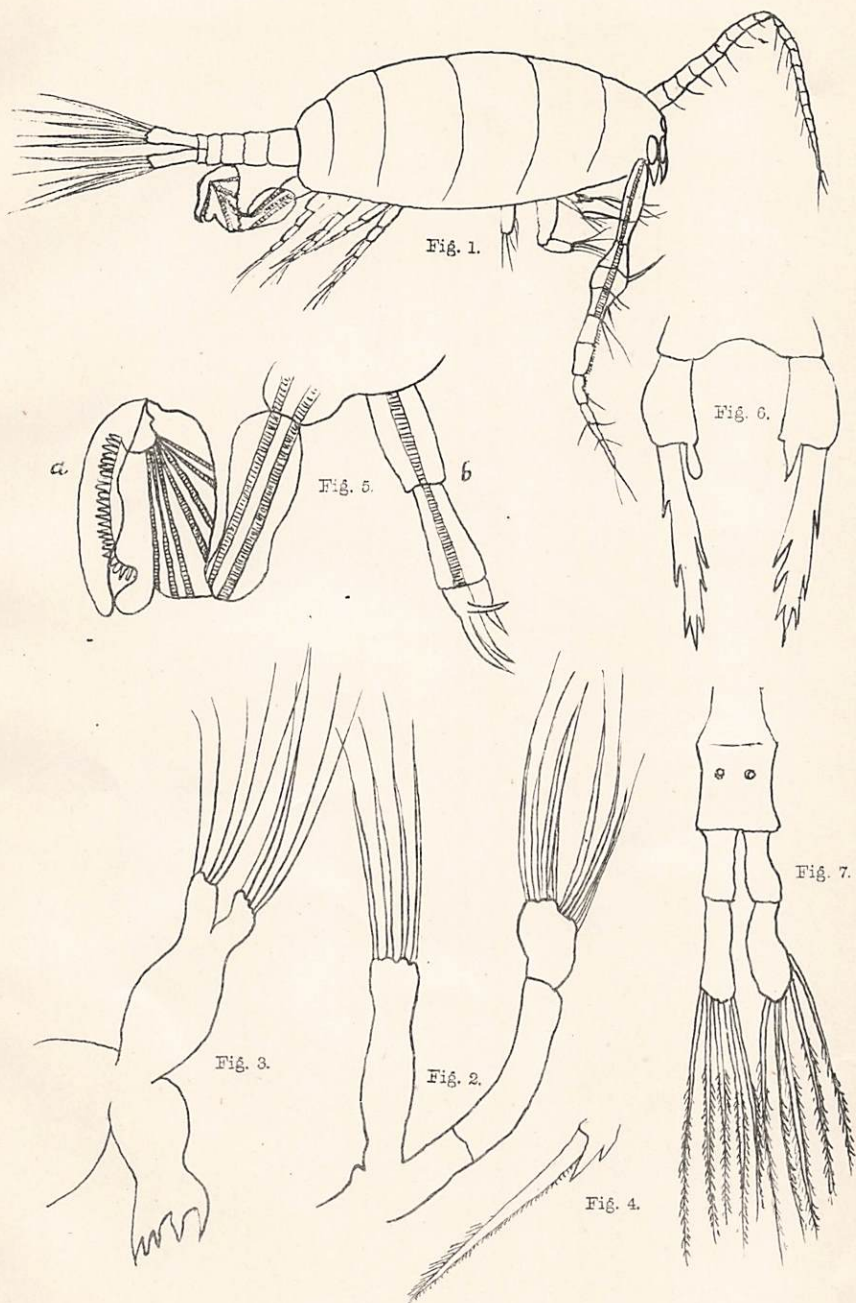
PLATE IX.

- Fig. 1. *Copilia brucii*, n. sp., female, × 60 diams.
Fig. 2. Anterior antenna of do. 250 „
Fig. 3. Posterior footjaw of do. 250 „
Fig. 4. One of third pair of swimming feet of do. 250 „
Fig. 5. One of fourth pair of do. do. 250 „
Fig. 6. Spinose basal termination to lateral
angles of second abdominal somite
of male, 250 „
Fig. 7. Abdomen and caudal stylets of female, 250 „

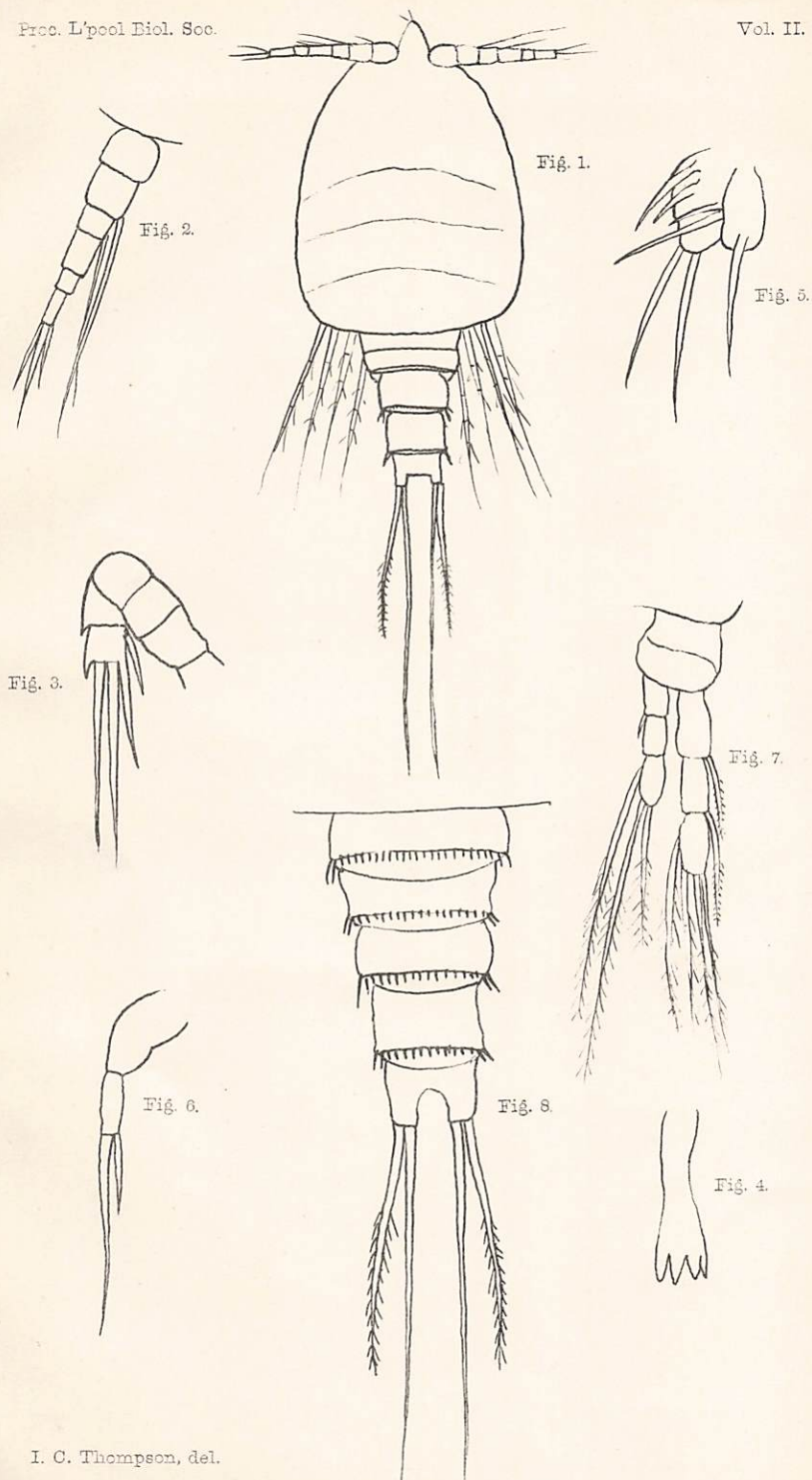


I. C. Thompson, del.

ACARTIA VERRUCOSA, n. sp. Figs. 1-9.



I. C. Thompson, del.



I. C. Thompson, del.

ZOSIME RUBRA, n. sp. Figs. 1—8.

