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Plankton from Christmas Island, Indian Ocean.—I. On Copepoda of the Family *Corycæidæ*.

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(Plates X.–XIV. †)

Through the kindness of Dr. W.T. Calman I have had the opportunity of examining the Copepoda of a small collection (8 bottles) of Plankton, made by Sir John Murray, K.C.B., F.R.S., and Dr. C. W. Andrews, F.R.S., at Christmas Island in the Indian Ocean, and presented to the British Museum by Sir J. Murray.

The gatherings were all made at approximately the same time (July–August, 1908) and in the same locality, on the north side of the island in shallow water near shore, and for this reason it has not been thought necessary to refer to each of them separately.

The collection, though small in bulk, is exceedingly rich in species, and the genus *Corycæus* is especially well represented.

It has been recognized that there are, in the the genus *Corycæus*, two groups differing from each other in several distinct characters, the most notable being the form of the ventral process, situated between the maxillipedes and the first pair of

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† For explanation of the Plates see p. 296.

feet of the female, which is beak-shaped in one group and semicircular in the other. There can be no doubt that these characters are, collectively, of generic importance, and I propose the name *Corycella* for that subdivision, as typified by *C. gibbulus*, which is marked by the possession of a beak-shaped ventral process, leaving the name *Corycæus* for the remaining species, of which *C. speciosus* may be selected as the type.

The genus *Corycæus* was founded by Dana in 1845 (6), his diagnosis being repeated in 1846 (7), but no species belonging to the genus was described till 1849 (8). Dana's definition of the genus includes both the genera defined above, and his papers describing the species, first published without figures in 1849 (8), and afterwards with figures in 1852 (9), contain forms belonging to both *Corycella* and *Corycæus*, but do not indicate any one of them as forming the type of the genus.

The principal differences between *Corycæus* and *Corycella* may be summarized as follows:—

Genus Corycella, nov.	Genus Corycæus Dana.
Abdomen of ♂ and ♀ one-jointed; 4th thoracic segment without lateral points, not distinct from 3rd thoracic segment. Ventral process beak-shaped in ♀. 2nd antenna with setæ on 1st and 2nd basal joints distantly feathered; terminal spine short in ♂; inner edge of 2nd basal coarsely feathered.	Abdomen of ♂ and ♀ usually two-jointed; 3rd and 4th thoracic segments distinctly separate, the latter with lateral points. Ventral process semicircular in ♀. 2nd antenna with the setæ on 1st and 2nd basal joints not feathered; terminal spine elongated in ♂, inner edge of 2nd basal usually with one or more strong teeth.
1st to 3rd feet, exopodite with 0.0.1 outer edge setæ.	1st to 3rd feet, exopodite with 1.1.3 outer edge setæ.
4th foot without endopodite, exopodite with 0.0.1 outer edge setæ.	4th foot with endopodite bearing one or two setæ, exopodite with 0.1.1 outer edge setæ.

The one-jointed abdomen and the feathered setæ of the second antennæ occur, as Dahl has pointed out, as characters of immaturity in the genus *Corycæus*.

Giesbrecht (10) recognises five species of *Corycæus* in the group for which the name *Corycella* is proposed, viz., *C. gibbulus* Giesbr., *C. concinnus* Dana, *C. rostratus* Claus, *C. carinatus* Giesbr., and *C. longicaudis* Dana. In Dahl's revision of the genus (5) he accepts *C. gibbulus*, *C. concinnus*, *C. carinatus*, *C. rostratus*, and, under the new name of *C. tenuicauda*, *C. longicaudis*, asserting that Dana's description of *C. longicaudis* really refers to *C. speciosus* juv., a view which is strongly supported by Dana's figures. Dahl also recognises Dana's (8) description of *C. gracilis* as being good, but does not give any reason for this opinion. Dana's description and figures of *C. gracilis* evidently refer to a male of *Corycella*, but the specific differences between the males of this genus are so slight that it does not appear possible to refer the description and figures with certainty to any particular species. Dahl's belief that *C. pellucidus* of Dana is the female of what he recognises as *C. gracilis* also appears to be a mere conjecture, there being very little evidence for or against

the view in Dana's figures, which, apparently, include two different species.

Wolfenden (11) also believes that he has recognised the *C. pellucidus* of Dana, but his figures and descriptions refer undoubtedly to the species which Giesbrecht has described as *C. gibbulus*.

Dahl, in the paper referred to above (5), which is a preliminary note on the Copepoda of the Plankton Expedition, has drawn up a useful diagnostic table of the members of the genus *Coryceus* as recognised by him. The portion which refers to the genus *Corycella* has been translated by Dr. Wolfenden (11) in his account of the Maldive Copepoda. In this table Dahl gives as a mark to distinguish the other members from *C. rostratus*, "Viertes Beinpaar mit einem inneren Zapfen welcher eine Borste trägt." If by "Zapfen" is meant endopodite, as is undoubtedly the case in the latter part of the table, and as Wolfenden translates it, this statement is an error, as the endopodite is absent throughout the group. There is a mistranslation in Wolfenden's table which detracts somewhat from its usefulness; the sentence "Genital openings of ♀ set at end of abdomen" should read "distant from end of abdomen," "vom Ende des Abdomens entfernt."

The specific characters in the genus *Corycella* are very slight and depend mainly on the shape of the abdomen and the third thoracic segment. The following is an attempt to draw up a diagnostic table, to include the females of which a recognisable description exists and two new species from the Christmas Island collection, which are described below.

1. Furca only twice as long as broad	*C. rostrata.*
2. Furca three or more times as long as broad.	
A. Furca shorter than widest part of abdomen in dorsal view.	
a. Widest part of abdomen behind the middle, 3rd thoracic segment with dorsal hump.	
α. Abdomen less than twice as long as high in lateral view, median furcal spine short and stout	*C. gibbula.*
β. Abdomen ca. 2½ times as long as high in lateral view, median furcal spine slender	*C. brevis*, sp. n.
b. Widest part of abdomen in front of middle, 3rd thoracic segment not humped dorsally.	
α. Thoracic spines long, abdomen with ventral setose pad	*C. carinata.*
β. Thoracic spines short, abdomen without setose pad	*C. curta*, sp. n.
B. Furca longer than widest part of abdomen.	
a. Furca less than half as long as abdomen, 3rd thoracic segment with dorsal hump	*C. longicaudis.*
b. Furca less than half as long as abdomen, 3rd thoracic segment without dorsal hump	*C. concinna.*

CORYCELLA GIBBULA Giesbr.

Coryceus gibbulus Giesbrecht (10).
Coryceus pellucidus Wolfenden (11).
? *Coryceus megalops* Will.-Suhm (1).

Common in all the gatherings, upwards of 120 specimens.

The most easily recognised characters of the female of this

species are the deep cephalon with eyes rather small and set far apart, the abdomen widest at its posterior third (without furca) and usually bearing two spermatophores, the furca contained $2\frac{1}{4}$ times in the rest of the abdomen, the middle furcal seta thick and equal in length to the width of the furca, and the setose pad on the antero-ventral part of the abdomen.

Wolfenden (11. p. 1027) has described at some length a female *Corycæus* which occurred plentifully in the Maldive collections, and which is apparently identical with the above. He ascribes it to *C. pellucidus* Dana, and records *C. gibbulus* as a separate species. He remarks, however, that he believes that the *C. pellucidus* of the Maldive collections is probably identical with *C. gibbulus*. His figure of the fourth foot (fig. 9, pl. xcix.) is evidently incorrect in showing an endopodite bearing a long seta, as in the text it is said that no endopodite is present.

Giesbrecht's (10) figure of the female abdomen of *C. gibbulus* in lateral view is not so deep nor so irregular in outline as are all my specimens; in this they agree more nearly with Wolfenden's figure, but I think there can be no doubt that all these forms are identical.

It seems not improbable that Willemoes-Suhm's *C. megalops* was in reality this species, but his description and figure, as given by Brady (1), can hardly be regarded as constituting a valid diagnosis. Brady's *C. pellucidus* may also include it with others.

Distribution. Red Sea, Arabian Sea, Indian Ocean (many records), and Tropical Pacific.

CORYCELLA BREVIS, sp. n. (Pl. X. figs. 1–6, Pl. XI. fig. 7.)

Female (Pl. X. figs. 1, 2).—Length ·85 mm.; cephalothorax, in middle line, ·54 mm.; abdomen and furca ·3 mm.; cephalon rather deep, curved dorsally in lateral view; eyes large, prominent in dorsal view.

2nd thoracic segment with slight dorsal hump, as in *C. gibbula* and *C. longicaudis*.

3rd thoracic segment (Pl. X. fig. 6) with comparatively short lateral points.

Abdomen widest at its posterior $\frac{3}{5}$ excluding furca; in lateral view the abdomen is parallel-sided for about $\frac{2}{5}$ of its length, and is then tapered to the furca; it has a slightly spinulose antero-ventral boss.

Furca about 6 × 1, contained $2\frac{1}{3}$ times in rest of abdomen; its median terminal spine not very strong, about twice as long as width of furca.

1st and 2nd antennæ (Pl. XI. fig. 7) as in *C. gibbula*.

1st to 3rd feet (Pl. X. figs. 3, 4) almost the same as in *C. gibbula*. The 3rd joints of the exopodites of the 1st and 2nd feet are finely serrate, in the 3rd foot the serrations are not visible.

4th foot (Pl. X. fig. 5) as in *C. gibbula*, hollowed on distal margin of 2nd basal; inner margin of the 2nd basal forms an acute angle with its base.

The characters which distinguish this species from *C. gibbula* are the proportionately greater length and different form of the abdomen and the shorter 3rd thoracic spines.

Only one specimen was found.

CORYCELLA CONCINNA Dana.

In five gatherings, about 30 specimens.

Giesbrecht (10) has given a figure of the female of this species by which it can easily be recognised, but he does not refer to the presence of a setose pad, as in *C. gibbula*, on the antero-ventral part of the abdomen.

Distribution. Widely distributed in the Indian Ocean, Tropical and South Pacific.

CORYCELLA CARINATA Giesbr. (Pl. XI. fig. 10.)

In five gatherings, 55 specimens.

Length of females ·85 mm.

The characteristic features of this species are the cephalon (deep from front to back), the small eyes moderately far apart, the long slender thoracic spines, and the abdomen, widest at its anterior fourth (excluding furca), with a ventral setose pad. The furca is about half as long as the rest of the abdomen.

CORYCELLA CURTA, sp. n. (Pl. X. figs. 7–11, Pl. XI. figs. 1–6.)

Female (Pl. XI. figs. 1, 2).—Length ·7 mm. Very close in general appearance to *C. carinata*, but may be distinguished by the more slender build in lateral view, by the shorter thoracic spines, which do not reach as far as the genital openings, and by the absence of the patch of fine setæ or spinules on the antero-ventral part of the abdomen.

The furca is short, about 2×7, and contained $2\frac{1}{2}$ times in the length of the rest of the abdomen (Pl. XI. fig. 3), which is broadest at its anterior fourth and tapered posteriorly.

The appendages have no special features. The fine serrulation, found on the third joints of the exopods in some species, is absent (Pl. X. figs. 7, 8). The 2nd basal of the fourth foot (Pl. X. fig. 11) is rounded on its inner face, and does not form one straight line with the inner face of the 1st basal. The angle between the base and inner margin of the 2nd basal is slightly obtuse.

Only one specimen was found.

In the same gathering there occurred two specimens which seem to be the males of the above, on account of the similarity of their thoracic spines, fourth feet and furca, and their small size.

Male (Pl. XI. figs. 4–6). Length ·65 mm. Cephalothorax in middle line ·4 mm., abdomen and furca ·24 mm. The form of the abdomen (Pl. XI. fig. 4) is more easily shown in the figure than described. The outer edges of the 3rd joints of the exopodites of 1st and 3rd feet are not serrulate. The angle between the base and inner margin of the 2nd basal of the 4th foot (Pl. XI. fig. 5) is slightly obtuse.

CORYCELLA sp., ♂. (Pl. XI. figs. 8, 9.)

There were present numerous specimens of males of *Corycella* belonging to at least two species judging by size alone, as in other characters they seemed to be in agreement. These doubtless represent the males of *C. gibbula*, *C. concinna*, and *C. carinata*, but I have not been able to refer them to their respective females. In size the larger measured ·85 mm. and the smaller ·78–·8 mm. Dahl's (5) recognition of Dana's *C. gracilis* is based on a supposed identification of a figure of a male; but Dana's (9) figures would apply equally well to any one of these specimens, and I do not think that there are any grounds for regarding his description as valid.

The proportional length of abdomen and furca in these specimens was 7 : 3; in one of Dana's figures of *C. gracilis* it is 3 : 2 and in the other 4 : 2. Cleve (2) has given figures of the male of *C. gibbula*, which agree fairly well with my specimens, except that the width of the abdomen is greater in his figures. He states that the proportion of abdomen to furca is 2 : 1, but in one figure shows it as 9 : 5, and in the other as 8 : 3, so it is possible that he may have been dealing with more than one species.

The figures (Pl. XI. figs. 8, 9) are taken from a specimen of the larger form.

Genus CORYCÆUS.

Of the genus *Corycæus*, as restricted above, there is a considerable number of more or less well described forms, which may be conveniently summarised under the grouping adopted by Dahl.

Of the forms with a very long furca, a convenient but heterogeneous group, Giesbrecht has figured *C. longistylis* and *C. furcifer*, while *C. lautus* of Dana is easily recognised from his figure.

The species of which the females have a one-jointed abdomen are, according to Giesbrecht, *C. alatus*, *C. flaccus*, and *C. elongatus*; to them Dahl adds *C. limbatus* of Brady, originally described from a male.

Corycæus robustus stands alone in having the end claw of the 2nd antenna elongated in both sexes.

Of the forms without setæ on the genital segment of the female, all of comparatively large size, Giesbrecht has dealt with *C. speciosus*, *C. danæ*, and *C. ovalis*, while Dahl accepts as a valid description the *C. vitreus* of Dana.

The remaining species, which do not fall into any of the above groups, are mostly of very small size. They all have setæ at the genital pores of the female abdomen, and may be divided into two groups according as the endopodite of the fourth foot bears one or two setæ. Of the first group *C. obtusus*, *C. gracilicaudatus*, and *C. venustus* have been figured by Giesbrecht; *C. minutus*, *C. catus*, and *C. pacificus* have been described, in his synoptic table, without figures, by Dahl, who also admits *C. latus* of Dana

and *C. huxleyi* of Lubbock. Of the second group, with two setæ on the endopodite of the fourth foot, *C. lubbocki* and *C. tenuis* have been figured by Giesbrecht; *C. anglicus* is a well-known species in British waters; *C. amazonicus*, *C. asiaticus*, *C. minimus*, and *C. africanus* figure as new species in Dahl's table; and *C. erythræus* has been described and figured by Cleve (4).

The three new species described below belong to the last group.

Corycæus longistylis Dana.

C. longistylis Dana (9).
C. varius Brady (1).
C. longistylis Giesbrecht (10).

Present in four gatherings, 5 females and 7 males.

Both sexes of *C. longistylis* are easily distinguished from *C. lautus* and *C. furcifer*, which also have a long furca, by the broad spreading 3rd thoracic segments. The female is not completely figured by Giesbrecht, but Brady's figure of the whole animal (1) (pl. lii. fig. 1), under the name *C. varius*, is fairly accurate.

Distribution. Indian Ocean, China Sea, and Tropical Pacific.

Corycæus lautus Dana.

C. lautus Dana (6).
C. lautus Dahl (5).

Present in four gatherings, 12 females and 29 males.

The female is distinguishable from that of *C. furcifer* by its larger size, 2·75 mm., *C. furcifer* ♀ measuring only 1·8 mm., and by the form of the abdomen, the anal segment being much wider in front than behind, while in *C. furcifer* it is only slightly tapered. The male of *C. lautus* (2·15 mm.) is considerably larger than that of *C. furcifer* (1·3–1·45 mm.), but otherwise resembles it rather closely in general appearance. The furca, however, is only $1\frac{1}{5}$ times as long as the rest of the abdomen, instead of almost $1\frac{1}{2}$ times as in *C. furcifer* ♂.

Both species can be readily distinguished by dissection, *C. lautus* having two setæ on the endopodite of the fourth foot, while in *C. furcifer* there is only one. Dana's (9) figure of *C. lautus* ♀ is easily recognisable as distinct from *C. furcifer*.

Distribution. Kingsmill I. (*Dana*), N.E. Atlantic.

Corycæus alatus Giesbrecht.

The female of *C. alatus* is well represented in the collection, 36 specimens occurring in five gatherings. The shape of the abdomen, as well figured by Giesbrecht, makes it unmistakable. The males of this species and *C. flaccus* present some difficulties. While the females of *C. alatus* and *C. flaccus* number respectively 36 and 12, there are 76 specimens of a male which corresponds closely to Giesbrecht's (10) description of *C. elongatus* ♂. These specimens are undoubtedly the males of *C. alatus* and *C. flaccus*,

but I have been unable to distinguish between them or to separate them satisfactorily from *C. elongatus* ♂. They can be readily picked out under a dissecting microscope, owing to the fact that, apart from differences of form, the maxillipedes are coloured a rusty-red.

Distribution. Tropical Pacific.

CORYCÆUS FLACCUS Giesbrecht.

There is nothing to add to Giesbrecht's (10) figures and description of this species, which is easily separated from *C. alatus*, the only species which it at all resembles, by the form of the abdomen and furca. There occurred twelve specimens, females, in three gatherings.

The other two species of this group, *C. elongatus* and *C. limbatus*, which Dahl (5) regards as distinct, were not found in the collection.

Distribution. Mediterranean, Indian Ocean, Tropical Pacific.

CORYCÆUS ROBUSTUS Giesbrecht.

C. venustus Brady (1).
C. robustus Giesbrecht (10).

Present in three gatherings, 10 males and 2 females.

The female is recognisable by its very large size and by the form of the genital segment, which is provided with lateral ridges and overlaps the anal segment in dorsal view.

There can be no doubt that the species which Brady (1) recorded as *C. venustus* Dana was in reality *C. robustus*. The detailed figure of the abdomen shows the genital segment overlapping the anal, in a way which is characteristic of that species alone. The figure (pl. liv. fig. 8) of the whole animal is somewhat misleading, as the artist or engraver evidently, after the picture was finished, mistook the lateral abdominal ridges for egg-sacs, and touched them up with a view to increasing the resemblance. Anyone who compares Giesbrecht's figure of *C. robustus* ♀ (11) (pl. li. fig. 38) with Brady's figure of *C. venustus* (1) (pl. liv. fig. 8) can hardly avoid the conclusion that both had the same species before them. The dimensions given by each are identical. Brady's description does not mention any characters of specific value. Giesbrecht's suggestion that Brady's *C. venustus* was really *C. obtusus* seems to me to be quite baseless.

Distribution. Red Sea, Arabian Sea, Indian Ocean, Tropical Pacific, and off Cape of Good Hope.

CORYCÆUS SPECIOSUS Dana.

An easily recognised species, well represented in the collection. It occurred in six gatherings, 22 females and 33 males.

Distribution. Mediterranean, Red Sea, Arabian Sea, Indian Ocean, Tropical Pacific, off Cape of Good Hope, Tropical and North Atlantic.

CORYCÆUS DANÆ Giesbrecht.

Dahl (5) has proposed that Giesbrecht's name of *C. danæ* should give way to Dana's *C. crassiusculus* which he believes to represent the male of the same species. There is some resemblance in the figure given by Dana to *C. danæ* ♂, but there does not seem to be any reason for upsetting a well-established name with a recognisable description on account of its possible identity with a very imperfect description with insufficient figures, to which, at best, it can only be brought home by a process of exclusion.

C. danæ occurred in seven gatherings, 44 females and 70 males.

Distribution. Mediterranean Sea, Red Sea, Arabian Sea, Indian Ocean, Tropical Pacific, off Cape of Good Hope.

CORYCÆUS GRACILICAUDATUS Giesbrecht. (Pl. XI. figs. 11, 12.)

Dahl (5) has proposed that Giesbrecht's name should be regarded as a synonym of Dana's *C. agilis*, which represents a male, length $\frac{1}{30}$ inch or ·83 mm. Females, which are almost certainly Giesbrecht's *C. gracilicaudatus*, occurred in five gatherings, nine specimens. In Dahl's key they fall in with *C. agilis*.

What I believe to be the male of the species occurred in three gatherings, 50 specimens (Pl. XI. figs. 11, 12). The length was ·76 mm. The proportions of the abdomen and furca agreed fairly well with Dana's figure of *C. agilis*, but the 3rd thoracic segment had the distance between its points less than the width of the hinder end of the 2nd thoracic segment. In Dana's figure the points are spread widely outwards. These males were remarkable in having the longest furcal seta bright red.

Distribution. Red Sea, Arabian Sea, Indian Ocean, Tropical Pacific.

CORYCÆUS CATUS Dahl. (Pl. XII. figs. 1–3.)

Dahl (5) has given the above name to a species of *Corycæus*, the female of which is only to be distinguished, according to his diagnostic table, from *C. obtusus* (*C. ovalis* of Dahl) by having outstanding sharp points on the ends of the 4th thoracic segment, whereas in *C. obtusus* the ends of that segment are short and blunt. The other characters, extracted from his table, are—Endopodite of 4th foot with one seta; abdomen with seta behind the genital opening; size not more than 1 mm.; furca comparatively short; third thoracic segment spreading, more than $\frac{3}{4}$ as broad as first, the points not reaching to the distal end of the genital segment; anal segment very little longer than its basal width.

There are several specimens of a female *Corycæus* in the collection which agree with the above diagnosis and are either *C. catus* or a new species, the probability being in favour of the former view. They occur in five gatherings, 90 specimens in all. The 3rd thoracic segment in dorsal view, though spreading,

is not so wide as in *C. obtusus*, being at its widest part, a little behind the anterior margin, only just $\frac{3}{4}$ as wide as the widest part of the cephalon (Pl. XII. fig. 1). The points of the segment are slightly contracted, the distance between them being only $\frac{2}{3}$ of the width of the cephalon. The total length is ·9 mm.

The most noticeable features, in comparison with *C. obtusus*, are the sharp slender points to both the 3rd and 4th thoracic segments (Pl. XII. fig. 2), and the somewhat larger eyes, separated by rather less than their own diameter. The form of the abdomen and furca is very similar in both species.

CORYCÆUS OBTUSUS Dana. (Pl. XII. figs. 4–6.)

Corycæus obtusus Dana.
C. obtusus Giesbrecht.
C. ovalis Dahl.

According to Dahl (5), Giesbrecht is in error in his identification of the species which he has described and figured under the name of *C. obtusus* Dana, Dana's species being different and not found subsequently. He believes that Giesbrecht's description really refers to the species which Claus (2) had described under the name of *C. ovalis*.

Under these circumstances the course least liable to cause confusion would be to reject both Dana's and Claus's names; however, for the present, I assume that Giesbrecht's name is correct. Eighteen specimens, females, of the species in question occurred in the collection, in three gatherings.

The distinguishing characters are the size, 1·05–1·1 mm., the wide spreading third thoracic segments, the blunt tips to the fourth thoracic segments (Pl. XII. fig. 5), the fine setæ in front of the genital openings, the anal segment as long as it is broad at the base and nearly as long as the furca, and the single seta on the endopodite of the fourth foot (Pl. XII. fig. 4).

Distribution. Red Sea, Arabian Sea, Indian Ocean, Tropical Pacific, Tropical Atlantic.

CORYCÆUS TENUIS Giesbrecht. (Pl. XII. figs. 8, 9.)

Of the forms with two setæ on the endopodite of the fourth foot and a moderately long furca there are two species, females, in the collection. One of these is described below as new, the other appears to be *C. tenuis*. In Dahl's (5) key the choice lies between *C. anglicus* and *C. tenuis*, the former being distinguished in the key by the presence of a corner on the inner side of the lateral prolongation of the 3rd thoracic segment and by a small hook-like ventral process on the proximal end of the abdomen. Both these characters are present in my specimens and, if the table were closely followed, they ought to be *C. anglicus*. They are, however, not that species, being distinguished from it by the shorter genital segment with much more slender setæ, the form of the anal segment, which is parallel-sided and about twice as long

as wide, and the furca, which is slightly longer and more slender. They agree well, on the other hand, as far as the text and figures go, with Giesbrecht's description of *C. tenuis*, though that writer makes no mention of the ventral hook on the genital segment.

The length, 1·05 mm., is slightly greater than that given by Giesbrecht, viz. ·9 mm. The length of the cephalothorax in the middle line, dorsal view, is ·64 mm., of the abdomen and furca ·41 mm., the proportional lengths of abdominal segments and furca being 14 : 8 : 18. Measured along the ventral margin the proportions are more nearly 12 : 10 : 17. The pigment of the eye-apparatus shows very distinctly through the body as of a blue-green colour.

The second antenna (Pl. XII. fig. 9) bears a long spine on the first basal joint and a much shorter spine, one-third as long, on the second basal joint. The inner margin of the second basal ends distally in two strong teeth. The terminal claw of the second antenna is just equal to the spine of the second basal.

The swimming-feet have no distinctive features, except that the terminal spine of the exopodite of the second foot is very slightly curved.

Six specimens were found in two gatherings.

Distribution. Indian Ocean and Tropical Pacific.

CORYCÆUS DUBIUS, sp. n. (Pl. XII. fig. 7, Pl. XIV. figs. 5–9.)

In the Maldive collections Dr. Wolfenden (11) obtained a specimen of *Corycæus*, which, following Dahl's table, ought to be *C. amazonicus*, but, as he remarks, without figures it is impossible to refer it with certainty to that species. In the Christmas Island collection there occurred one specimen of a female, described below under the name of *C. dubius*, which may well be the same species as that to which Dr. Wolfenden refers, but again the absence of figures precludes certainty. The particulars given by Dr. Wolfenden—namely, the size, 1·0 mm., and the proportionate lengths of abdomen and furca 7 : 8 : 9—come very near ·97 mm. and 21 : 23 : 28, the corresponding measurements in my specimen. The lateral prolongations of the third and fourth thoracic segments are short in both specimens. In Wolfenden's specimen, however, the spine on the second joint of the second antenna is said to be "not more than half the length of that of the 1st basal, and shorter than the distal hook," but in mine the spine in question is just one-third as long as that on the 1st basal and is distinctly longer than the distal hook.

Cleve (4) has described a species, *C. erythræus* ♀, from the Red Sea, which is very closely allied to both the above-mentioned forms, but if his description be taken as accurate it must be distinct. The female genital segment has setæ on the genital openings and a ventral hook, the endopodite of the 4th foot has two setæ, and the furca is moderately long. The size ·88–·94 mm. is slightly less than that of *C. dubius*. The proportions of the

abdominal segments and furca are 10:10:12, *i. e.* the genital and anal segments are equal; in the figure, however, the genital segment is shown as being the longer. The most noticeable difference is in the 2nd antenna, in which the spine of the 2nd basal is figured as being half as long as that of the 1st basal, and is said to reach to the distal margin of the joint. In my species the spine of the 2nd basal is only one-third as long as that of the 1st, and falls short of the distal margin of the joint by half its own length.

In view of this uncertainty it seems advisable to give the Christmas Island specimen a distinct name until the specific characters of *C. amazonicus* and *C. erythræus* are more fully known.

Female (Pl. XIV. fig. 5).—Length ·97 mm.; cephalothorax in mid-dorsal line ·58 mm.; abdomen ·39 mm. (Pl. XIV. fig. 6); proportions of abdominal segments and furca, dorsally 21 : 23 : 28, ventrally 16 : 22 : 27. Sides of cephalon parallel, Ceph. + Th. 1 being about twice as long as broad. Points of 3rd thoracic segment (Pl. XIV. fig. 7) not very long (broken in my specimen), with thickened margin on posterior edge. 4th thoracic segment short, with sharp points. Genital segment about $1\frac{1}{3}$ times as long as wide, with setæ on genital openings, in lateral view with a small sharp hook anteriorly on ventral edge. Anal segment a little longer than genital segment and slightly overlapped by it dorsally, about three times as long as wide. Furca slightly diverging, a little longer than anal segment. Furcal rami about 1×10, terminal setæ missing.

1st antenna six-jointed, proportional lengths of joints $\frac{1\ 2\ 3\ 4\ 5\ 6}{3\ 3\ 4\ 4\ 2\ 2}$.

2nd antenna (Pl. XIV. fig. 8) with spine on 1st basal very long; spine on 2nd basal short, about $\frac{1}{3}$ as long as that on 1st basal and falling short of the nearest point of distal margin of joint by about half its own length. Distal margin of 2nd basal with two sharp teeth. Terminal spine of 2nd antenna very strong, shorter than spine on 2nd basal.

Mouth-parts not satisfactorily made out.

Jointing and number of setæ of swimming-feet normal.

1st foot: exopodite with broad terminal spine, almost as long as endopodite, with fine denticulations.

2nd foot (Pl. XIV. fig. 9): terminal spine of exopodite almost straight, with moderately coarse denticulations on outer edge and two small distal serrations on inner edge (possibly an individual character and not specific).

3rd foot with long slender terminal spine on exopodite, the proportional lengths of joints and spine being 28 : 20 : 60 : 70.

4th foot (Pl. XII. fig. 7): endopodite small, with two setæ; exopodite slender, the proportional lengths of its joints being approximately 6 : 4 : 5; outer edge seta on 1st joint almost as long as 2nd joint, blunt process on 2nd basal joint internal to endopodite.

Corycæus andrewsi, sp. n. (Pl. XIII. figs. 7–9, Pl. XIV. figs. 1–4.)

Female (Pl. XIV. fig. 1).—Length ·95 mm.; cephalothorax in middle line ·64 mm., to end of thoracic spines ·7 mm.; abdomen ·31 mm. (Pl. XIV. fig. 4). Proportional lengths of abdominal segments and furca 19 : 12 : 10. Furcal rami about five times as long as wide. The genital segment is about $\frac{2}{3}$ as wide as long and $\frac{4}{5}$ as deep, in lateral view, as long; the antero-ventral angle is very marked in lateral view, being almost a right angle, rounded off at the apex and furnished with a small patch of minute spinules. The points of the 2nd thoracic segment are short and notched on the inner margin. The points of the 4th thoracic segment are very short, but sharp at the extreme tip.

The eyes are of medium size and are separated by rather less than their own diameter.

1st antenna, proportional lengths of joints $\frac{1\ 2\ 3\ 4\ 5\ 6}{4\ 3\ 4\ 5\ 3\ 2}$.

2nd antenna (Pl. XIII. fig. 9): 1st basal with long spine; 2nd basal with spine about $\frac{2}{3}$ as long as that on the first, and two rather slender teeth on its distal edge. The terminal spine of the 2nd antenna is about half as long as that on the 2nd basal.

The proportional lengths of the joints of the swimming-feet are best seen in the figures.

The outer edge spines of the exopodites of the 1st and 2nd feet (Pl. XIII. fig. 8, Pl. XIV. fig. 3) have well-developed laminæ, but on the 3rd foot they are very slightly laminate. The terminal spine on the exopodite of the 2nd foot is slightly curved, on the 1st and 3rd feet it is straight. In the 4th foot (Pl. XIII. fig. 7) the outer edge spine of the 1st joint of the exopodite is short and slender. The endopodite of the 4th foot bears two moderately large setæ.

Five specimens, females, were found in two gatherings.

Comparing *C. andrewsi* with the other species in which there are two setæ on the endopodite of the 4th foot, we find that it is separated from *C. lautus*, *C. lubbocki*, *C. tenuis*, *C. erythræus*, *C. venustus*, *C. anglicus*, and *C. africanus* by its short furca, which is less than $\frac{1}{3}$ of the length of the rest of the abdomen. In *C. amazonicus* the anal segment is said to be longer below than the genital, a fact which at once distinguishes that species. In *C. asiaticus* and *C. minimus*, according to Dahl's table, the furca agrees in being about half as long as the genital segment, but the genital segment is said to be respectively two and three times as long as the anal, while in *C. andrewsi* it is only $1\frac{1}{2}$ times as long.

Corycæus murrayi, sp. n. (Pl. XIII. figs. 1–6.)

Female (Pl. XIII. figs. 1, 2).—Length 1·2 mm.: cephalothorax in middle line ·75 mm.; abdomen and furca ·43 mm. The proportional lengths of the abdominal segments and furca in ·01 mm. are 18 : 13 : 12. The wings of the 3rd thoracic segment

(Pl. XIII. fig. 3) are long, sharp-pointed, and spreading, the width between the points being $\frac{7}{8}$ of the width of the cephalon and equal to the length of the abdomen without furca. The abdomen is wide in front and regularly tapered to the furca, the segmentation between the genital and anal segments being rather obscure. Immediately behind and exterior to each genital opening is a small blunt process or papilla projecting beyond the margin of the genital segment in dorsal view. The setæ at the genital openings are very small and might easily be overlooked.

The 2nd antenna (Pl. XIII. fig. 4) is much stouter than in *C. andrewsi* and has one strong tooth on the inner margin of the 2nd joint. The seta on the 2nd joint is rather more than half as long as that on the 1st joint, and reaches almost to the end of the inner edge tooth. The terminal claw of the 2nd antenna is strong.

The swimming-feet have no special characters. The terminal spine of the exopodite of the 2nd foot (Pl. XIII. fig. 6) is only very slightly curved. The endopodite of the 4th foot (Pl. XIII. fig. 5) bears two moderately strong setæ, and the outer edge spine of the 1st joint of the exopodite is rather short.

This species is rather closely allied to the above-described *C. andrewsi*, having, like it, setæ on the female genital segment, two setæ on the endopodite of the fourth foot, and a short furca.

Six specimens were found in three gatherings.

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EXPLANATION OF THE PLATES.

All the figures have been drawn with the aid of a camera lucida.

Plate X.

Fig. 1. *Corycella brevis* ♀, dorsal view.
2. „ „ ♀, lateral view.
3. „ „ ♀, 3rd foot.
4. „ „ ♀, 1st foot.
5. „ „ ♀, 4th foot.
6. „ „ ♀, 3rd thoracic segment, mounted.
7. *Corycella curta* ♀, 3rd foot, exopodite.
8. „ „ ♀, 2nd foot.
9. „ „ ♀, 3rd thoracic segment, mounted.
10. „ „ ♀, 2nd antenna.
11. „ „ ♀, 4th foot.

Plate XI.

Fig. 1. *Corycella curta* ♀, dorsal view.
2. „ „ ♀, lateral view.
3. „ „ ♀, abdomen, dorsal view.
4. „ „ ♂, abdomen, dorsal view.
5. „ „ ♂, 4th foot.
6. „ „ ♂, 3rd thoracic segment, mounted.
7. *Corycella brevis* ♀, 2nd antenna.
8. *Corycella* sp., ♂, dorsal view.
9. „ „ ♂, 4th foot.
10. *Corycella carinata* ♀, abdomen, lateral view.
11. *Corycæus gracilicaudatus* ♂, dorsal view.
12. „ „ ♂, lateral view.

Plate XII.

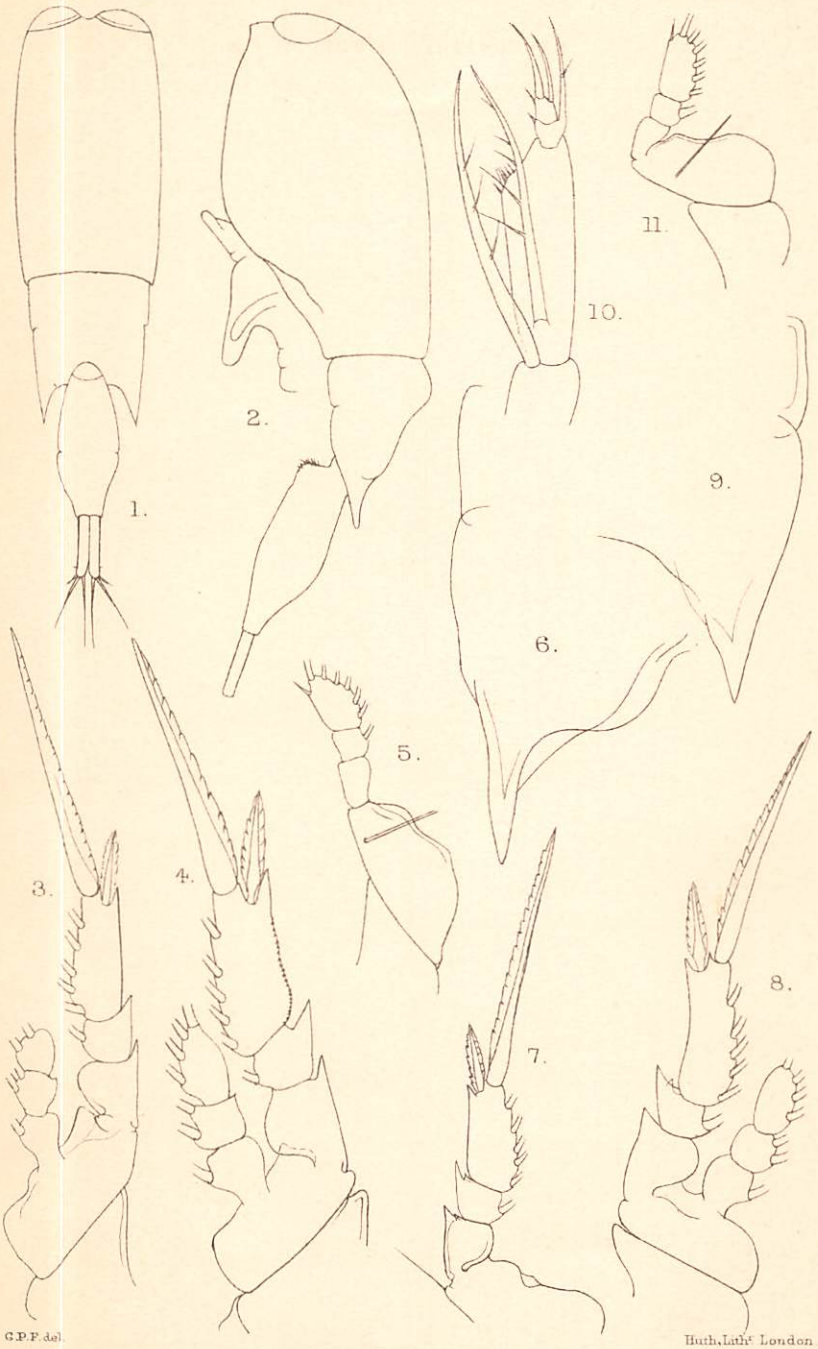
Fig. 1. *Corycæus catus* ♀, dorsal view.
2. „ „ ♀, 3rd and 4th thoracic segments, mounted.
3. „ „ ♀, 4th foot.
4. *Corycæus obtusus* ♀, 4th foot.
5. „ „ ♀, 3rd and 4th thoracic segments, mounted.
6. „ „ ♀, 2nd antenna.
7. *Corycæus dubius* ♀, 4th foot.
8. *Corycæus tenuis* ♀, 3rd and 4th thoracic segments, mounted.
9. „ „ ♀, 2nd antenna.

Plate XIII.

Fig. 1. *Corycæus murrayi* ♀, dorsal view.
2. „ „ ♀, lateral view.
3. „ „ ♀, 3rd and 4th thoracic segments, mounted.
4. „ „ ♀, 2nd antenna.
5. „ „ ♀, 4th foot.
6. „ „ ♀, 2nd foot.
7. *Corycæus andrewsi* ♀, 4th foot.
8. „ „ ♀, 2nd foot.
9. „ „ ♀, 2nd antenna.

Plate XIV.

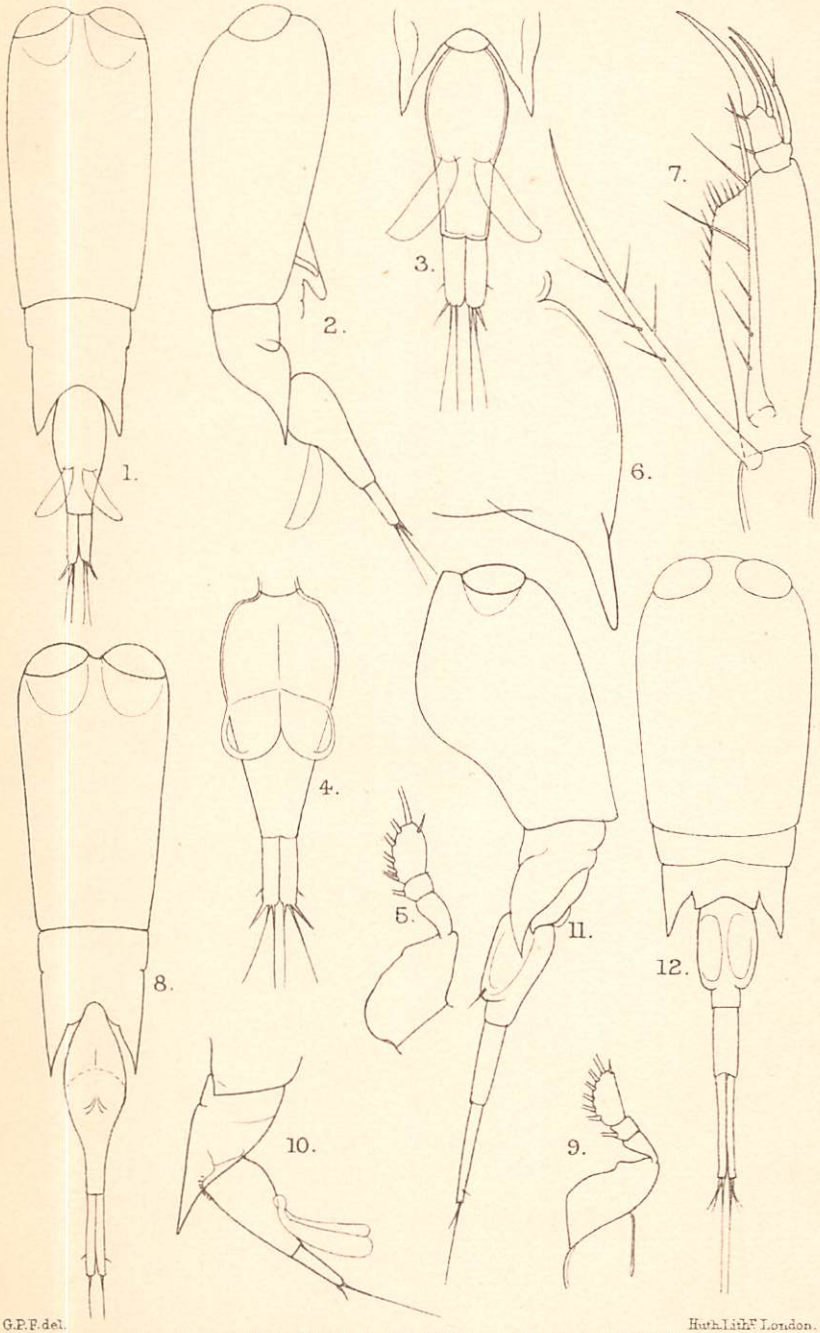
Fig. 1. *Corycæus andrewsi* ♀, dorsal view.
2. „ „ ♀, 3rd and 4th thoracic segments, mounted.
3. „ „ ♀, 1st foot.
4. „ „ ♀, abdomen, dorsal view.
5. *Corycæus dubius* ♀, dorsal view.
6. „ „ ♀, abdomen, lateral view.
7. „ „ ♀, 3rd and 4th thoracic segments, mounted.
8. „ „ ♀, 2nd antenna.
9. „ „ ♀, 2nd foot, exopodite.



G.P.F. del.

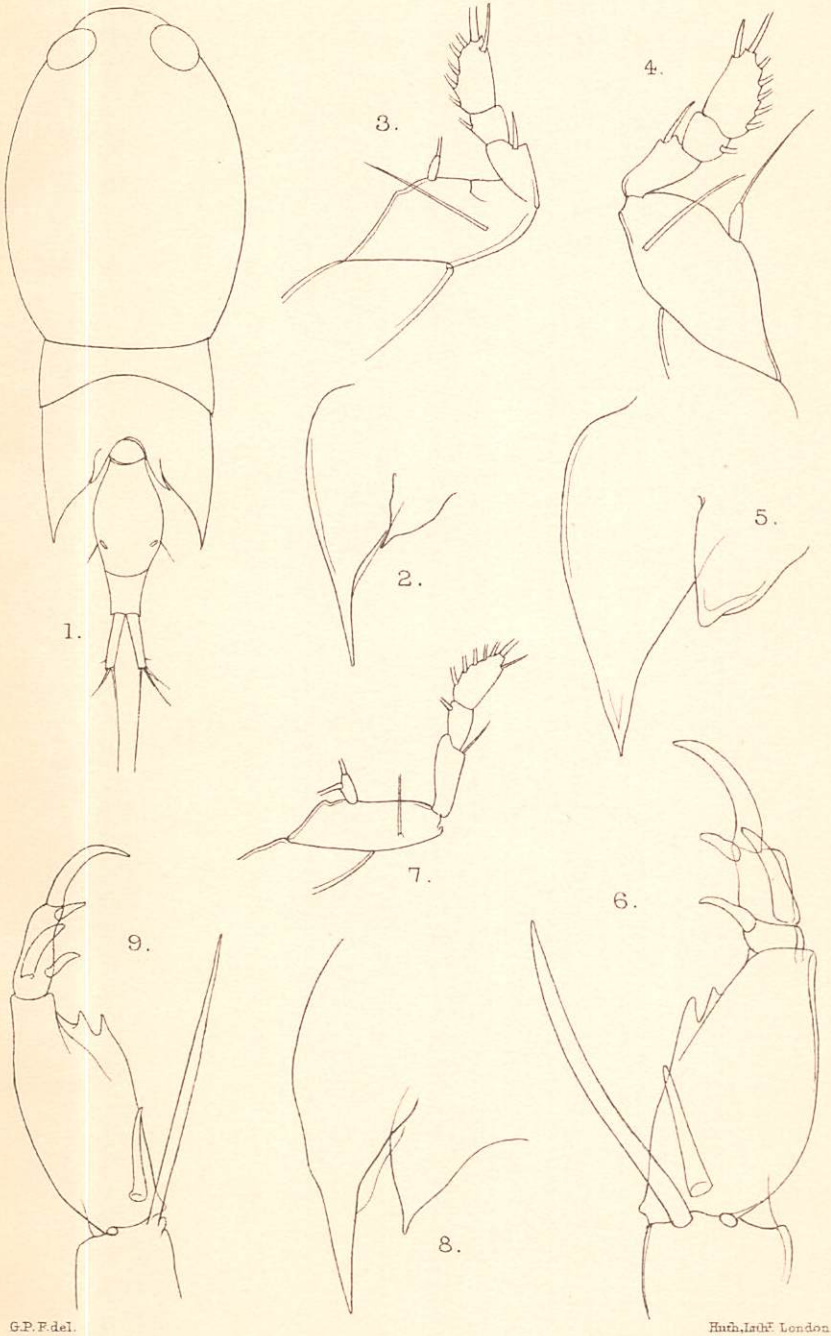
Huth, Lith^r London

1—6. CORYCELLA BREVIS.
7—11. CORYCELLA CURTA.



G.P.F. del. Huth. Lith. F. London.

1–6. CORYCELLA CURTA. 7. C. BREVIS.
8, 9. CORYCELLA sp. ♂ 10. C. CARINATA.
11, 12. CORYCAEUS GRACILICAUDATUS.



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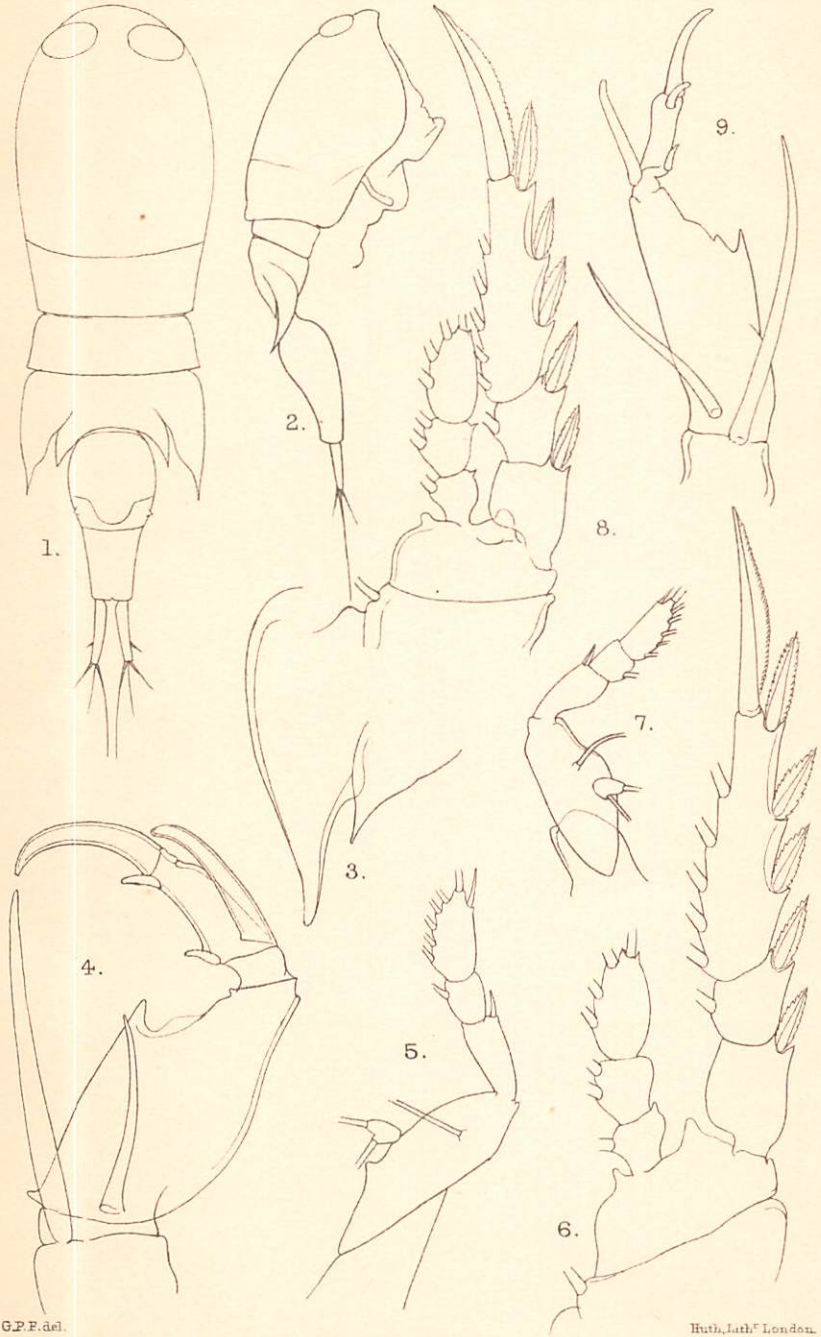
1—3. CORYCAEUS CATUS. 4—6. C. OBTUSUS
7. C. DUBIUS. 8—9. C. TENUIS.



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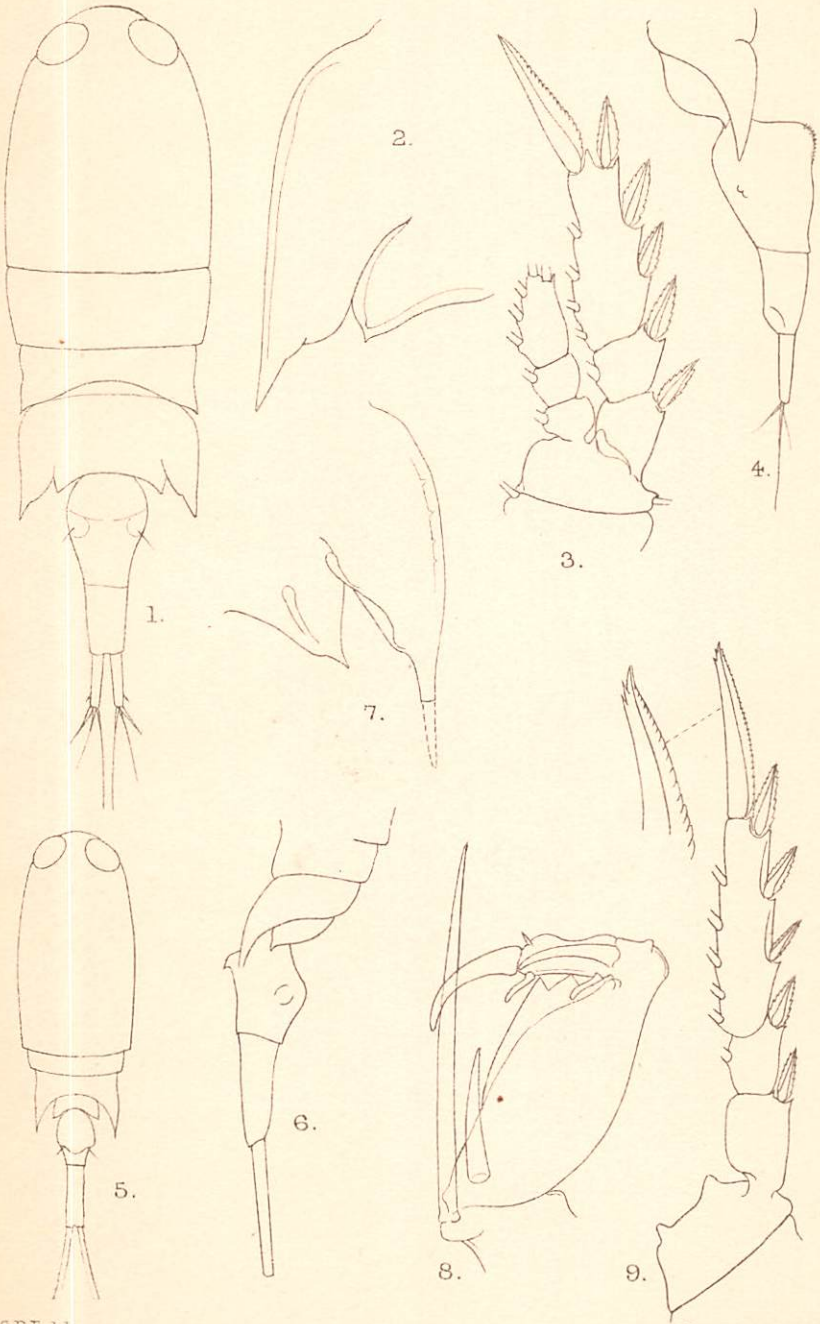
1–6. CORYCAEUS MURRAYI.
7–9. C. ANDREWSI.



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Huth, Lith.t London.

1–4. CORYCAEUS ANDREWSI.
5–9. C. DUBIUS.