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A DESCRIPTION OF SOME GOLD COAST
ENTOMOSTRACA

A DESCRIPTION OF SOME GOLD COAST ENTOMOSTRACA*

BY

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It is a matter of common observation in the Gold Coast Colony, Ashanti and the Northern Territories that the incidence of Guinea worm varies locally. Some stations shew a high percentage of cases, some a low percentage, and some are free from the disease. Why should such local variations exist? The probable explanation is the abundance, the variety or the absence of the Cyclops-host from the water sources of the locality. Cyclops belongs to a widely-distributed family, and some species of the family can be found readily in the water sources of every station. But as Guinea worm disease is not present at every station, it is evident that the presence of any species in the water is not sufficient to cause the disease. The inference seems probable that a special species of Cyclops is required to act as efficient host to the worm, and that the absence of such species from the water sources of a station coincides with the absence of Guinea worm disease. If this be true, then an exact knowledge of the species to be found at each station becomes of great practical importance, but there is at present no classification of Gold Coast Copepoda. I have, therefore, sought in the present article to furnish means for the identification of the species found in the water sources of the station of Obuasi, and in those of the country within a three-mile radius round it, as a first instalment. Obuasi is a mining village on the Gold Coast Government Railway, 124 miles from Sekondi. The country is hilly and covered with forest. During the dry season the streams are small, sluggish and full of weed. With the setting in of the heavy rains they become rapid torrents, and the weed disappears. During the first period, to the end of April, Cyclops 1 to 5 can be caught in the streams, but after the first week in May

* The thanks of the Editors are herewith given to Dr. Brady for his kindness in identifying and describing this collection of Entomostraca.—EDS.

I have failed to find them there. The country is covered with gold holes of varying depth, and along the railway by borrow-pits. The water in the shallower pits dries up, and by the end of the dry season the bottoms of the pits have been baked dust dry. After a week's heavy rain these pits begin to retain a permanent pool of water. Upon this pool frog spawn soon appears, and shortly afterwards adult females of No. 6 (*Cyclops leuckarti*, Claus) can be found. By the middle of May the intermediate nauplius forms have appeared. Then the females become gradually less numerous and males increase in number, until by the middle of July the females have become rarer than the males.

Meanwhile, Cyclops Nos. 2, 3, 4 and 5 appear in the pools in relatively small numbers, and are soon accompanied by their nauplius forms.

Lastly, Cyclops No. 7 (*C. simillimus*, sp. nov., Graham) appears in the pools (the females first, the males later), and seems to take the place vacated by *C. leuckarti*.

This account brings up the history to the end of July; and I was transferred early in August to another station.

The inference previously alluded to, that all species of Copepoda cannot act as efficient hosts to Guinea worm, is strengthened by the following considerations:—

1st.—There is a large number of species.

2nd.—The habits of the different species vary greatly. Some are surface feeders, some are found at the bottom. Some inhabit foul, some clean water. Some leave the water to climb on stalks of water-weed enveloped in a drop of water carried with them, some do not leave the water. Some are found in streams, some are not.

3rd.—The different species are infested by different parasites. I have found Nos. 3, 4 and 5 infested only by ecto-parasites (algae), and No. 6 infested by ento-parasites (worms).

4th.—The different species differ in the date of their appearance in the pools. Some are found early in May; some appear, or, at least, only became numerous, in July. The importance of this variation in date has been already explained by me in a former article (B.M.J., 11/11/05).

A careful examination of the water sources of each station, and a classification of the Copepoda found in each place, is urgently required. When it has been made, a comparison of the species of *Cyclops* found at a station where Guinea worm is common with the species of *Cyclops* found at a station where Guinea worm disease is absent would, I have no doubt, offer an explanation of the observed local variation in the incidence of the disease. The practical value of an explanation is evident. It would enable the Medical Officer to identify those water sources likely to aid in the propagation of the malady.

CYCLOPS NO. 1. ? *Cyclops bicolor*, G. O. Sars.

MALE.—Colour yellowish, with darker coloured first antennae. First antennae, 11 segments as long as $\frac{3}{4}$ cephalothorax. Total length, 0.46 mm. Cephalothorax and thorax, 0.30 mm. Furca, 0.03 mm.

FEMALE.—Colour as in male. First antennae as in male, but more slender; total length, 0.62 mm. Cephalothorax and thorax, 0.42 mm. Furca, 0.04 mm. Egg sacs, a pinkish colour, carried apart.

In both series the outward tail seta is long. Found in pool with *Calanus* No. 1; water clear, and used by village as supply.

CYCLOPS NO. 2. *Cyclops varicoides*, sp. nov. (Brady)

MALE.—Colour, transparent pale yellow. First antennae, 12 segments, nearly as long as cephalothorax. Total length, 0.59 mm. Cephalothorax and thorax, 0.38 mm. Furca, 0.04 mm.

FEMALE.—Colour as in male. First antennae as above, but more slender. Total length, 0.64 mm. Cephalothorax and thorax, 0.39 mm. Furca, 0.04 mm. Egg sacs, a yellow colour, carried close together.

Found in river water.

CYCLOPS NO. 3. *Cyclops longistylis*, sp. nov. (Brady)

MALE.—Colour, a pale yellowish-green. First antennae, 12 segments as long as cephalothorax and two thoracic segments. Total length, 0.70 mm. Cephalothorax and thorax, 0.45 mm. Furca, 0.10 mm.

FEMALE.—Colour as above. First antennae as above, but slender. Total length, 0.84 mm. Cephalothorax and thorax, 0.50 mm. Furca, 0.12 mm. Egg sacs, a violet colour, carried slightly apart.

This species is frequently covered partially or entirely by ectoparasites (algae).

It can be readily distinguished from No. 2 by the great length of the furca.

CYCLOPS NO. 4. *Cyclops virescens*, sp. nov. (Brady)

MALE.—Colour, cephalothorax a pale yellow-green; thorax a dark green. First antennae, 10 segments; copper coloured, carried a sparkling spot below the eye when swimming; an air bubble in mouth. Total length, 0.47 mm. Cephalothorax and thorax, 0.29 mm. Furca, 0.03 mm.

FEMALE.—Colour as above. First antennae as above, but lighter in colour. Total length, 0.60 mm. Cephalothorax and thorax, 0.40 mm. Furca, 0.04 mm. Egg sacs, pale yellowish, carried very close together.

Caught in rapid streams, and later on in year in ponds.

CYCLOPS NO. 5. *Cyclops pheleratus*, Koch

MALE.—Colour, a bright copper. First antennae, 10 segments, as long as the cephalothorax only. Total length, 0.60 mm. Cephalothorax and thorax, 0.38 mm. Furca, 0.05 mm. Legs of a light blue colour.

FEMALE.—Colour as above. First antennae as above. Total length, 0.77 mm. Cephalothorax and thorax, 0.46 mm. Furca, 0.08 mm. Egg sacs, a bright blue colour, carried close together.

This species leaves the water readily, and climbs on the sides of the vessel carrying a drop of water with it.

CYCLOPS NO. 6. *Cyclops leuckarti*, Claus

MALE.—Colour, a very pale yellow-green. First antennae, 17 segments, as long as the cephalothorax and thorax. Total length, 0.89 mm. Cephalothorax and thorax, 0.54 mm. Furca, 0.06 mm.

Become plentiful at end of July. I have not found males before the middle of July.

FEMALE.—Colour as above, but not so very pale. First antennae as above. Total length, 1.04 mm. Cephalothorax and thorax, 0.65 mm. Furca, 0.10 mm. Egg sacs (white) transparent, a long oval, egg very circular, sacs carried at an angle of more than 45°.

Found in stagnant pools in May. Become scarce in July.

CYCLOPS NO. 7. *Cyclops simillimus*, sp. nov. (Graham)

MALE.—Colour, very pale salmon with orange spots (circular) in cephalothorax. First antennae, 17 segments, somewhat longer than cephalothorax and thorax. Total length, 0.62 mm. Cephalothorax and thorax, 0.35 mm. Furca, 0.05 mm.

FEMALE.—Colour, pale yellow-green with circular orange spots in cephalothorax. First antennae as above, a very pale yellow. Length as above. Total length, 0.80 mm. Cephalothorax and thorax, 0.49 mm. Furca, 0.05 mm. Egg sacs, a pale yellow, carried apart.

This species also usually carries an air bubble in mouth when swimming. It differs from No. 6, being smaller and having relatively shorter tail setae.

CYCLOPS NO. 8. (*non det.*)

MALE.—Not found.

FEMALE.—Colour transparent, with slightly milky spots in cephalothorax and thorax. First antennae, 17 segments, as long as cephalothorax and thorax. Total length, 0.79 mm. Cephalothorax and thorax, 0.48 mm. Furca, 0.09 mm. Egg sacs small, milky white, carried apart.

Caught in well half a mile from the sea. Water in well clear, but slightly brackish. Frogs in well.

CALANUS NO. 1. = *Diaptomus innominatus*, sp. nov. (Brady)

MALE.—Colour, a very pale blue, the antennae being somewhat darker. First antennae, left 25 segments, right 22 segments, modified as clasper. Second antennae, 8 segments. Total length, 0.95 mm. Cephalothorax and thorax, 0.67 mm. Furca, 0.05 mm. Legs, central three pair a violet colour; fifth pair modified as claspers.

FEMALE.—Colour as above. First antennae, 25 segments. Second antennae, as above in male. Total length, 1.10 mm.

Cephalothorax and thorax, 0.75 mm. Furca, 0.07 mm. Egg sac, slightly blue, carried beneath.

When swimming appear transparent, with a dark blue longitudinal spot in about centre of cephalothorax and thorax.

I have only been able to find it in a single pond under trees, in which Cyclops No. 1 was also present.

CANTHOCAMPTUS NO. 1. = *Attheyella africana*, sp. nov. (Brady)

FEMALE.—Colour, a bright orange. First antennae, eight segments. Second antennae, four segments, forked. Total length, 0.35 mm. Cephalothorax and thorax, 0.17 mm. Egg sac nearly as long as body.

Very common in certain pools, where they occur in enormous numbers.

NOTES ON DR. GRAHAM'S COLLECTION
OF CYCLOPIDAE FROM THE AFRICAN
GOLD COAST

BY

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(Received May 14th, 1907)

The following notes are intended merely as guides to the identification of species, and do not attempt a complete morphological account of the various forms. The brief descriptions are based upon the examination of females only, the males having been left out of the account.

In addition to the various species of *Cyclops*, the collection contained specimens of a minute Cyprid, a species of *Diaptomus*, and one called by Dr. Graham *Canthocamptus*, but which belongs to the nearly-related genus *Attheyella*. Both these last-named forms appear to be new, and I propose for them the names *Diaptomus innominatus* and *Attheyella africana*; they, however, need complete figures of structural detail, which at present I am unable to give.

GENUS CYCLOPS

No. 1. ? *Cyclops bicolor*, G. O. Sars.

No. 2. *Cyclops varicoides*, sp. nov.

Anterior antennae twelve-jointed, reaching to the third cephalothoracic segment, both branches of the first four pairs of swimming feet three-jointed, fifth pair rudimentary; caudal stylets short, about as long the last caudal segment. Length of body, exclusive of tail setae, 0.77 mm.

No. 3. *Cyclops longistylis*, sp. nov.

Anterior antennae twelve-jointed, reaching to the posterior border of the first cephalothoracic segment, both branches of the first four pairs of swimming feet three-jointed, fifth pair consisting of a

single small papilliform joint with two terminal setae; caudal stylets long and slender, about six times as long as broad, and equal in length to the three preceding caudal segments. Length of body, 0.78 mm.

No. 4. *Cyclops virescens*, sp. nov.

Anterior antennae ten-jointed, reaching to the third cephalothoracic segment, first four pairs of feet having both branches three-jointed, fifth pair minute, papilliform, bearing two long apical setae; caudal stylets short, about equal in length to the last caudal segment. Length of body, 0.6 mm.

This species is very similar to *C. gracilis*, Lilljebon, but differs in having all the branches of the swimming feet triarticulate; all the inner branches in *C. gracilis* being biarticulate; there are also other minor differences.

No. 5. *Cyclops phaleratus*, Koch

No. 6. *Cyclops leuckarti*, Claus.

No. 7. *Cyclops simillimus*, sp. nov.

Anterior antennae seventeen-jointed, reaching nearly to the posterior extremity of the cephalothorax, all branches of the swimming feet triarticulate, fifth pair biarticulate, last joint simple, narrow and bearing two long apical setae; caudal stylets about twice as long as broad, and nearly twice as long as the last caudal segment. Length, 0.77 mm.

EXPLANATION OF PLATE XXXIII

CYCLOPS BICOLOR, G. O. Sars

Fig. 1.—Female with ovisacs. $\times 74$.

Fig. 2.—Male. $\times 74$.

CYCLOPS VARICOIDES, n. sp., Brady

Fig. 3.—Female with ovisacs. $\times 74$.

Fig. 4.—Male. $\times 74$.

CYCLOPS LONGISTYLIS, n. sp., Brady

Fig. 5.—Female with ovisac. $\times 74$.

Fig. 6.—Male. $\times 74$.

The figures on this and the subsequent plates are reduced from Dr. Graham's original drawings.—EDS.

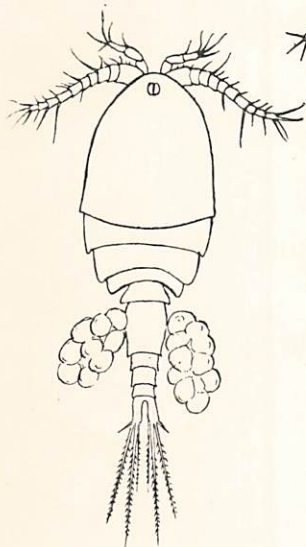


Fig. 1

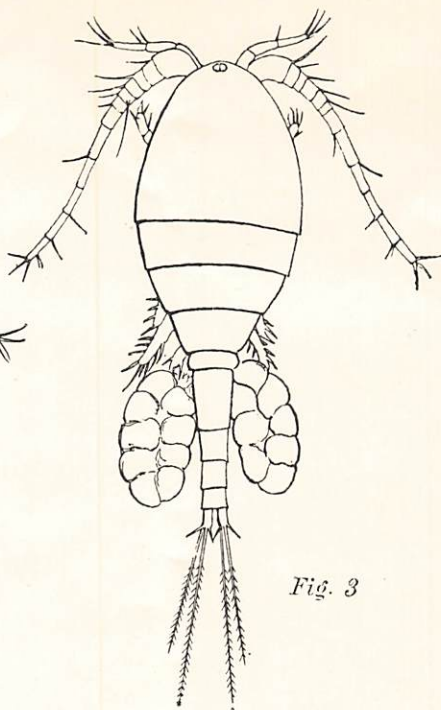


Fig. 3

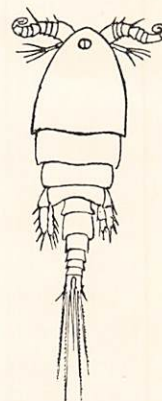


Fig. 2

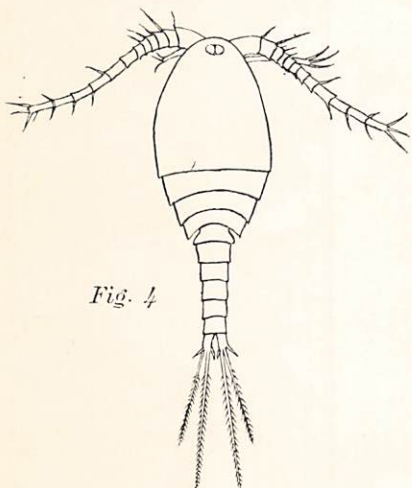


Fig. 4

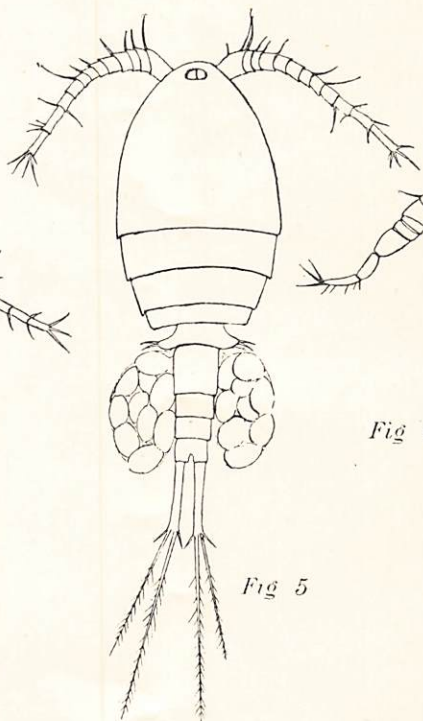


Fig. 5

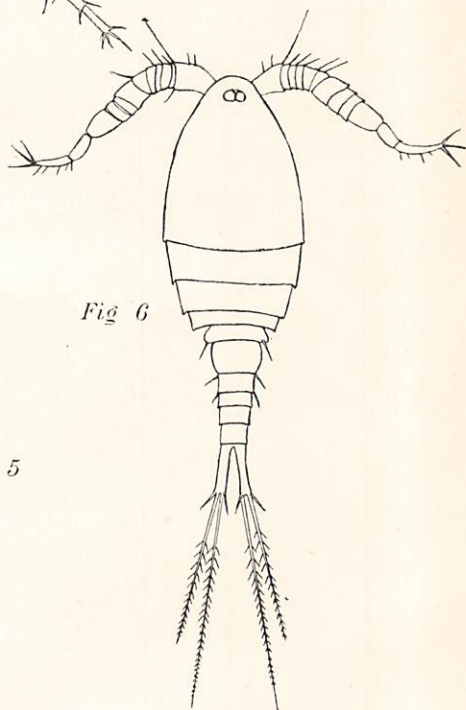


Fig. 6

EXPLANATION OF PLATE XXXIV

CYCLOPS VIRESCENS, sp. nov., Brady

Fig. 7.—Male. $\times 74$.

Fig. 8.—Female with ovisacs. $\times 74$.

CYCLOPS PHALERATUS, Koch

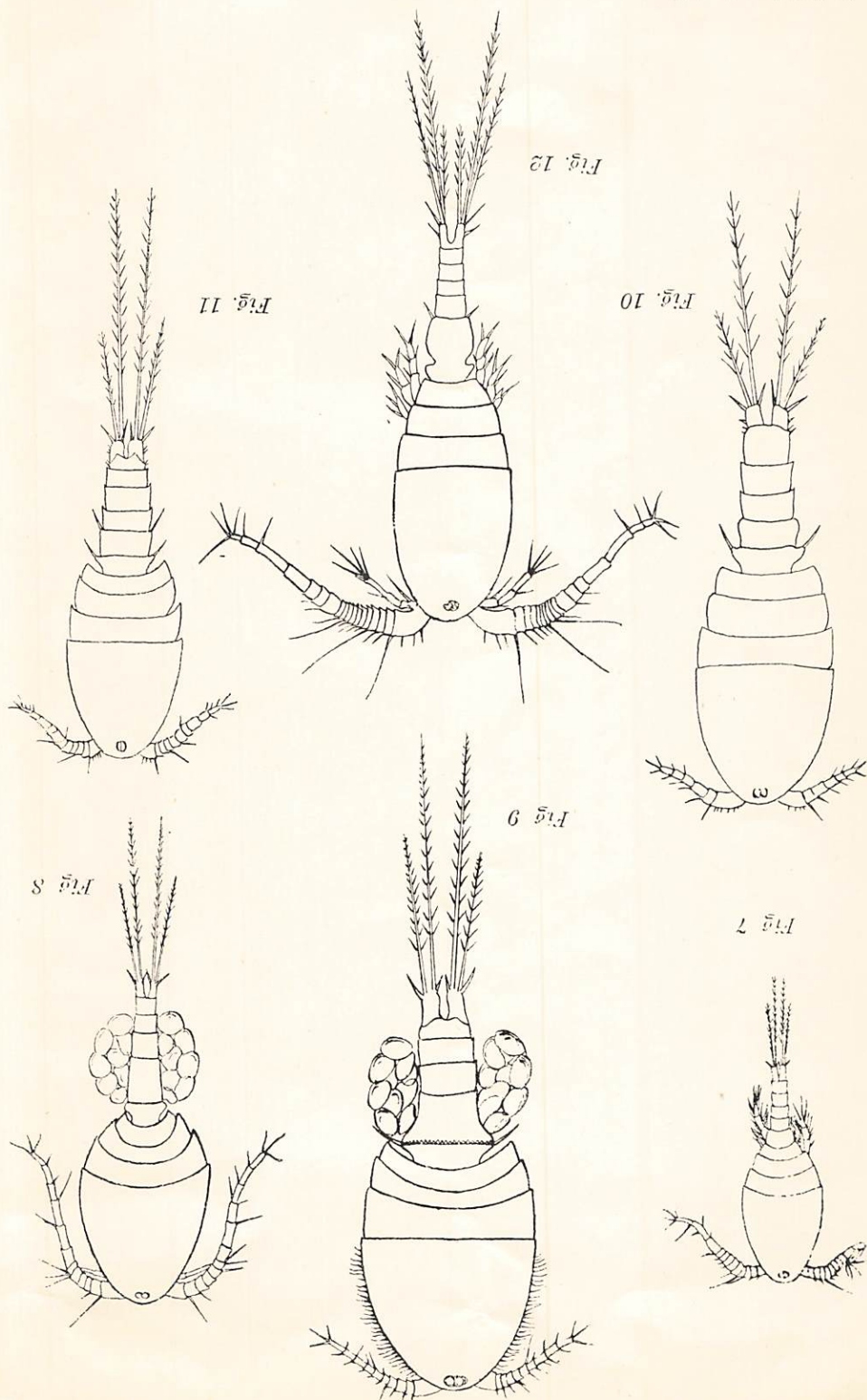
Fig. 9.—Female with ovisacs. $\times 74$.

Fig. 10.—Immature. $\times 74$.

Fig. 11.—Male. $\times 74$.

CYCLOPS LEUCKARTI, Claus

Fig. 12.—Male. $\times 54$.



EXPLANATION OF PLATE XXXV

CYCLOPS LEUCKARTI, Claus

Fig. 13.—Female with ovisacs. $\times 74$.

Fig. 14.—Immature. $\times 54$.

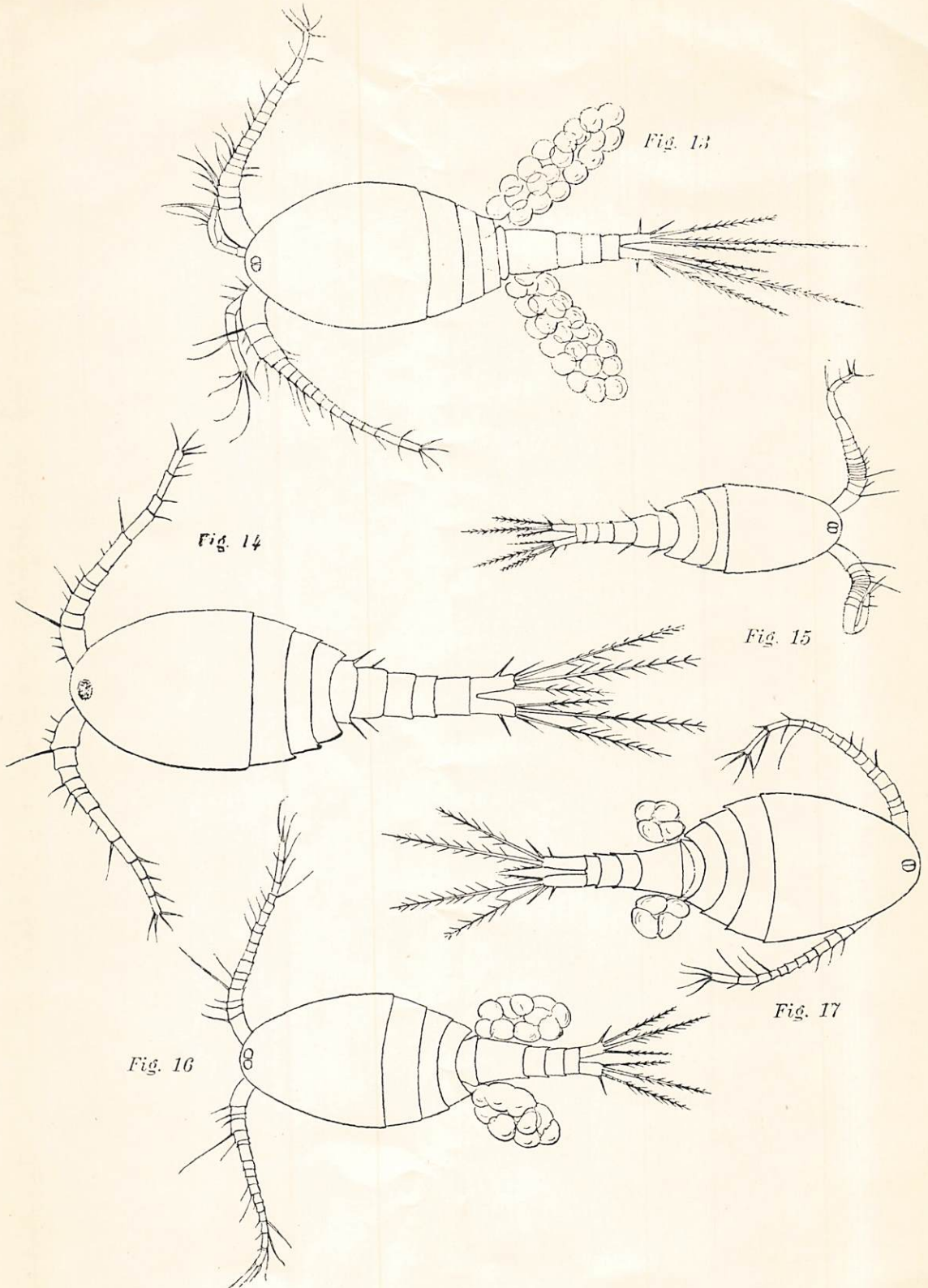
CYCLOPS SIMILLIMUS, sp. nov., Brady

Fig. 15.—Male. $\times 74$.

Fig. 16.—Female with ovisacs. $\times 74$.

CYCLOPS, ? sp.

Fig. 17.—There were no specimens of this species in Dr. Graham's collection when submitted to Dr. Brady for determination.



EXPLANATION OF PLATE XXXVI

DIAPTOMUS INNOMINATUS, sp. nov., Brady

Fig. 18.—Female. $\times 124$.

Fig. 19.—Male. $\times 124$.

Fig. 20.—Male, fifth pair of legs. $\times 102$.

Fig. 21.—Female, fifth pair of legs. $\times 102$.

ATTHEYELLA AFRICANA, sp. nov., Brady

Fig. 22.—Male. $\times 74$.

Fig. 23.—Female. $\times 74$.

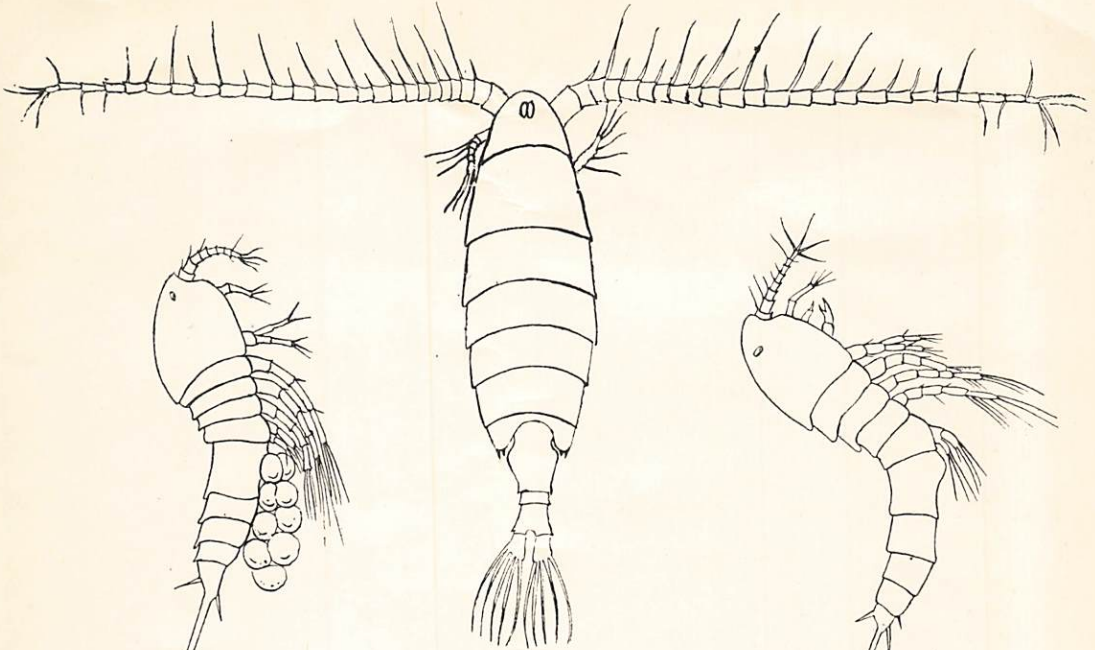


Fig. 18

Fig. 22

Fig. 23

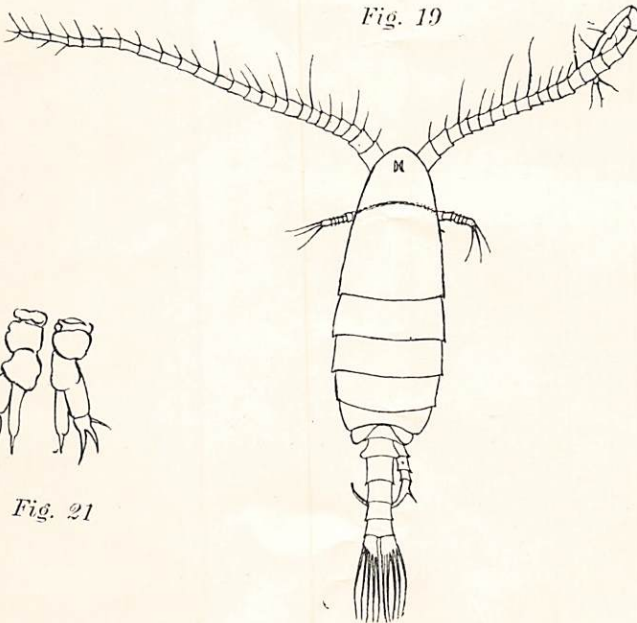


Fig. 19



Fig. 21



Fig. 20