AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY

G. O. SARS

VOL. VI

COPEPODA

CYCLOPOIDA

PARTS III & IV

CYCLOPIDÆ (continued)

WITH 16 AUTOTYPIC PLATES

BERGEN

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Colour generally light yellow or orange.

Length of adult female 1.50—1.70 mm.

Remarks.—The present species is in all probability identical with the form named by Jurine *Monoculus quadricornis rubens,* and also *Cyclops pictus* of Koch may be the same species. As, however, some doubt might arise about the identity, this species has generally been recorded under the name proposed by Fischer, who indeed was the first to give a recognisable description of it. Both *C. brevicaudatus*, Claus and *C. Clausi*, Lubbock are undoubtedly referable to the present species, which may be regarded as the type of the genus *Cyclops* as defined here.

Occurrence.—This is one of our commonest Cyclopses, being very abundant in small ponds and tarns, especially early in the spring. It is not, like most other species of the present genus, a strict bottom-form, but is generally found close to the surface of the water, swimming about rather quickly in the usual jumping manner. Male specimens are at first rather scarce, but become more numerous later in the season. Two varieties occur, the one of rather smaller size than the other and of lighter colour, and found in somewhat larger tarns. I have, however, failed to detect any other difference between the 2 forms.

Distribution.—Throughout Europe, central and northern parts of Asia, Bear Island, Spitsbergen, Algeria.

15. Cyclops abyssorum, G. O. Sars.

(Pl. XVII).

Cyclops abyssorum, G. O. Sars, Oversigt af de indenlandske Ferskvandscopepoder. Chr. Vid. Selsk. Forhandl. 1862, p. 29.

Syn.: *C. strenuus*, var. *tenuipes*, G. O. Sars.

Specific Characters.—Female. Body comparatively more robust than in *C. strenuus*, with the anterior division more tumefied in its anterior part. Cephalic segment obtusely rounded in front. Lateral parts of penultimate trunk-segment terminating in a well-marked dentiform point curving outwards. Last trunk-segment acutely produced laterally. Genital segment considerably dilated in front, its greatest width exceeding the length. Caudal rami very slender and narrow, exceeding somewhat in length the last 3 caudal segments combined, and rather divergent, each having dorsally a very distinct longitudinal keel, inner edge coarsely ciliated, seta of outer edge small and attached near the end, apical setæ comparatively longer and thinner than in *C. strenuus*, the inner medial one almost attaining the length of the tail, seta of inner corner twice as long as that of the outer. Anterior antennæ much more slender and elongated than in *C. strenuus*,

reaching, when reflexed, considerably beyond the 2nd segment, and having some of the marginal setæ rather slender. Posterior antennæ with the terminal joint longer than the penultimate one and much narrower. Anterior maxillipeds with the claw of the 2nd basal joint comparatively longer than in *C. strenuus*. Natatory legs having the same number of spines and setæ as in that species, rami, however, considerably more slender, especially those of 4th pair; apical spines of inner ramus in this pair more elongated, the outer one about half as long as the inner. Last pair of legs with the proximal joint comparatively less broad than in *C. strenuus*, distal joint about twice as long, and having the lateral spine of moderate size and attached nearly in the middle of the inner edge. Ovisacs smaller than in the preceding species and rounded oval in form, each containing a rather limited number of ova. Seminal receptacle comparatively small, with the anterior part evenly rounded.

Colour whitish grey, with a slight yellow tinge more distinct on the tail. Length of adult female 1.80—1.90 mm.

Remarks.—The above-described form is closely allied to *C. strenuus*, and has indeed by most recent authors been regarded as only a variety of that species. We know, however, at present of several species exhibiting a similar close relationship to *C. strenuus*, and together forming a natural group of Cyclopses. All of these have, it is true, been combined by Dr. Schmeil in a single species; but in recent time, the specific distinctness of some of these forms has been fully recognized. Thus Lilljeborg, in his account of the Swedish Cyclopses (1901), describes as well-defined species the 2 forms *C. scutifer*, G. O. Sars and *C. vicinus*, Uljanin, which are both recorded by Dr. Schmeil as only synonyms of *C. strenuus*. Though Lilljeborg was inclined to regard the present form as merely a "luxuriant" deep-water variety of *C. strenuus*, it is in my opinion fully as distinct from that form as are the 2 just-named species. On a closer comparison, it is in reality found to differ conspicuously from *C. strenuus*, both as to its outward appearance and the structure of some of the appendages. Among more easily observable differences I may mention the greater length of the anterior antennæ, the very narrow form of the caudal rami, and the somewhat different mutual relation in the length of the apical setæ. It may moreover be noted here, that the form of the seminal receptacle, on which Dr. Schmeil laid so much stress for the discrimination of species, is in the present species rather different from that in *C. strenuus*, as shown by the figures given in the 2 respective plates. The form recorded by me from the lake Telecki in Altai as *C. strenuus*, var. *gracilipes*, I now find to be more properly referable to the species here under consideration.

Occurrence.—I first found this species in the Maridal Lake near Christiania, where it occurred only in the deepest part of the lake, at the considerable depth of 40—50 fathoms; hence the specific name proposed. Prof. Brady has taken it under quite similar circumstances in some of the British lakes. Besides in the Maridal Lake, I have observed this form in the Vansjø, near Moss, and in the Stensfjord, a branch of the great lake, Tyrifjord. In the last-named locality it occurred rather frequently at depths varying from 6 to 12 fathoms, muddy bottom. The specimens from all 3 localities agree perfectly with each other, and the figures given by Prof. Brady show the British form also to be in full accordance with the Norwegian one.

Distribution.—Sweden (Lilljeborg), British Isles (Brady), Central Asia (the present author).

16. Cyclops lacustris, G. O. Sars.

(Pl. XVIII).

Cyclops lacustris, G. O. Sars, l. c., p. 30.

Specific Characters.—Female. Body moderately slender, with the anterior division oblong oval in form, greatest width about half the length and occurring somewhat in front of the middle. Cephalic segment comparatively large, with the frontal part almost transversely truncated. Lateral parts of penultimate trunk-segment not at all produced, being of the very same appearance as in the 2 preceding segments. Last trunk-segment likewise only very slightly prominent laterally. Genital segment of a rather characteristic form, being considerably longer than it is broad and abruptly narrowed in the middle, with the anterior part moderately dilated, the posterior part cylindric in shape. Caudal rami not attaining the length of the 3 preceding segments combined, and slightly divergent, dorsal keel obsolete, inner edge very finely ciliated, seta of outer edge small and not very far from the end, apical setæ rather slender, the inner medial one attaining fully the length of the tail, seta of inner corner more than twice as long as that of the outer. Anterior antennæ rather slender, reaching, when reflexed, beyond the 2nd segment of the body. Anterior maxillipeds with the claw of the 2nd basal joint unusually slender. Natatory legs exhibiting an armature similar to that in the 2 preceding species, rami comparatively slender, with very long setæ; outer apical spine of inner ramus in 4th pair rather small, scarcely exceeding $^1/_3$ of the length of the inner. Last pair of legs with the distal joint rather narrow, sublinear in form, lateral spine extremely minute and attached at about the middle of the inner edge, apical seta, on the other hand,

unusually long and slender. Ovisacs small, rounded, and each containing a very limited number of ova. Seminal receptacle comparatively larger than in *C. abyssorum*, anterior part evenly rounded, posterior part rather produced. Spermatophores attached to the genital opening of about the same appearance as in *C. strenuus*.

Body highly pellucid, with a very faint bluish or greenish tinge.

Length of adult female 1.50 mm., of male 1.30 mm.

Remarks.—In the case also of the present form the specific validity has not been admitted by recent authors, though in my opinion it is a very well-defined species. Lilljeborg was inclined to regard it as a variety of *C. strenuus*, which has adapted itself to a limnetic life. On a closer examination, however, the well-marked differences which this form exhibits cannot by any means be explained in this way, nor be regarded as simply accidental or varietal.

Occurrence.—I have only met with this form in our 2 largest lakes, Mjøsen and Tyrifjord. It lives there as a true limnetic form together with *Limnocalanus macrurus* and other midwater forms, being generally found swimming about close to the surface of the water.

Distribution.—Sweden (Lilljeborg).

17. Cyclops scutifer, G. O. Sars.

(Pl. XIX).

Cyclops scutifer, G. O. Sars, l. c., p. 28.

Specific Characters.—Female. Body comparatively slender, with the anterior division narrow oblong in outline, greatest width scarcely attaining half the length, and occurring somewhat in front of the middle. Lateral parts of the last 2 trunk-segments greatly produced, being expanded to triangular exstant lamellæ, which are more or less contiguous, so as to present, together with the corresponding segments, the appearance of a quadrangular shield obtecting the posterior part of the trunk. Genital segment comparatively large and very much dilated in front, with a small knob-like prominence on each side, posterior part gradually narrowed. Caudal rami scarcely longer than the last 2 segments combined and only very slightly divergent, dorsal keel only faintly indicated, inner edge finely ciliated; seta of outer edge rather remote from the end, apical setæ very unequal in length, the inner medial one much the longest, seta of inner corner more than twice as long as that of the outer. Anterior antennæ rather slender, reaching, when reflexed, considerably beyond the 2nd segment of the body, and clothed with comparatively long setæ. Posterior antennæ with the terminal joint scarcely longer than the penultimate one. Anterior maxillipeds resembling in

structure those in *C. lacustris*. Natatory legs armed as in the 3 preceding species, rami moderately slender, the inner one in 4th pair with the outer apical spine very small; spines of outer ramus in all pairs rather thin; seta attached inside the 1st basal joint in 4th pair much coarser than in the other pairs. Last pair of legs with the proximal joint comparatively small, distal joint more than twice as long, with the lateral spine of moderate size and attached somewhat beyond the middle. Ovisacs generally very small, rounded, each containing a very limited number of ova. Seminal receptacle of moderate size and evenly rounded both in front and behind. Spermatophores attached to the genital opening unusually large, projecting beyond the side of the genital segment

Body highly pellucid and generally almost colourless, in some cases, however, exhibiting a beautiful emerald green hue.

Length of adult female 1.20—1.40 mm, of male 1.10 mm.

Remarks.—This form was considered by Dr. Schmeil as only a variety of *C. strenuus;* but Lilljeborg has subsequently, in his account of the Swedish Cyclopses, vindicated its specific distinctness. It is especially recognisable by the extraordinary development in the female of the epimeral plates on the last 2 trunk-segments, which gives the body a rather characteristic appearance and has indeed given rise to the specific name *scutifer*.

Occurrence.—I have met with this form rather abundantly in several of our larger lakes, for instance in the Maridal and Lut Lakes near Christiania, where it lives as a true limnetic form. It also occurs in mountain lakes at the limit of perpetual snow, and is indeed the only Crustacean to be found there.

Distribution.—Sweden (Lilljeborg), Northern part of Siberia (the present author).

18 Cyclops vicinus, Uljanin.

(Pl. XX).

Cyclops vicinus, Uljanin, Crustacea of the Expedition of A. Fedtschenko in Turkestan (in Russian). p. 30, Pl. X, figs. 1—7.

Syn.: *Cyclops strenuus*, Schmeil (not Fischer).
„ „ *pulchellus*, Brady (not Koch).

Specific Characters.—Female. Body moderately slender, with the anterior division oblong oval in form and somewhat tumefied in front. Lateral parts of penultimate trunk-segment produced in the form of acutely triangular extant lappets; those of last segment likewise produced, though less so than in *C. scutifer*. Genital segment about as long as it is broad at the base, and gradually narrowed behind. Caudal rami long and slender, equalling in length the last 3 segments

combined, and only slightly divergent, dorsal keel well marked, inner edge minutely ciliated; seta of outer edge not very far from the end, apical setæ not much elongated, the inner medial one about twice the length of the ramus, seta of inner corner more than twice as long as that of the outer. Anterior antennæ comparatively shorter and stouter than in the preceding species, reaching, when reflexed, scarcely beyond the middle of the 2nd body-segment; number of joints generally only 16, the 8th and 9th joints being confluent. Posterior antennæ with the terminal joint a little longer and narrower than the penultimate one. Natatory legs with the rami moderately slender, terminal joint of outer ramus in all pairs with only 2 spines outside; outer apical spine of inner ramus in 4th pair very small and rudimentary. Last pair of legs resembling in shape those in *C. strenuus*, the distal joint being rather short and stout, with the lateral spine well developed and attached about in the middle. Ovisacs of moderate size and oval in shape. Seminal receptacle comparatively small, resembling that in *C. abyssorum*.

Colour, according to Lilljeborg, somewhat variable, the body being in some cases of a uniform whitish grey hue, in other cases tinged with brownish red or reddish yellow.

Length of adult female about 1.70 mm.

Remarks.—This form was first described by the Russian naturalist Uljanin, but was subsequently considered by Dr. Schmeil to be only a variety of *C. strenuus*. Its specific distinctness has, however, been vindicated by Lilljeborg, and I have myself, by an examination of specimens from Mongolia, had an opportunity of confirming this view. The habitus-figure given in Dr. Schmeil's work, as pointed out by Lilljeborg, evidently refers to this species, and also the form described in Prof. Brady's Monograph as *C. pulchellus*, is unquestionably referable to the same species.

The most conspicuous character distinguishing this form from *C. strenuus* is the very prominent lateral parts of the last 2 trunk-segments, in which respect it somewhat resembles *C. scutifer*. It differs, however, very markedly both from this and the 3 other species described above, in the armature of the natatory legs, the terminal joint of the outer ramus having in all pairs only 2 spines outside.

Occurrence.—This form, it is true, has not yet been observed within the limits of our country; but I cannot doubt that, on a closer investigation, it will be found to occur at any rate in the south-eastern part of the country, since Lilljeborg has recorded it from immediately adjacent tracts of Sweden. The figures here given are from specimens found in a sample taken in the delta of

the Volga, and kindly sent to me for examination from the Zool. Museum of St. Petersburg.

Distribution.—Sweden (Lilljeborg), British Isles (Brady), Germany (Schmeil), Turkestan (Uljanin), Mongolia and Mouth of Volga (the present author).

19. Cyclops insignis, Claus.

(Pl XXI).

Cyclops insignis, Claus, Weitere Mittheilungen über Cyclopiden, Arch. Nat. Hist. 23 Jahrg. Bd. 1, p. 209, Pl. XI, figs. 8—13.

Syn.: *Cyclops quadricornis*, Koch.

Specific Characters.—Female. Body rather slender, though having the anterior division somewhat dilated and of regularly elliptical form, its greatest width somewhat exceeding half the length and occurring in the middle. Lateral parts of penultimate trunk-segment not produced, and of same shape as those of the 2 preceding segments. Last trunk-segment rather broad and sharply pointed on each side. Tail slender and attenuated, though shorter than the anterior division; genital segment very broad in front and abruptly constricted behind. Caudal rami long and slender, considerably exceeding in length the last 3 segments combined, and narrow linear in form, being only very slightly divergent, each ramus exhibiting dorsally a very distinct longitudinal keel; seta of outer edge somewhat remote from the end, apical setæ not much elongated, the inner medial one being scarcely more than twice as long as the ramus, seta of inner corner very little longer than that of the outer, which is rather strong, almost spiniform. Anterior antennæ of moderate length, reaching, when reflexed, about to the middle of the 2nd segment of the body, and composed of only 14 joints, the 8th to 11th joints being coalesced into a single elongate segment. Posterior antennæ with the terminal joint scarcely longer than the penultimate one. Natatory legs more strongly built than in the preceding species, terminal joint of outer ramus in all of them having only 2 spines outside; outer apical spine of inner ramus in 4th pair less rudimentary, exceeding half the length of the inner. Last pair of legs with the distal joint rather narrow and somewhat constricted near the base, lateral spine of moderate size and attached about in the middle. Ovisacs large, oval, and carried closely appressed to the sides of the tail. Seminal receptacle short and broad, of a somewhat irregular transversely elliptical form and not produced behind. Spermatophores attached to the genital opening placed at right angles to the axis of the body.

Colour yellowish, with a more or less distinct olivaceous tinge.

Length of adult female amounting to 2.60 mm.

Remarks—This is an easily recognisable species, though, according to the structure of the several appendages, it seems to be referable to the same group as the 4 preceding species. It is, however, at once distinguished from them by its much larger size, the 14-articulate anterior antennæ, the peculiar shape of the genital segment, and the long and slender caudal rami. The *C. qvadricornis* of Koch seems to be this species; but as the name qvadricornis is a collective one, it cannot be maintained. The form recorded by Brady as *C. insignis* is scarcely that species.

Occurrence.—I have taken this form in great numbers early in the spring from ponds near Christiania. Later in the summer it was not observed.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), Bohemia (Fric).

20. Cyclops vulgaris, Koch.

(Pl. XXII).

Cyclops vulgaris, Koch, Deutschlands Crustaceen, Myriopoden und Arachniden, Heft 21, Tab. 4.

Syn.: *Monoculus qvadricornis viridis*, Jurine.
„ *Cyclops viridis*, Fischer,
„ „ *brevicornis*, Claus.

Specific Characters.—Female. Body comparatively robust, with the anterior division rather dilated and broadly oval in form, greatest width considerably exceeding half the length Cephalic segment very large and broadly rounded in front. Lateral parts of penultimate trunk-segment of same appearance as those of the 2 preceding segments. Last trunk-segment only slightly produced laterally. Tail scarcely exceeding half the length of the anterior division; genital segment moderately dilated in front and gradually narrowed behind. Caudal rami scarcely longer than the last 2 segments combined, and only very slightly diverging, without any dorsal keel, but with the inner edge finely ciliated; seta of outer edge not very far from the end, middle apical setæ rather elongated, the inner one attaining half the length of the body; seta of inner corner more than twice as long as that of the outer. Anterior antennæ not very slender, being scarcely longer than the cephalic segment, and composed of the usual number of joints (17). Posterior antennæ with the terminal joint longer than the penultimate one. Anterior maxillipeds more strongly built than in the preceding species. Natatory legs likewise rather strong; terminal joint of outer ramus in all of them with only 2 spines outside, inner edge of same joint in the 1st pair with only 2 setæ, in the other pairs with 3 setæ; apical spines of inner ramus in 4th pair of almost equal size. Last pair of legs with the proximal joint unusually broad and conically produced outside, distal joint very small, with the lateral spine extremely minute and rudimentary. Ovisacs large, fusiform in shape, and con-

siderably divergent. Seminal receptacle with the anterior part transversely elliptical in form and sharply defined from the posterior part, which is exserted on each side to a band-like stripe.

Colour rather variable, in some cases bluish green, in other cases with a distinct olivaceous tinge, and not uncommonly light whitish grey, with dark patches at the end of the segments.

Length of adult female amounting to 1.90 mm.

Remarks.—This form has generally been recorded under the name *C. viridis* Jurine. I consider it, however, to be scarcely admissible to appropriate as specific designations the several varietal names appended by Jurine to his species *Monoculus quadricornis* and merely indicating the diversity in colour found by him in different specimens. As moreover the colour both in the present species and in several other Cyclopses is rather variable, the Jurinian names would in fact be of very little significance to the species. The form recorded by Koch as *C. vulgaris* is unquestionably this species, and as the name *viridis* applied to the species by Fischer is of much later date, it must cede to that proposed by Koch. The *C. brevicornis* of Claus is likewise identical with the present species. On the other hand, the North American form named by Herrick *C. viridis* var. *americana*, is scarcely the same species, as the armature of the natatory legs is essentially different.

The present species, which belongs to the group of Cyclopses distinguished by Dr. Schmeil as the bicuspidatus group, may be easily recognised by its comparatively robust body, the large divergent ovisacs, and the peculiar structure of the last pair of legs.

Occurrence.—It is one of our commonest Cyclopses, and thus fully deserves the specific name proposed for it by Koch. I have met with it at all seasons of the year, both in small ponds and ditches and in larger lakes, where it descends to rather considerable depths.

Distribution.—Sweden (Lilljeborg), British Isles (Brady), Germany (Schmeil), France (Richard), Russia (Fischer), Central Asia and Siberia (the present author).

21. Cyclops gigas, Claus.

(Pl. XXIII).

Cyclops gigas, Claus, Weitere Mittheilungen über Cyclopiden; Arch. Nat. Hist 23 Jahrg, B. 1, p. 201, Pl. XI, figs. 1—5.

Syn.: *Cyclops ingens*, Herrick.

Specific Characters.—Female. Body much larger than in *C. vulgaris* and of a somewhat more slender form, though otherwise exhibiting a very similar

appearance. Caudal rami, however, conspicuously more produced, even exceeding in length the last 3 segments combined, and only very slightly divergent; middle apical setæ rather slender, the inner one being considerably longer than the tail, seta of inner corner comparatively shorter than in *C. vulgaris*, not attaining twice the length of the outermost one. Both pairs of antennæ of a very similar structure to that in the said species. Natatory legs likewise rather similar; apical spines of inner ramus in 4th pair, however, conspicuously more slender. Last pair of legs, as in *C. vulgaris*, with the proximal joint rather expanded and conically produced outside, distal joint, however, comparatively narrower, with the lateral spine almost obsolete. Ovisacs very large and of a somewhat irregular form, projecting far beyond the caudal rami, and less divergent than in *C. vulgaris*. Seminal receptacle with the anterior part comparatively larger than in that species, occupying almost the whole width of the genital segment.

Colour light yellowish brown, with a more or less distinct olivaceous or greenish tinge.

Length of adult female amounting to 2.50 mm.

Remarks.—This form has been considered by Dr. Schmeil and several other authors to be only a large variety of the preceding species. Lilljeborg has, however, vindicated its specific distinctness, and I have myself, by a careful comparison, come to the same result. It may be at once distinguished from *C. vulgaris*, not only by its unusually large size, but also by the much more produced caudal rami, and by the somewhat different mutual relation in the length of the apical setæ. The last pair of legs also, though somewhat resembling those in the said species, differ slightly in the shape of the distal joint. Finally, the seminal receptacle is of a somewhat different shape, as shown by the figure here given. The North American form *C. ingens* of Herrick seems to be referable to the present species.

Occurrence.—I have taken this form in great abundance from some small ponds near Christiania. The specimens were observed early in the spring, even before the ice was wholly melted, and as all of them at that time were fully grown and to some extent thickly covered with Epizoa, they must have developed at a much earlier period, during the winter. Later in the spring their number decreased gradually, and at the approach of the summer they seemed wholly to have disappeared. The species also occurs in some of our larger lakes and more generally in very considerable depths. In Lake Mjøsen I have even taken it at the great depth of 100 fathoms; and though most of the specimens there obtained were immature, they could with full certainty be adduced to the present species, on account of the considerably produced caudal rami. Lilljeborg has found the species under quite similar circumstances in some of the Swedish lakes.

Distribution.—Sweden (Lilljeborg), British Isles (Brady), Germany (Claus), Bear Island (Lilljeborg), North America (Herrick).

22. Cyclops capillatus, G. O. Sars.

(Pl. XXIV).

Cyclops capillatus, G. O. Sars, l. c., p. 39.

Specific Characters.—Female. Body not very slender, resembling somewhat in its general form that in *C. vulgaris*, anterior division regularly elliptical in outline, with the greatest width somewhat exceeding half the length and occurring in the middle. Lateral parts of penultimate trunk-segment of same shape as those on the 2 preceding segments. Last trunk-segment comparatively small, not produced laterally. Genital segment resembling in shape that in *C. vulgaris*, being about as long as it is broad at the base. Caudal rami comparatively slender, almost attaining the length of the last 3 segments combined, and not at all divergent; seta of outer edge rather slender and far from the end, being attached near the middle; middle apical setæ slender, the inner one attaining half the length of the body; seta of inner corner scarcely longer than that of the outer. Anterior antennæ about the length of the cephalic segment, and composed of only 12 joints, the 7 short articulations intercalated in other species between the 7th and the antepenultimate joint being in the present form by concrescence reduced to 2 elongated segments; lateral setæ of the antennæ unusually long and slender. Posterior antennæ with the terminal joint considerably longer than the penultimate one. Natatory legs moderately slender, terminal joint of outer ramus in all of them armed outside with 3 spines, inner edge of same joint in 1st pair with 3, in the other pairs with 4 setæ; inner ramus of 4th pair very narrow, with the terminal joint fully as long as the other 2 combined, apical spines of this ramus slender and elongated, the inner one slightly longer than the outer. Last pair of legs with the proximal joint rather broad and expanded, distal joint much smaller, rounded oval in form and having the lateral spine very small. Ovisacs narrow fusiform in shape and greatly diverging. Seminal receptacle with the anterior part transversely oval and evenly rounded in front, posterior part only slightly produced.

Colour yellowish, with a more og less distinct olivaceous or brownish tinge.

Length of adult female about 1.80 mm.

Remarks.—This is a very distinct species, though in size and general appearance somewhat resembling *C. vulgaris*. From this species it is, however, markedly distinguished by the smaller number of joints in the anterior antennæ,

the structure of the caudal rami, and the rather different armature of the natatory legs.

Occurrence.— I have found this form only quite occasionally in 3 different localities, viz., in the Maridal Lake near Christiania, in Mjøsen and in Tyrifjord. In all 3 localities it occurred at a depth of from 2 to 6 fathoms on a muddy bottom.

Distribution.—Sweden (Lilljeborg).

23. Cyclops lucidulus, Koch.

(Pl. XXV).

Cyclops lucidulus, Koch, l. c. Heft 21, 10.

Syn.: *Cyclops vernalis*, Fischer.
„ „ *elongatus*, Claus.
„ „ *parcus*, Herrick.

Specific Characters.—Female. Body comparatively slender and attenuated, with the anterior division oblong oval in form, greatest width about half the length and occurring somewhat in front of the middle. Lateral parts of the pedigerous segments rather prominent, those of penultimate segment terminating in a tooth-like projection curved outwards. Last trunk-segment rather broad, and acutely produced on each side. Genital segment conspicuously dilated in front and gradually tapered behind. Caudal rami rather long and slender, equalling in length the last 3 segments combined, and scarcely at all divergent; seta of outer edge attached not far from the end, middle apical setæ long and slender, the inner one exceeding the length of the tail; seta of inner corner very thin and somewhat longer than that of the outer, which is rather thick, spiniform. Anterior antennæ scarcely longer than the cephalic segment, and generally composed of the normal number of joints (17), though in some cases 18 joints may be counted, on account of a subdivision of the 7th joint. Posterior antennæ with the terminal joint about the length of the penultimate one. Natatory legs comparatively strongly built, with the spines rather coarse and varying somewhat in number, the terminal joint of the outer ramus having in some cases 3 spines outside in one or other of the pairs instead of the usual number (2); setæ of inner edge of this joint in 1st pair 2, in the other pairs 3; apical spines of inner ramus in 4th pair subequal in size. Last pair of legs very small, proximal joint not much dilated, distal joint narrow, with the lateral spine of moderate size and attached near the end. Ovisacs comparatively large, oval in form, and only slightly diverging. Seminal receptacle transversely elliptical in form, and

scarcely produced at all behind. Spermatophores attached to the genital opening small and placed longitudinally close together.

Colour light yellowish, with a more or less distinct reddish or ochraceous tinge.

Length of adult female 1.40—1.50 mm.

Remarks.—I have thought it right to maintain my original identification of this form with *C. lucidulus* of Koch, in spite of the controversy of Dr. Schmeil. It is true, that the description given by Koch of this species, as pointed out by Dr. Schmeil, is quite insufficient, but nevertheless I find it possible to recognise the species from the figure accompanying the description, and Dr. Rehberg is also of opinion that my identification is correct. The species has generally been recorded under the name *vernalis* proposed for it by Fischer; but this name is of much later date than that given to the species by Koch. The *Cyclops elongatus* of Claus is certainly the same species, and this is also the case with the North American form *C. pareus*, Herrick, of which I have had specimens for examination kindly sent to me by Prof. Forbes. From the 3 preceding species it is easily distinguished by its slender elongated body, rather resembling in this respect some of the succeeding species, especially *C. pulchellus* and *C. bisetosus*. It is, however, well distinguished also from these species by several well-marked characters, as shown hereafter.

Occurrence—The present species is found rather commonly throughout the whole country in shallow pools and ditches. Especially early in the spring it abounds in nearly all the ponds round Christiania, but is also met with, though not so frequently, at other seasons. A smaller variety is often found having the caudal rami somewhat shorter, but otherwise agreeing with the typical form.

Distribution.—Throughout Europe, Central Asia, New Siberian Islands, Ceylon, North America.

24. Cyclops robustus, G. O. Sars.

(Pl. XXVI).

Cyclops robustus, G. O. Sars, l. c., p. 36.

Syn.: *Cyclops brevispinosus*, Herrick.

Specific Characters.—Female. Body considerably more robust than in the preceding species, with the anterior division rather dilated and oval in form, greatest width exceeding half the length and occurring about in the middle. Cephalic segment very large and evenly rounded in front. Lateral parts of

penultimate trunk-segment conspicuously produced, each terminating in a sharp, somewhat extant point. Last trunk-segment likewise acutely produced laterally. Genital segment longer than it is broad at the base, anterior part slightly dilated, posterior sub-cylindrical in shape. Caudal rami comparatively shorter and less narrow than in *C. lucidulus*, not attaining the length of the last 3 segments combined, and scarcely divergent; seta of outer edge rather coarse and somewhat remote from the end; apical setæ unusually strong, almost spiniform, the inner medial one nearly attaining half the length of the body and, like the outer one, quite smooth in its proximal half, the remaining part being clothed with short, coarse hairs; seta of inner corner only slightly longer than that of the outer. Anterior antennæ scarcely as long as the cephalic segment, and composed of the normal number of joints (17). Posterior antennæ with the terminal joint not longer than the penultimate one. Natatory legs comparatively strongly built; terminal joint of outer ramus in all of them armed outside with 3 coarse spines and having the normal number of setæ inside; seta attached outside the terminal joint of the inner ramus in 1st pair of normal appearance, in the other pairs, however, transformed into a strong denticulated spine; apical spines of same ramus in 4th pair subequal in size. Last pair of legs somewhat resembling those in *C. vulgaris*, the proximal joint being considerably expanded, and the distal joint of inconsiderable size, with the lateral spine very minute. Ovisacs of moderate size and oval in form, being only slightly divergent. Seminal receptacle transversely elliptical in form, and only very slightly produced behind.

Colour light yellowish brown.

Length of adult female 1.20 mm.

Remarks.—Dr. Schmeil does not admit the specific validity of this form, which he only regards as a variety of the preceding species. I think, however, that it ought to be kept apart, and Lilljeborg has also, in his account of the Swedish Cyclopses, described it as a well-defined species. It may indeed readily be distinguished from *C. lucidulus* by its much more robust body, for which reason also the specific name *robustus* was proposed by the present author. In the structural details also several well-marked differences are found to exist, as shown in the above-given diagnosis. According to Lilljeborg, the North American form *C. brevispinosus* Herrick is identical with the present species.

Occurrence.—This form seems in our country to be of rather rare occurrence. I have only met with it quite occasionally at the border of 3 of our larger lakes, viz., the Nordsjø Lake, Maridal Lake and Mjøsen. In habits it is a true bottom-form, keeping constantly close to the ground.

Distribution.—Sweden (Lilljeborg), North America (Herrick).

25. Cyclops pulchellus, Koch.

(Pl. XXVII).

Cyclops pulchellus, Koch, l. c. Heft 21, 2.

Syn.: *Cyclops bicuspidatus*, Claus.
" " *Lubbocki*, Brady.
" " *insignis*, Brady (not Claus).
" " *odessanus*, Schmankewitsch.
" " *helgolandicus*. Rehberg.

Specific Characters.—Female. Body rather slender and attenuated, with the anterior divison oblong oval in outline, greatest width about equalling half the length and occurring in the middle. Lateral parts of penultimate trunk-segment not extant, resembling in shape those of the 2 preceding segments. Last trunk-segment only slightly produced laterally. Genital segment comparatively large and gradually narrowed behind. Caudal rami long and slender, generally attaining the length of the last 3 segments combined, and not at all divergent; seta of outer edge at a considerable distance from the apex, being attached not far from the middle of the corresponding ramus; middle apical setæ rather slender, the inner one being much the longer and about equalling the tail in length; seta of inner corner very little longer than that of the outer, and much thinner. Anterior antennæ about the length of the cephalic segment and generally 17-articulate; in some instances, however, by the concrescence of the 8th to 11th joints, only 14-articulate. Posterior antennæ with the terminal joint slightly longer and narrower than the penultimate one. Natatory legs comparatively slender, with only 2 spines outside the terminal joint of the outer ramus; apical spines of inner ramus in 4th pair rather unequal, the outer one being much the larger. Last pair of legs with the proximal joint comparatively small, distal joint more than twice as long, and narrow linear in form, lateral spine rather slender and attached at a short distance from the end. Ovisacs generally narrow oblong or fusiform in shape, and considerably diverging. Seminal receptacle with the posterior part rather produced.

Colour generally yellowish, with a more or less distinct orange or reddish tinge, in some instances, however, uniformly whitish grey.

Length of adult female amounting to 1.30 mm.

Remarks.—My original identification of this form with *C. pulchellus* of Koch has not been admitted by Dr. Schmeil, and the present species has therefore by most recent authors, and also by myself, been recorded under the name *bicuspidatus* given to it by Claus. I now find, however, that there are so many things which speak in favour of my former identification, that I have thought it right to maintain it here. It must indeed be assumed that Koch has observed

this rather common Cyclops, and no other species can properly be identified with his *C. pulchellus* than the present one. The *C. Thomasi* of Forbes, which both by Dr. Schmeil and Lilljeborg is recorded as only a synonym of the present form, is in reality a well-defined species, as I have convinced myself by an examination of specimens kindly sent to me by Prof. Forbes. The form at first described by Prof. Brady as *C. Lubbocki* and subsequently as *C. insignis* Claus, seems to be referable to the variety *odessana* of the present species, and this is also the case with *C. helgolandicus* of Rehberg. I have been in some doubt as to whether the said variety should not more properly be regarded as a separate species, as it differs from the typical form not only in the smaller number of joints in the anterior antennæ, but also in the comparatively shorter caudal rami, and in a somewhat different shape of both the inner ramus of the 4th pair of legs and of the last pair of legs, as shown in the accompanying plate. The characteristic position of the seta on the outer edge of the caudal rami, as also the mutual relation of the innermost and outermost apical setæ, is, however, exactly as in the typical form, and I have also found in some instances, that the elongate 8th joint of the anterior antennæ exhibits distinct traces of a subdivision into the usual 4 short articulations.

Occurrence.—The present species is found not unfrequently in ponds and ditches round Christiania, especially in the spring. I have also met with it occasionally at the border of larger lakes, or in pools left by the reflux of the water. In the living state it is easily recognised from the allied species by the considerably diverging ovisacs, the ova of which often exhibit a light reddish colour, as indicated in the figure given by Koch. The variety *odessana* I have taken early in the spring from small water-holes with grassy bottom, the water of which very soon evaporated.

Distribution.—Throughout the greater part of Europe, Central Asia (G. O. Sars), North America (Herrick).

26. Cyclops bisetosus, Rehberg.

(Pl. XXVIII).

Cyclops bisetosus, Rehberg, Beitrag zur Kentniss der freilebenden Süsswasser-Copepoden. Abhandl. nat. Verein zu Bremen, Bd. VI, Heft 3, p. 543.

Syn.: *Cyclops bicuspidatus*, G. O. Sars (not Claus).

Specific Characters.—Female. Body still more slender and attenuated than in the preceding species. Lateral parts of penultimate trunk-segment not extant. Last trunk-segment slightly produced laterally. Genital segment rather

tumid, being scarcely longer than it is broad. Caudal rami narrow and somewhat tapered, being about as long as the last 3 segments combined and not at all diverging; seta of outer edge not far from the apex, middle apical setæ slender, the inner one exceeding the length of the tail; seta of inner corner very small, shorter than that of the outer. Anterior antennæ scarcely as long as the cephalic segment, and 17-articulate. Posterior antennæ with the terminal joint a little longer than the penultimate one. Maxillipeds of the usual structure. Natatory legs exhibiting a similar armature to that in the preceding species; rami, however, comparatively shorter; terminal joint of inner ramus in 4th pair scarcely longer than the middle one, and having the outer apical spine shorter than the inner. Last pair of legs somewhat resembling those in *C. pulchellus*, though having the distal joint comparatively shorter and the lateral spine less produced. Ovisacs rather large, oval in form, and only slightly divergent. Seminal receptacle with the anterior part surrounded by a clear area forming on each side an auricular corner, posterior part somewhat produced and evenly rounded.

Colour whitish grey, with a more or less distinct reddish or brownish tinge.

Length of adult female 1.00 to 1.25 mm.

Remarks.—This form was formerly erroneously identified by the present author with *C. bicuspidatus* Claus, which belongs to the preceding species. It has subsequently been described by Dr. Rehberg as *C. bisetosus*, and this name is now generally adopted for the present species. In its external appearance it has a general resemblance to *C. pulchellus*, but is of somewhat smaller size, and is moreover distinguished by some differences in the structure of the caudal rami and legs, as also in the manner in which the ovisacs are carried in relation to the axis of the body.

Occurrence.—This species is by no means uncommon. I have taken it in many parts of the country, and always in very shallow pools and ditches, which are subjected to more or less complete exsiccation during the summer.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), Siberia (G. O. Sars), Spitsbergen (Richard).

27. Cyclops crassicaudis, G. O. Sars.

(Pl. XXIX).

Cyclops crassicaudis, G. O. Sars, l. c., p. 40.

Specific Characters.—Female. Body less slender than in the preceding species, with the anterior division oblong oval in form, greatest width about half the length and occurring somewhat in front of the middle. Lateral parts of the trunk-segments somewhat prominent. Last trunk-segment rather broad,

being produced on each side to an acuminate projection pointing outwards. Tail comparatively short and thick, exceeding only very slightly half the length of the anterior division: genital segment unusually dilated throughout its whole length, exhibiting a slight constriction in front of the middle. Caudal rami of moderate size, about equalling in length the last 2 segments combined, and scarcely at all divergent; seta of outer edge not far from the apex, middle apical setæ slender, the inner one exceeding the length of the tail; seta of inner corner extremely small and rudimentary, scarcely more than half as long as that of the outer. Anterior antennæ about the length of the cephalic segment, and composed of only 12 joints, the 8th and 9th joints, as in *C. capillatus*, answering to the 7 short articulations succeeding the 7th joint in other species. Posterior antennæ and maxillipeds about as in the preceding species. Natatory legs unusually short and stout, with the joints of the rami broad and expanded, number of spines and setæ as in the 2 preceding species; inner ramus of 1st pair with the apical spine unusually strong and somewhat curved, that of 4th pair with the terminal joint scarcely longer than the middle one, and having the inner apical spine longer than the outer. Last pair of legs resembling in shape those in *C. bisetosus*. Ovisacs rather large, oblong oval in form, and slightly divergent. Seminal receptacle with the anterior part somewhat expanded laterally, posterior part only slightly produced. Spermatophores attached to the genital opening of quite unusual size, kidney-shaped and placed close together longitudinally to the axis of the body.

Colour uniformly whitish grey.

Length of adult female 0.90—1.10 mm.

Remarks.—This form ranges among the smaller species of the present genus, and may readily be recognised by its comparatively short and stout tail, which character indeed has given rise to the specific name proposed. In the structural details also it exhibits several well-marked differences from the species described in the preceding pages.

Occurrence.—I have taken this form occasionally in shallow pools and ditches near Christiania. It is not very active in its motions, and in this respect somewhat resembles the next species.

Distribution.—Sweden (Lilljeborg), Bohemia (Schmeil).

28. Cyclops langvidus, G. O. Sars.

(Pl. XXX).

Cyclops langvidus, G. O. Sars, l. c., p. 40.

Specific Characters.—Female. Body moderately slender, with the anterior division oval in form, greatest width somewhat exceeding half the length and

occurring about in the middle. Lateral parts of the penultimate trunk-segment of the same shape as those of the 2 preceding ones. Last trunk-segment only slightly produced laterally. Tail of moderate length, with the genital segment rather large, though evenly contracted behind. Caudal rami almost attaining the length of the last 3 segments combined, and very slightly divergent; seta of outer edge somewhat remote from the apex; middle apical setæ slender, the inner one somewhat exceeding the tail in length; seta of inner corner extremely small and rudimentary, that of outer corner normally developed. Anterior antennæ about equal in length to the cephalic segment, and composed of only 16 joints, the 3rd and 4th joints being confluent. Posterior antennæ with the terminal joint longer than the penultimate one. Maxillipeds rather short and stout, though otherwise exhibiting the usual structure. Natatory legs to some extent imperfectly developed, both rami of 1st pair being only biarticulate, and the inner ramus of 2nd pair likewise biarticulate, outer ramus of this pair, on the other hand, as also both rami of the 2 succeeding pairs, distinctly 3-articulate; terminal joint of outer ramus in these pairs provided outside with 2 spines, inside with 3 setæ; apical spines of inner ramus in 4th pair comparatively short, the inner one being the longer. Last pair of legs distinctly biarticulate, resembling in structure those in *C. pulchellus*, the distal joint being rather slender, sublinear in form, with the lateral spine attached close to the end. Ovisacs generally of very large size, reaching in some cases far beyond the caudal rami, and somewhat divergent. Seminal receptacle with the anterior part transversely elliptical in form, posterior part very little produced.

Colour uniformly whitish grey.

Length of adult female about 1.00 mm.

Remarks. This form was described by the present author as early as the year 1863, and has subsequently been also observed by some other authors. It is chiefly distinguished from the species described in the preceding pages by the imperfect development of the 2 anterior pairs of natatory legs, agreeing in this respect with the 2 succeeding species. From the latter it may be readily recognised by its comparatively larger size, by the greater number of joints in the anterior antennæ, and by the normally developed last pair of legs.

Occurrence.—I have met with this form occasionally in shallow pools and ditches near Christiania, especially in the spring. The movements of the animal, when alive, are very slow and are not, as usual, effected by abrupt jumps, but more resemble an even course through the water, during which the body turns now

the right, now the left side upwards. This peculiar mode of movement has indeed given rise to the specific name proposed.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), France (Richard).

29. Cyclops diaphanus, Fischer.

(Pl. XXXI).

Cyclops diaphanus, Fischer, Beiträge zur Kenntniss der in der Umgegend von St. Petersburg sich findenden Cyclopiden (Fortsetzung). Bulletin Soc. Imp. Moscow; Vol. XXVI, p. 93, Pl. III, figs. 6—12.

Syn.: *Cyclops nanus*, G. O. Sars.
„ „ *minutus*, Claus.

Specific Characters.—Female. Body somewhat more slender than in the preceding species, with the anterior division less dilated, the greatest width scarcely exceeding half the length. Lateral parts of penultimate trunk-segment resembling in shape those of the 2 preceding segments. Last trunk-segment very slightly produced laterally. Genital segment comparatively large and protuberant below, being longer than it is broad at the base, and gradually contracted behind. Caudal rami scarcely attaining the length of the last 3 segments combined and not at all divergent; seta of outer edge at a considerable distance from the apex, being attached almost in the middle; inner medial seta much longer than the outer, and attaining almost half the length of the body; seta of inner corner, as in *C. langridus*, very small and rudimentary. Anterior antennæ scarcely as long as the cephalic segment, and composed of only 11 joints. Posterior antennæ and maxillipeds about as in the preceding species. Natatory legs, as in that species, imperfectly developed, both rami of the 1st pair and the inner one of the 2nd pair being only biarticulate; rami of the 2 succeeding pairs of normal structure and comparatively more slender than in *C. langridus;* apical spines of inner ramus in 4th pair rather elongated, the inner one attaining fully the length of the terminal joint. Last pair of legs extremely small, with the proximal joint imperfectly defined from the segment, distal joint narrow linear in form, with a very small lateral spine near the apex. Ovisacs of moderate size and only very slightly divergent. Seminal receptacle resembling in shape that in *C. langridus.*

Body rather pellucid, with a faint yellow or reddish tinge.

Length of adult female 0.70—0.90 mm.

Remarks.—Lilljeborg has pointed out that the species originally described by the present author as *C. nanus*, is in reality identical with that recorded by Fischer at a somewhat earlier date under the name *C. diaphanus*, and that the *C. minutus* of Claus is referable to the same species. Dr. Schmeil, who, how-

ever, had not himself had an opportunity of examining the species, placed it, together with *C. gracilis* Lilljeborg, in a separate group of Cyclopses (his gracilis-diaphanus group). This arrangement cannot, however, be accepted. The 2 said species are in reality very different, though apparently agreeing as to the number of joints in the anterior antennæ and the imperfect development of the last pair of legs. I am inclined to refer *C. gracilis*, which, however, I unfortunately have not myself had an opportunity of examining, to the succeeding genus, *Mesocyclops*, whereas the present species is unquestionably a genuine *Cyclops*, and indeed so closely allied to *C. langridus*, that Dr. Schmeil was inclined to regard my *C. nanus*, which as above stated is only a synonym of *C. diaphanus*, as merely a variety of *C. langridus*, the latter being referred by that author to his "*bicuspidatus* group". The specific distinctness of the present form cannot, however, by rights be disputed, as it differs from *C. langridus*, not only in its much smaller size, but also in the smaller number of joints in the anterior antennæ, the imperfect development of the last pair of legs, and finally in the shape of the caudal rami.

Occurrence.—I have only met with this form in a few places near Christiania, viz., in some shallow grassy pools lying close to the border of a large lake, the Sognsvand, and apparently left by the reflux of the water in the lake. A single specimen was also found last summer in Mjøsen, near Hamar, at a depth of about 4 fathoms.

Distribution.—Sweden (Lilljeborg), Germany (Claus), Russia (Fischer).

30. Cyclops abyssicola, Lilljeborg.

(Pl. XXXII).

Cyclops abyssicola, Lilljeborg, Svenska Arterna af Sl. Cyclops. Kongl. Sv. Vet. Akad. Handl. Bd. 35, No. 4, p. 66, Pl. IV, figs. 16—19.

Specific Characters.—Female. Body comparatively short and stout, with the anterior division regularly oval in outline, greatest width considerably exceeding half the length and occurring in the middle, frontal part narrowly rounded. Lateral parts of the trunk-segments only slightly prominent and rounded off at the end. Last trunk-segment very small and scarcely produced laterally. Genital segment, on the other hand, of unusual size, exceeding in length the 3 succeeding segments combined, and considerably dilated in front, being conspicuously broader than the last trunk-segment. Caudal rami not much produced, being scarcely longer than the last 2 segments combined, and not at all divergent; seta of outer edge not far from the apex and attached somewhat dorsally; middle apical setæ rather strong and somewhat unequal, the inner one being much the larger

and nearly equalling the tail in length; seta of inner corner very small, that of the outer about twice as long and spiniform. Anterior antennæ short and stout, not nearly attaining the length of the cephalic segment, and composed of only 10 joints thickly clothed with coarse diverging setæ. Posterior antennæ likewise unusually short, with the 3 outer joints nearly equal in length. Maxillipeds also comparatively short and stout, especially the anterior ones. Natatory legs, as in the 2 preceding species, imperfectly developed, both rami of 1st pair and the inner one of 2nd pair being biarticulate; spines of outer ramus unusually long and slender, especially those in the 1st pair; seta attached outside the terminal joint of inner ramus in all the pairs spiniform; apical spines of this joint in 4th pair rather produced, the inner one being somewhat longer than the outer. Last pair of legs extremely small and attached to the outer corners of the last trunk-segment, proximal joint confluent with the segment, distal joint narrow, sublinear in form, with the lateral spine issuing from the apex itself, immediately inside the apical seta. Ovisacs, according to Lilljeborg, of small size. Seminal receptacle rather large, with the anterior part very broad, forming on each side a rounded expansion, posterior part somewhat produced, linguiform.

Colour whitish, with a faint rosy or violaceous tinge.

Length of adult female 0.75 mm.

Remarks.—This is a very distinct and easily recognisable species, differing conspicuously in its outward appearance from those described in the preceding pages, and somewhat recalling certain species of the genus *Platycyclops*, especially *P. fimbriatus* (Fischer). It is, however, a genuine *Cyclops*, as shown by the structure of the legs, and in this respect closely approaches the 2 preceding species.

Occurrence.—Some specimens of this pretty form were taken last summer in Mjøsen, near Hamar, from a depth of 4—6 fathoms, muddy bottom. According to Lilljeborg, it descends in some instances to considerably greater depths, having been found by that author in one of the Swedish lakes (Ifsjö) down to 25 fathoms. It was indeed for this reason that the specific name *abyssicola* was proposed.

Distribution.—Sweden (Lilljeborg).

31. Cyclops varicans, G. O. Sars.

(Pl. XXXIII).

Cyclops varicans, G. O. Sars, l. c., p. 43.

Syn.: *Cyclops orientalis*, Uljanin.

Specific Characters.—Female. Body not very slender, with the anterior division oval in form, greatest width somewhat exceeding half the length and

occurring about in the middle. Cephalic segment comparatively large and evenly rounded in front. Last trunk-segment somewhat produced laterally. Tail only slightly exceeding half the length of the anterior division; genital segment conspicuously dilated in front and gradually narrowed behind. Caudal rami about the length of the last 2 segments combined and scarcely divergent; seta of outer edge somewhat remote from the apex, middle apical setæ rather slender, the inner one considerably longer than the outer, and about equalling in length the tail and last trunk-segment combined; seta of inner corner very thin, though considerably longer than that of the outer. Anterior antennæ comparatively short, not attaining the length of the cephalic segment, and only composed of 12 joints. Posterior antennæ with the last joint scarcely longer than the penultimate one. Anterior maxillipeds short and stout, with the claw of the 2nd basal joint almost straight. Natatory legs with both rami in all the pairs biarticulate, 4th pair, in the living animal, generally projecting to each side of the trunk; inner ramus of this pair with both apical spines well developed, the outer one about half as long as the inner. Last pair of legs with the proximal joint wholly confluent with the segment, its seta springing off from the lateral corner, distal joint small, narrow conical in form, and having an extremely minute spinula in the middle of the inner edge, apical seta rather slender. Ovisacs comparatively large, oblong in form, and somewhat divergent. Seminal receptacle small, rounded, exserted on each side to a narrow band-like stripe.

Colour whitish, with a fainte yellow or reddish tinge.

Length of adult female 0.70—0.90 mm.

Remarks.—This species, together with the succeeding one, is included by Dr. Schmeil in a particular group of Cyclopses (his *varicans-bicolor* group), chiefly characterised by the biarticulate rami on all the natatory legs, and the imperfect development of the last pair of legs. The same characters are also exhibited by some exotic Cyclopses. Thus, of the several species described by the present author from the lake Tanganyika, Central Africa, *C. attenuatus*, *C. Cunningtoni* and *C. pachycomus* belong to this group. The same is also the case with the Australian species, *C. Arnaudi*, G. O. Sars. Finally the form recorded by Dr. Lepeschkin as *C. diaphanus*, var. *dengizica* represents another species of the said group. According to the statement of Dr. Schmeil the *C. orientalis* of Uljanin is identical with the present species, and I am also of opinion, that the *C. rubellus* of Lilljeborg can hardly be distinguished specifically.

Occurrence.—This form seems to be of rare occurence in our country. I have only met with it in some grassy ponds near Christiania. The specific name *varicans* alludes to the peculiar manner in which the 4th pair of natatory

legs are borne in the living animal, these legs being constantly extended laterally to each side of the trunk, without apparently partaking in the movements of the other pairs.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), Poland (Lande), Turkestan (Uljanin), Central Africa (G. O. Sars), New Zealand (G. O. Sars), North America (Herrick).

32. Cyclops bicolor, G. O. Sars.

(Pl. XXXIV).

Cyclops bicolor, G. O. Sars, l. c., p. 44.

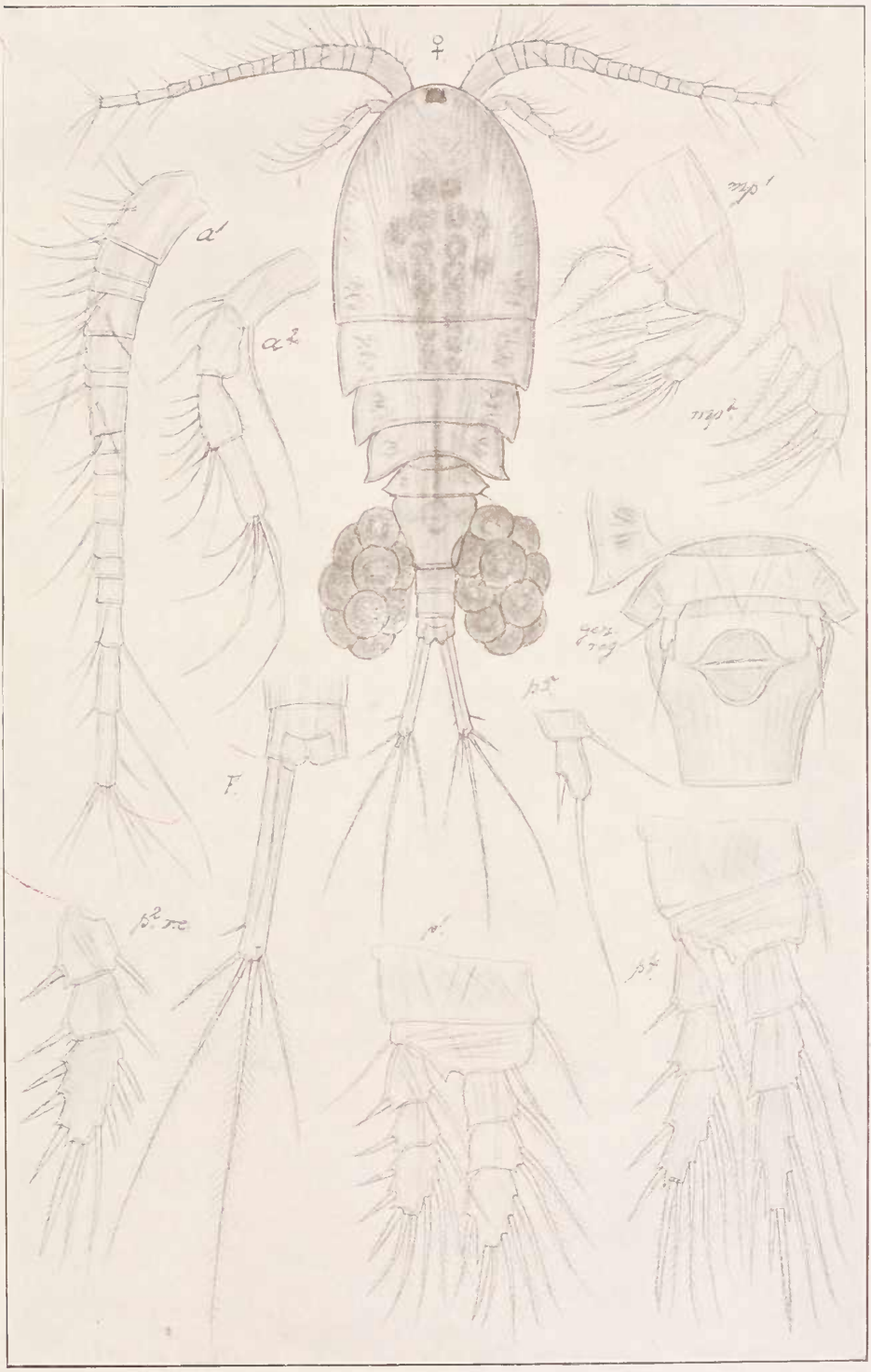
Syn.: *Cyclops diaphanus*, Rehberg (not Fischer).

Specific Characters.—Female. Body comparatively short and stout, with the anterior division oval in form, greatest width slightly exceeding half the lenght and occurring about in the middle. Last trunk-segment less produced laterally than in *C. varicans*. Tail rather slender, equalling $^2/_3$ of the length of the anterior division; genital segment only slightly dilated in front and gradually tapered behind, its anterior parts rather protuberant below. Caudal rami about the length of the last 2 segments combined and of linear form, being not at all divergent; seta of outer edge not far from the apex, the 2 middle apical setæ remarkably thick and densely covered with cilia, the inner one only slightly longer than the outer and much shorter than the tail; seta of inner corner about twice as long as that of the outer and much thinner. Anterior antennæ still shorter than in *C. varicans*, only slightly exceeding half the length of the cephalic segment, and composed of only 11 joints. Posterior antennæ with the last joint considerably longer than the penultimate one. Maxillipeds agreeing in structure with those in *C. varicans*. Natatory legs, as in that species, with both rami in all the pairs biarticulate; 4th pair rather smaller than the preceeding pairs, and having the rami comparatively narrow, outer apical spine of inner ramus very small and rudimentary, inner spine long and slender. Last pair of legs still more reduced than in *C. varicans*, its proximal joint wholly coalescent with the segment, distal joint extremely small, without any trace of a lateral spine. Ovisacs of moderate size and carried closely appressed to the tail. Seminal receptacle transversely elliptical in form and almost occupying the whole width of the genital segment.

Colour rather peculiar, the anterior division of the body being, as a rule, nearly colourless, whereas the whole tail and the anterior antennæ exhibit a beautiful golden yellow or orange hue.

Length of adult female scarcely exceeding 0.60 mm.

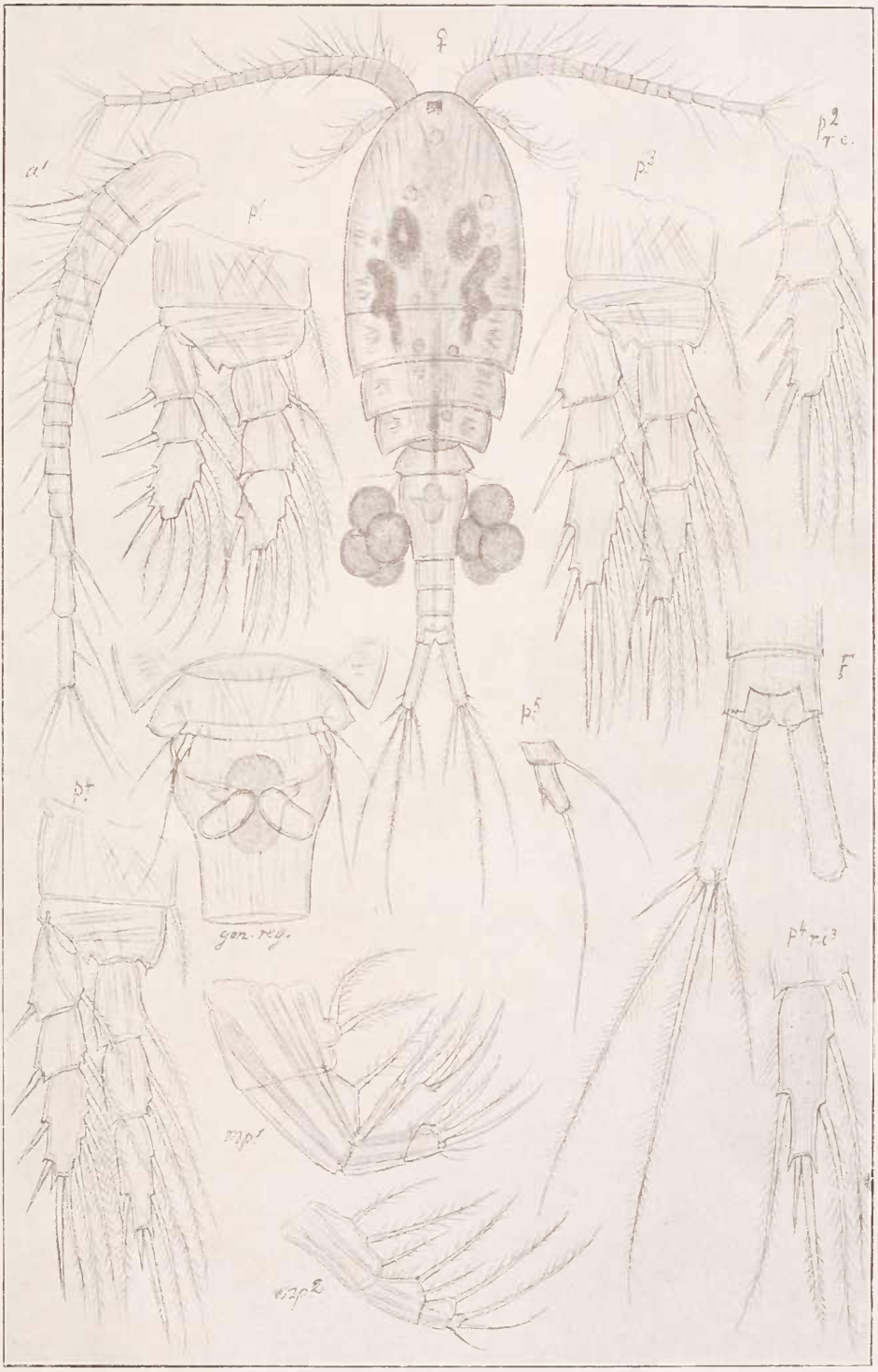
Copepoda



G. O. Sars, del.

Cyclops abyssorum, G. O. Sars.

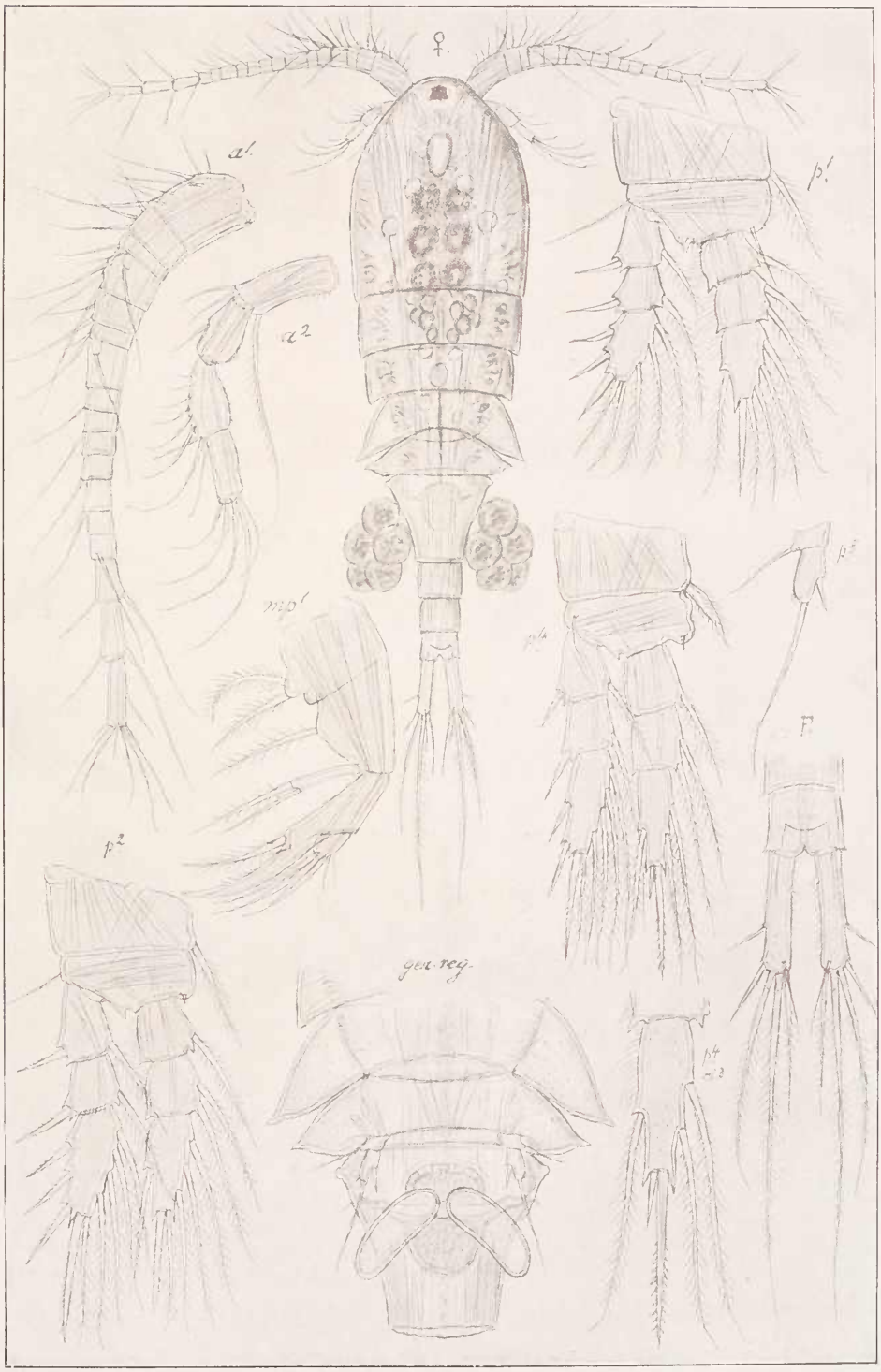
Copepoda



G. O. Sars, del.

Cyclops lacustris, G. O. Sars.

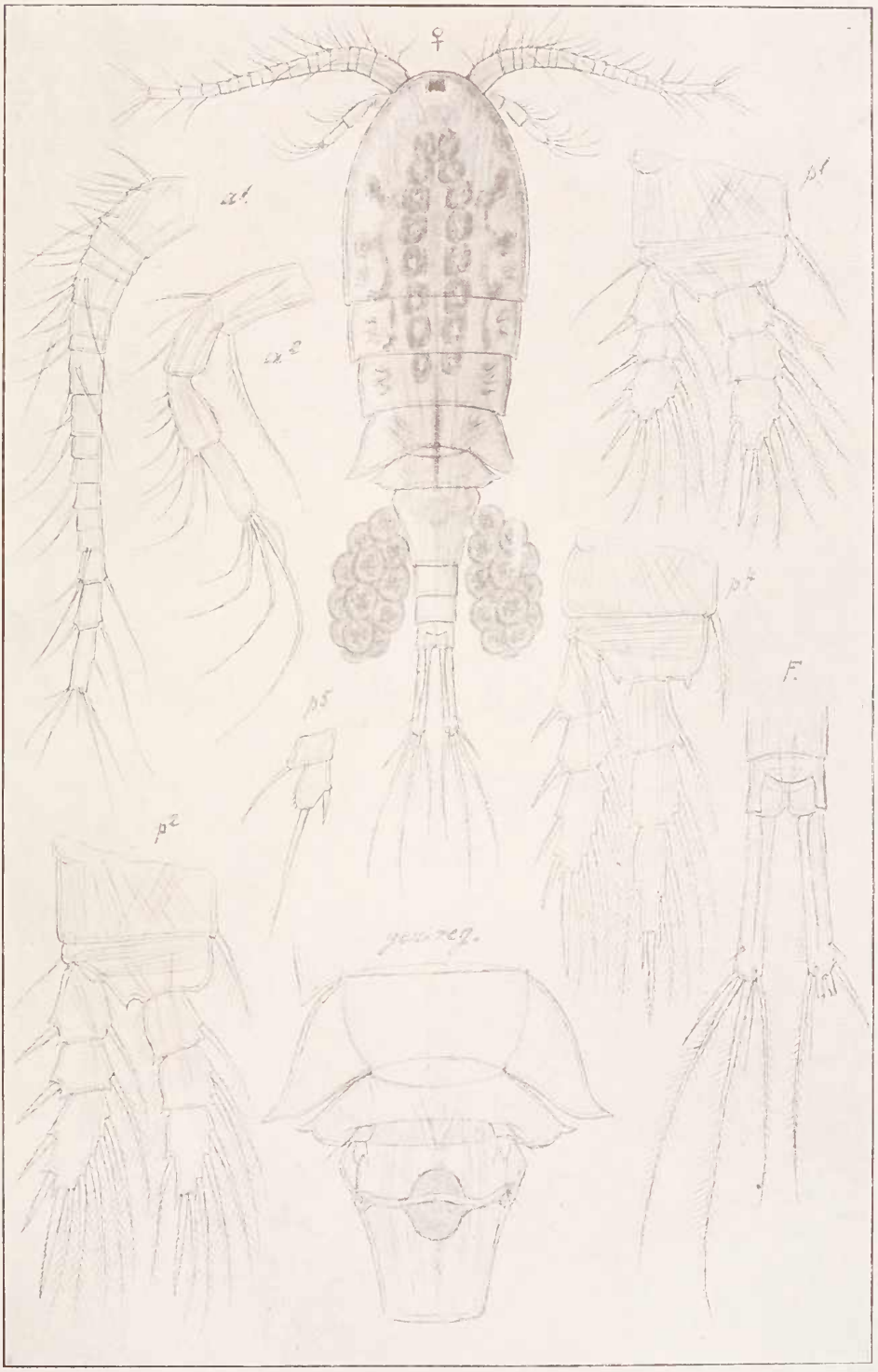
Copepoda



G. O. Sars, del.

Cyclops scutifer, G. O. Sars.

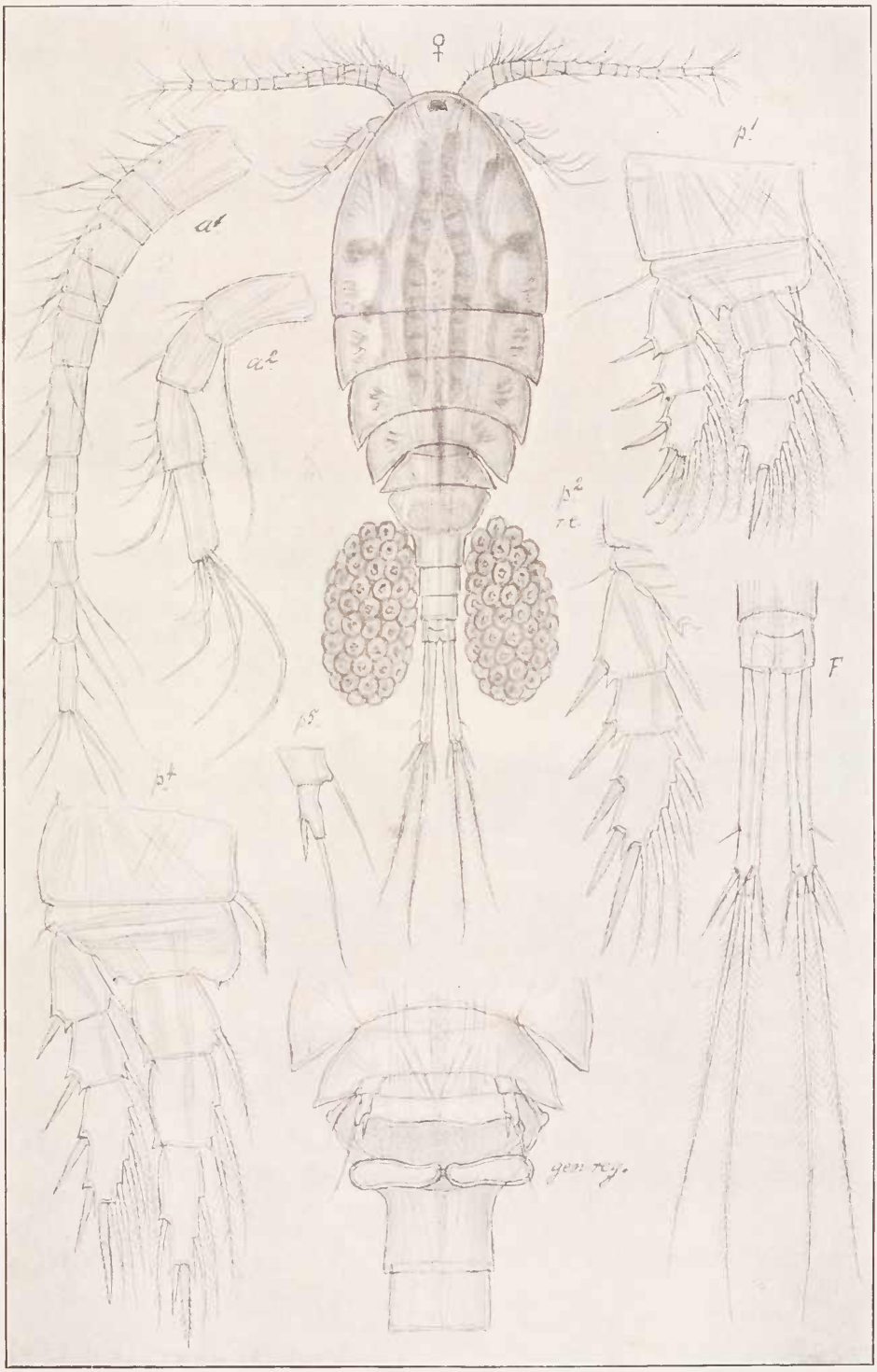
Copepoda



G. O. Sars, del.

Cyclops vicinus, Uljanin.

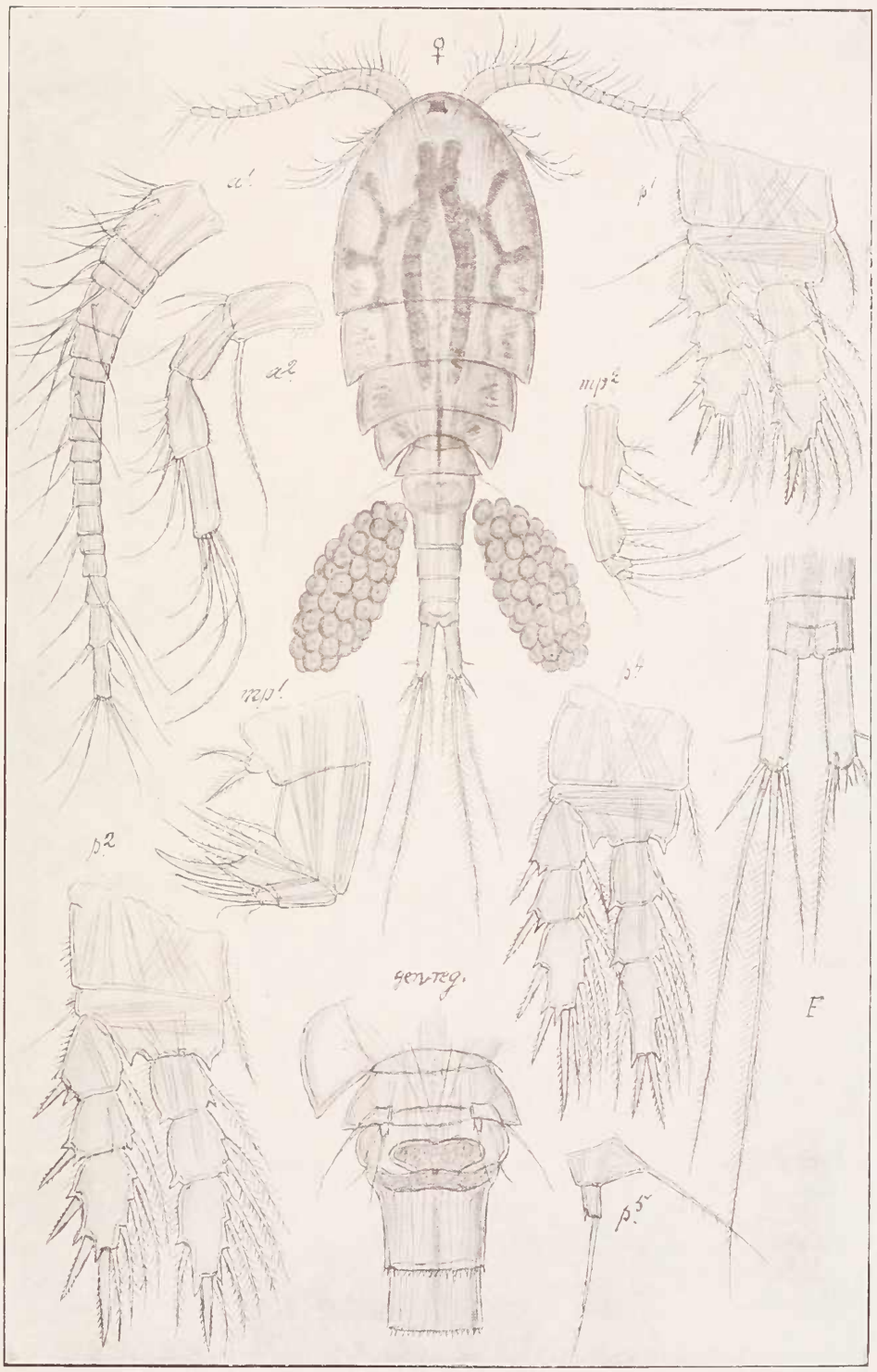
Copepoda



G. O. Sars, del.

Cyclops insignis, Claus.

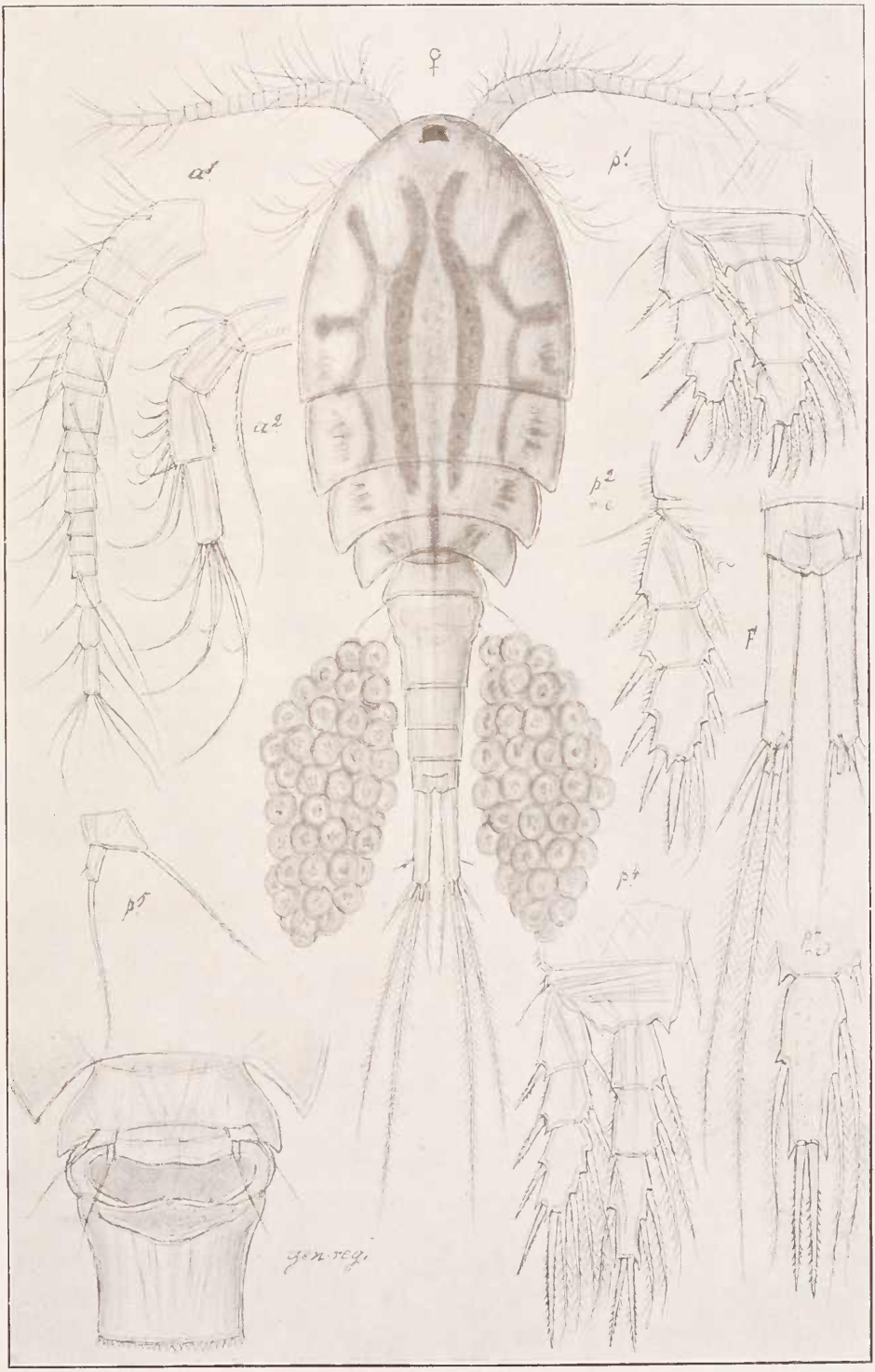
Copepoda



G. O. Sars, del.

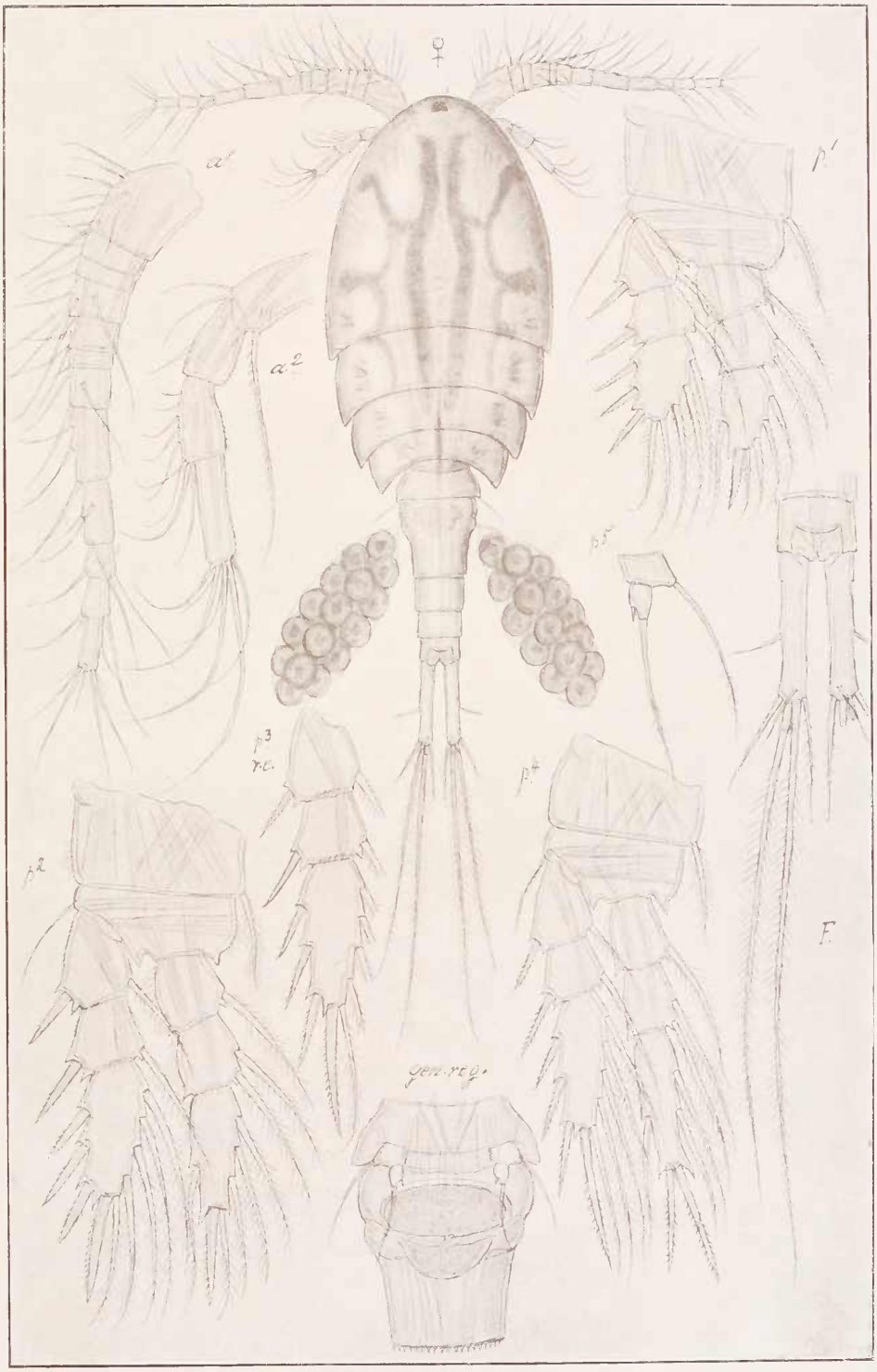
Cyclops vulgaris, Koch.

Copepoda



G. O. Sars, del.

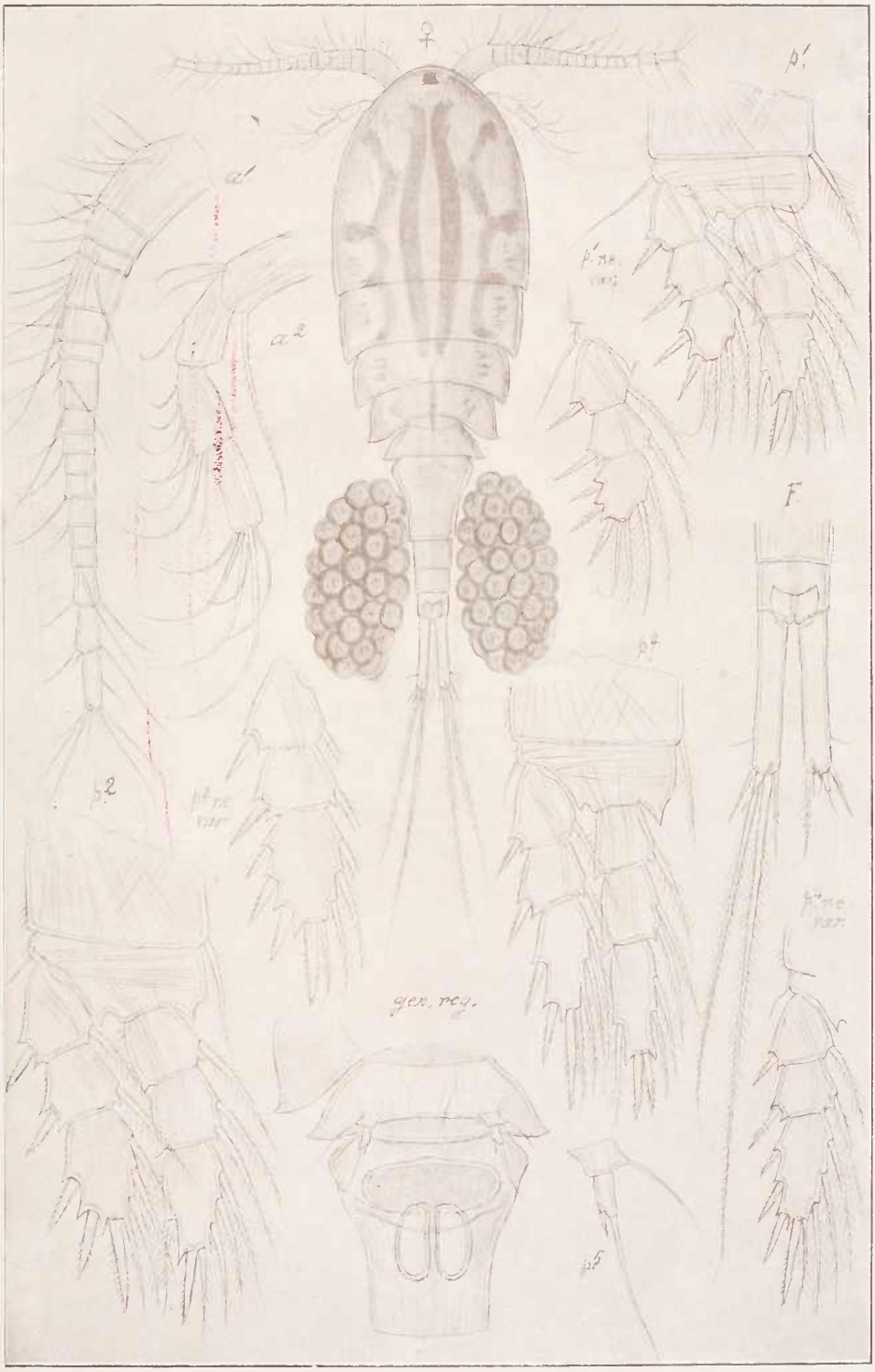
Cyclops gigas, Claus.



G. O. Sars, del.

Cyclops capillatus, G. O. Sars.

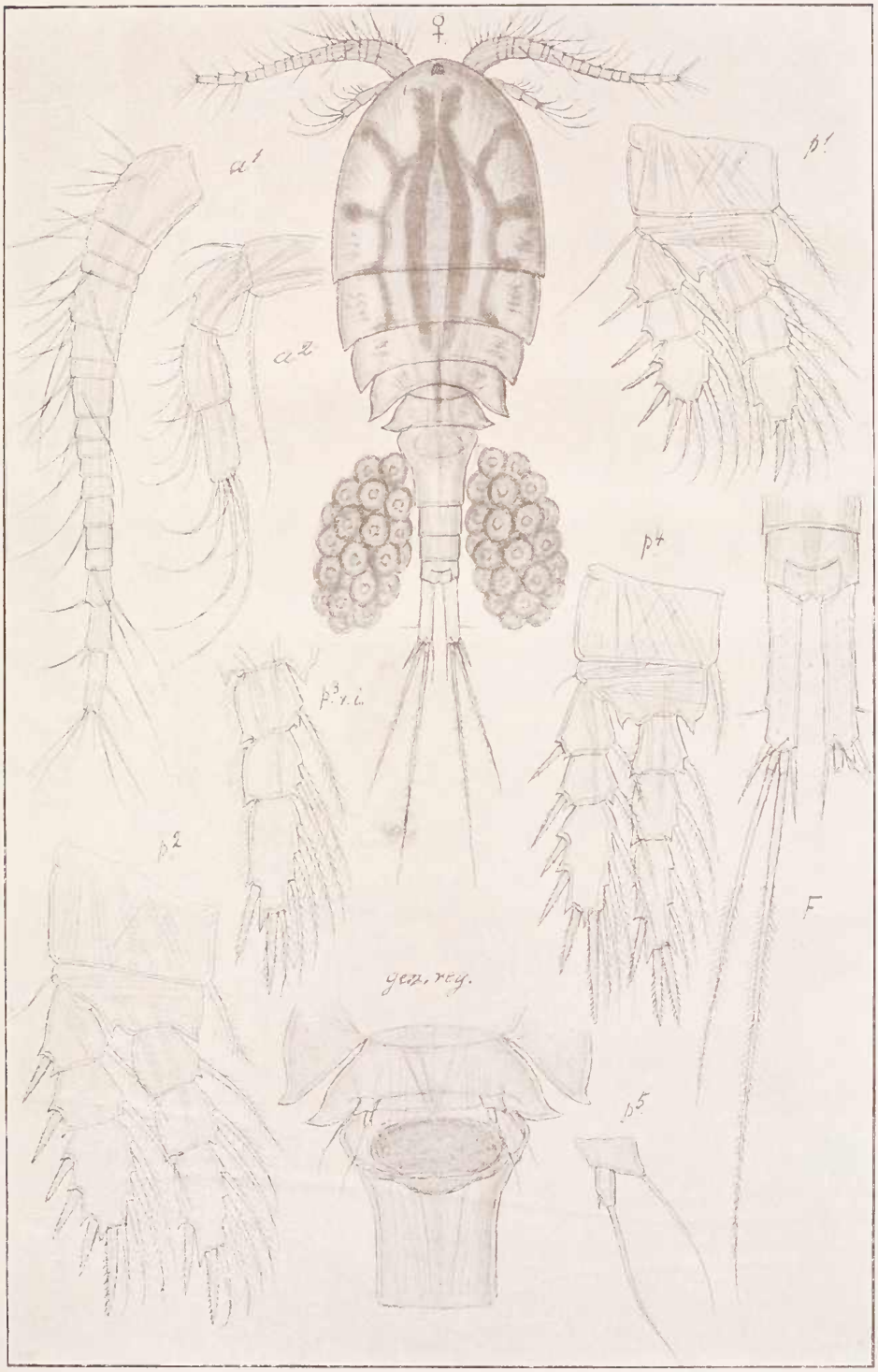
Copepoda



G. O. Sars, del.

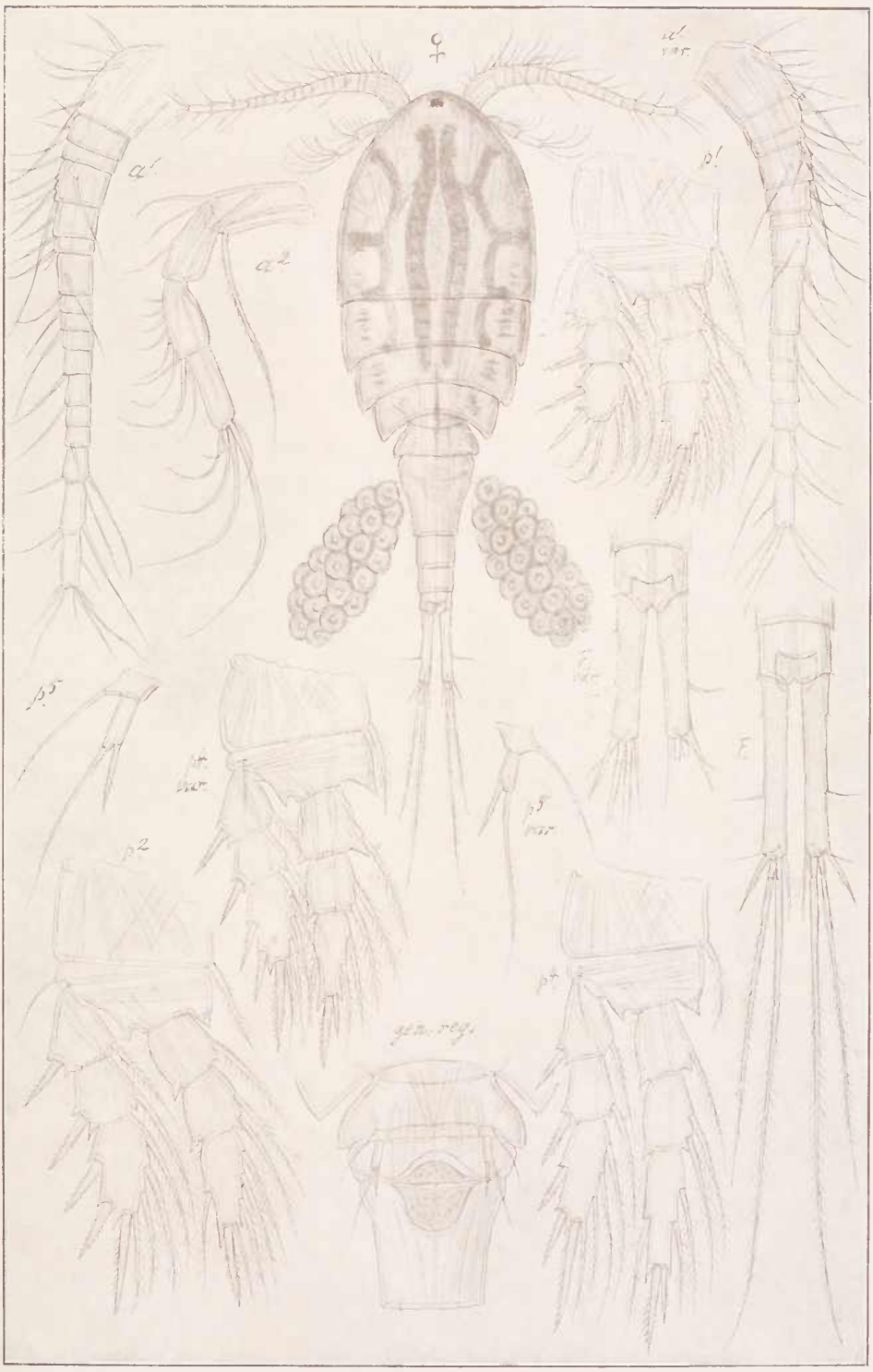
Cyclops lucidulus. Koch.

Copepoda



G. O. Sars, del.

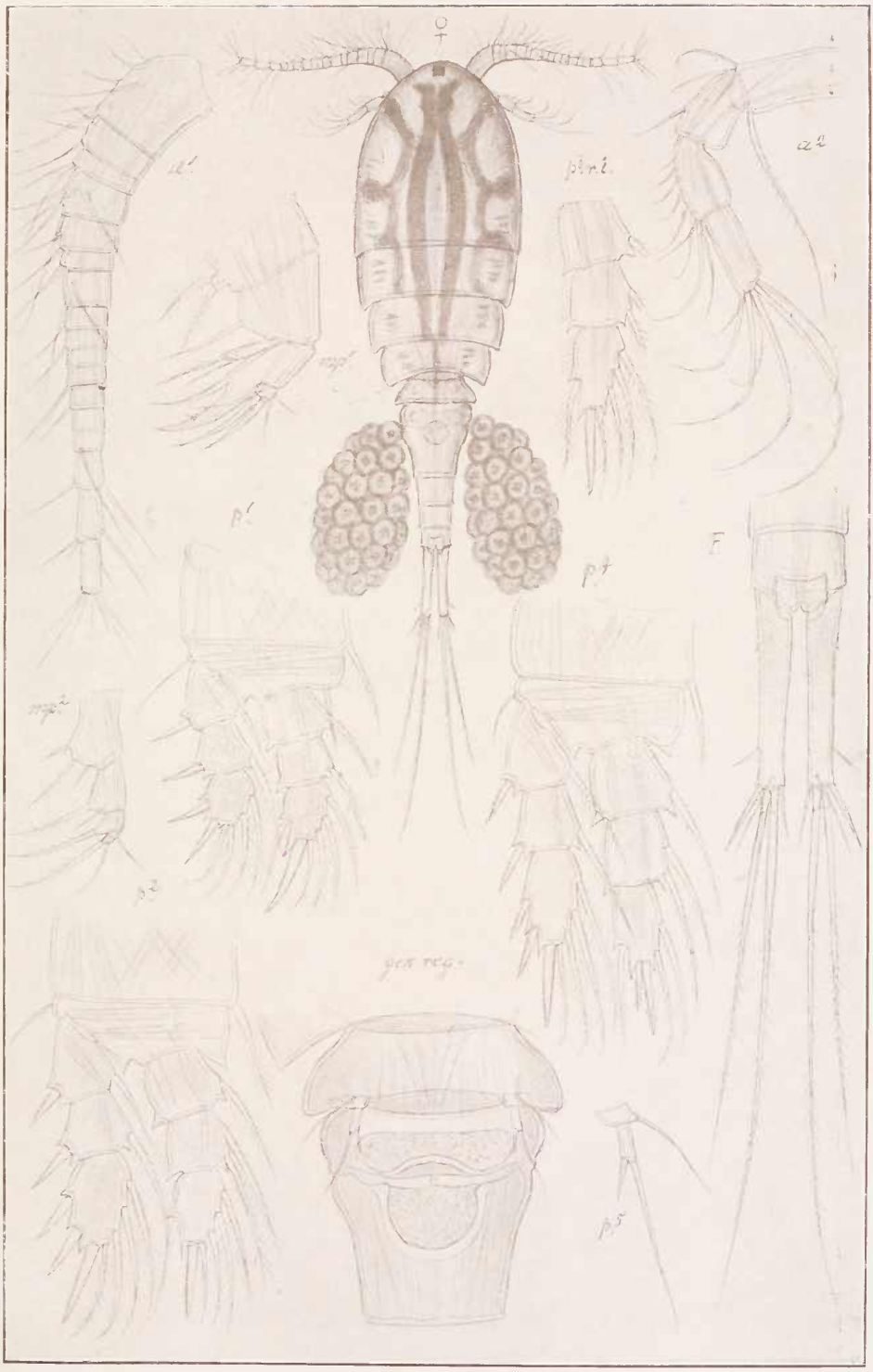
Cyclops robustus, G. O. Sars.



G. O. Sars, del.

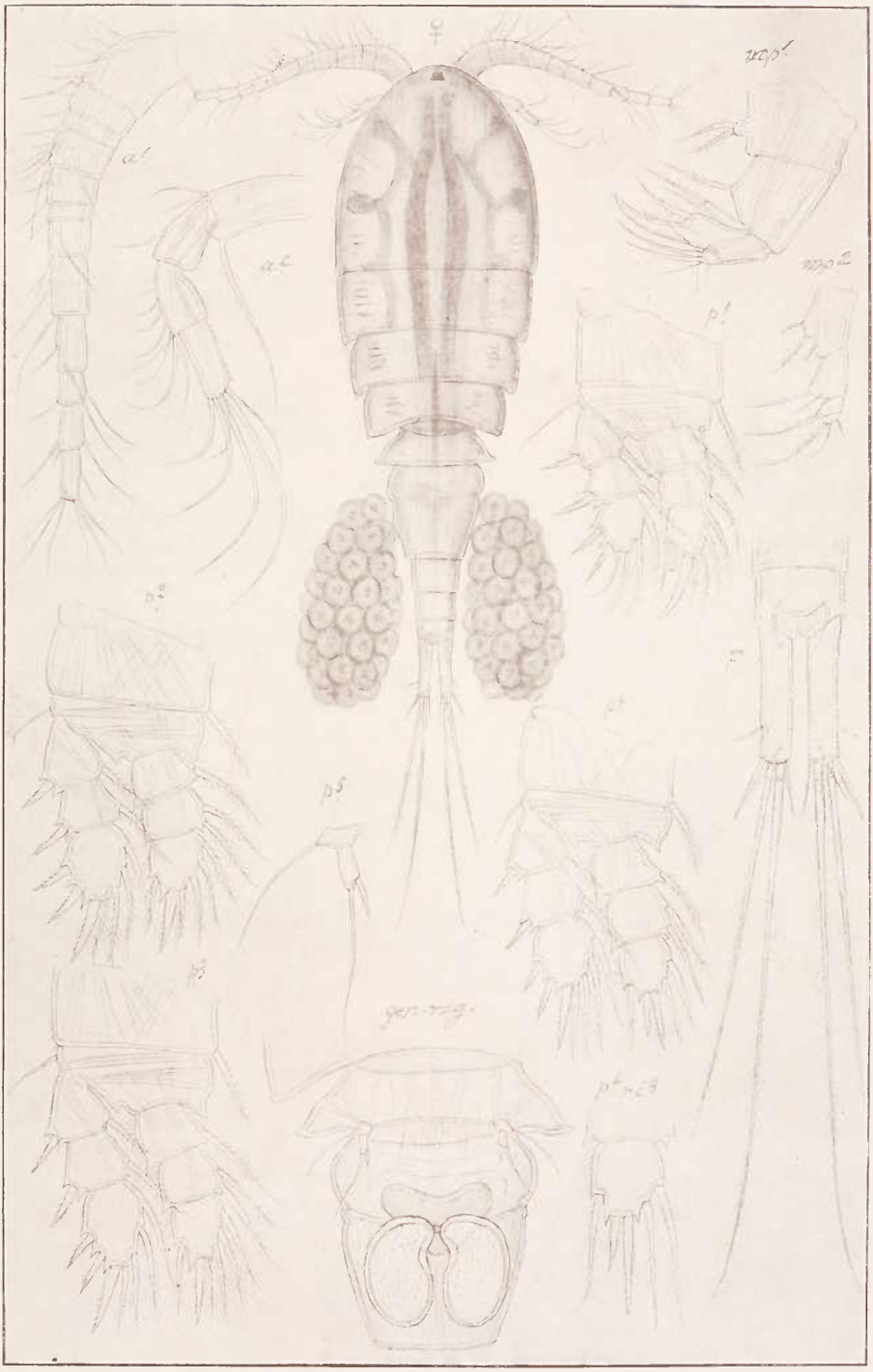
Cyclops pulchellus, Koch.

Copepoda



G. O. Sars, del.

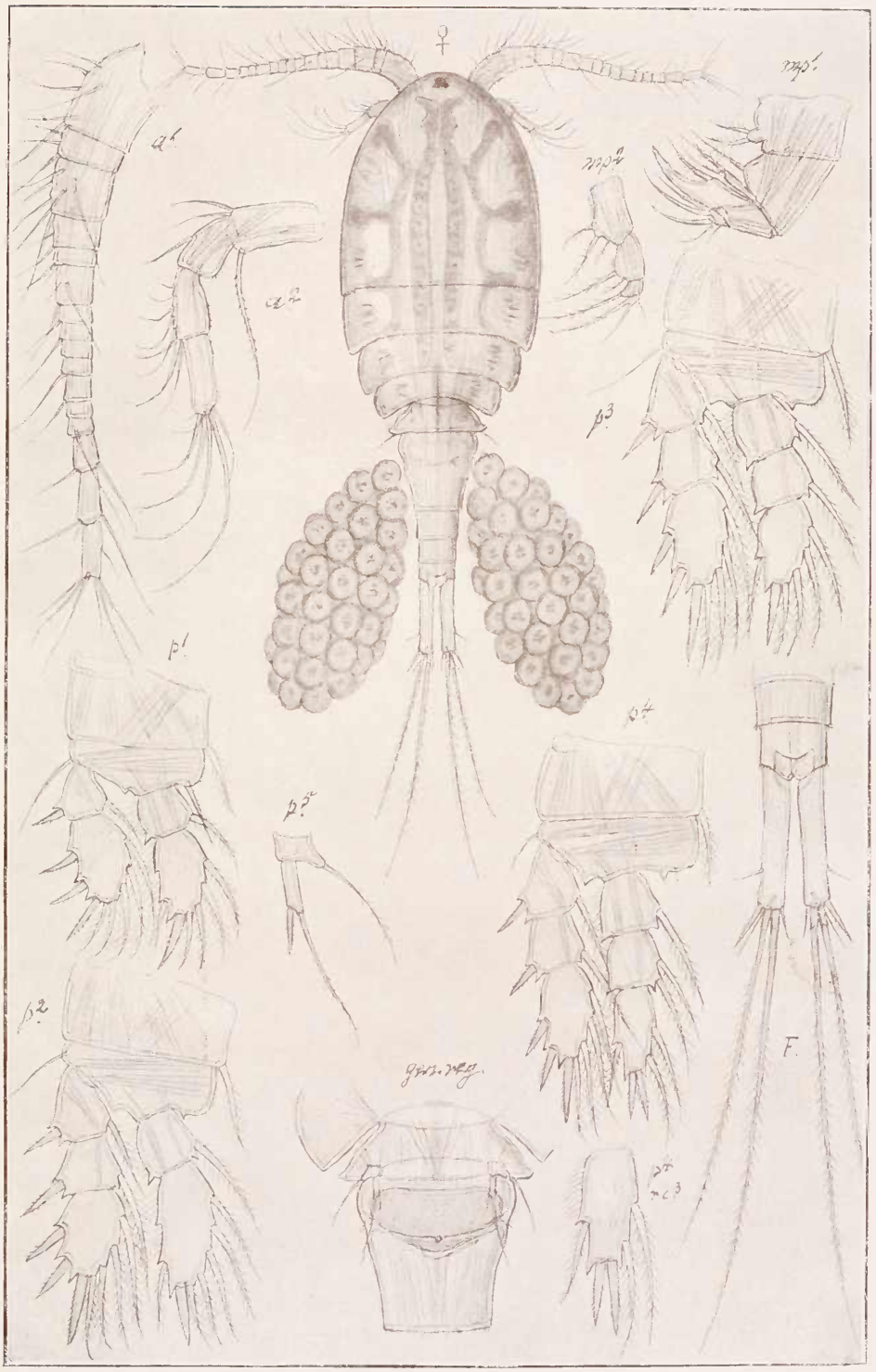
Cyclops bisetosus, Rehberg.



G. O. Sars, del.

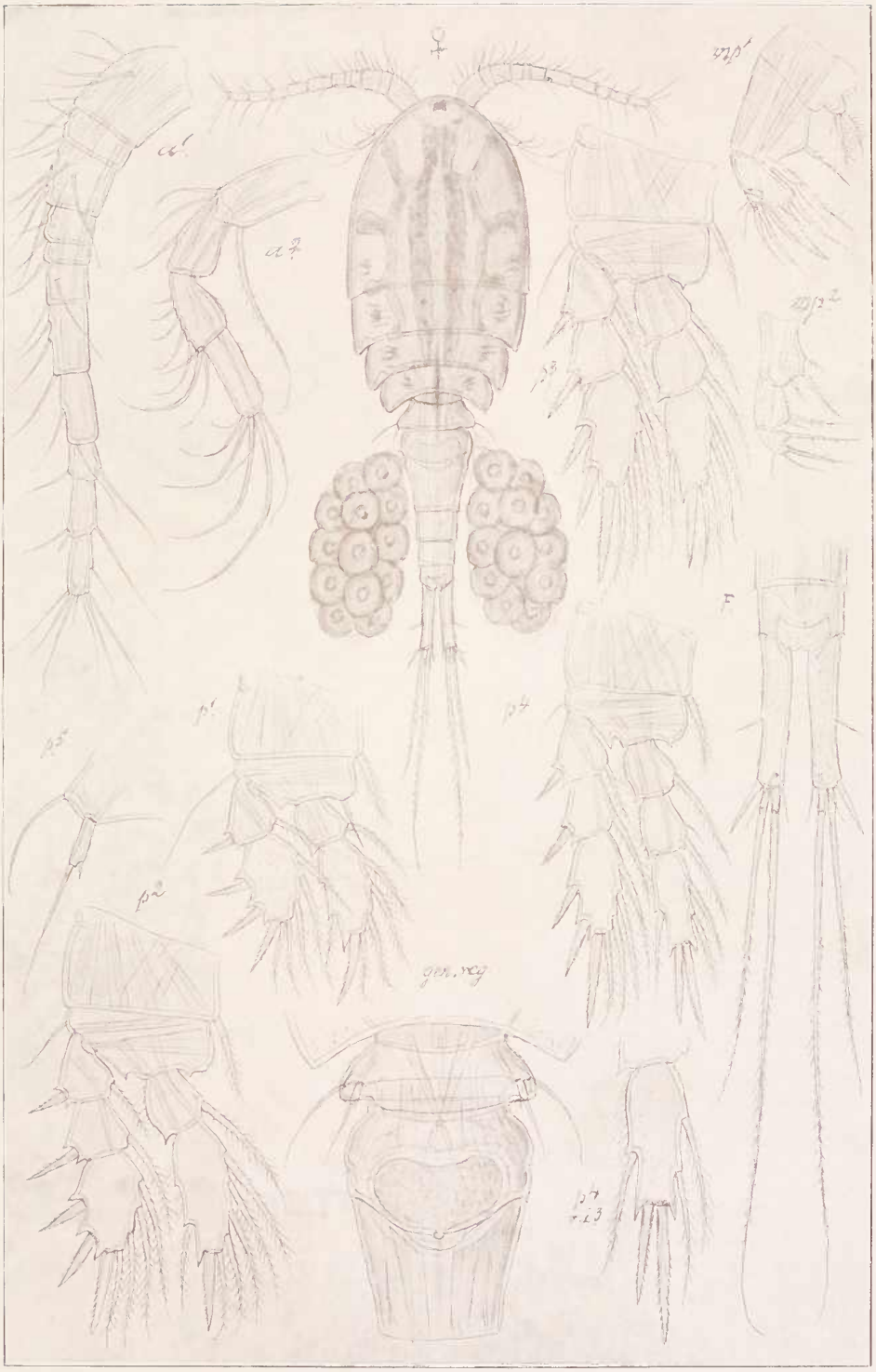
Cyclops crassicaudis, G. O. Sars.

Copepoda



G. O. Sars, del.

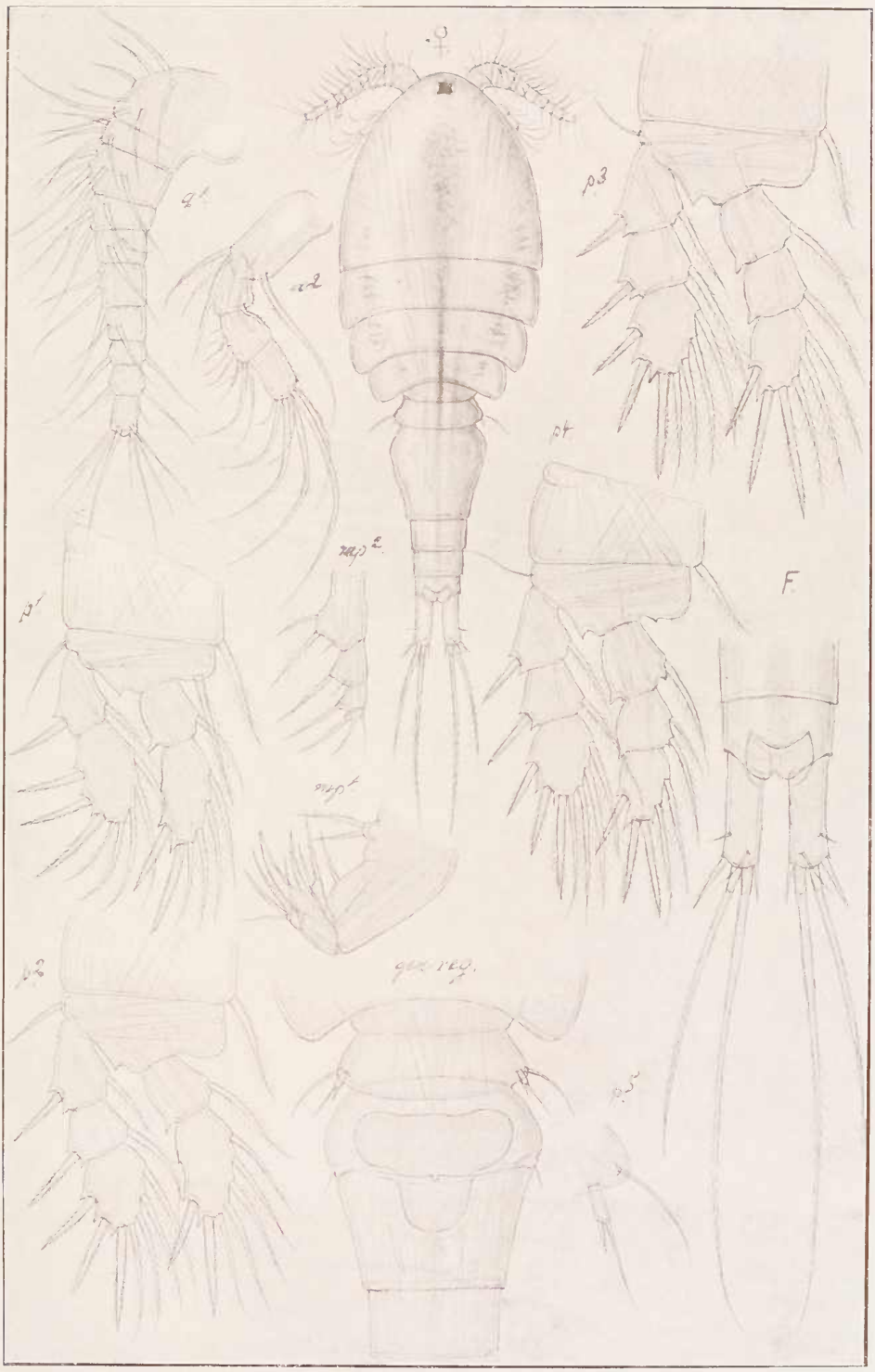
Cyclops langvidus, G. O. Sars.



G. O. Sars, del.

Cyclops diaphanus, Fischer.

Copepoda



G. O. Sars, del.

Cyclops abyssicola, Lilljeb.